

**Understanding the intertwined influence of the
built and the social environments on
children's unaccompanied trips**

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Declaration

‘I, Natan Waintrub Santibáñez confirm that the work presented in this thesis is my own. Where information has been derived from other sources, I confirm that this has been indicated in the thesis.’

Signature Date

Abstract

Existing research has acknowledged the influence of the street environment on children's mobility. However, the literature has given little attention to how the physical aspects of the streets, the people present in the public space, and the interactions between both factors can alter perceptions, experiences and, collectively, discourage unaccompanied trips. Furthermore, children's views on these issues are often neglected in the literature; even more so in Latin American academic research.

This thesis seeks to redress this gap by exploring and quantifying the relationships between these variables from the perspectives of children and young people (6 to 16 years old) living in London (UK) and Santiago (Chile); two capital cities of high-income countries that feature high levels of urban inequality. It contributes to the literature about the influence of the built environment and the social sphere on children and young people's unaccompanied trips by (i) employing novel methods to gather data and built knowledge, (ii) exploring settings that, so far, have received little attention and (iii) suggesting several policy implications. This thesis presents the findings of a sequential study that blends qualitative and quantitative methods. In the first stage, children and young people were invited to talk about the social and physical attributes that are relevant for their travelling (face-to-face semi-structured interviews). While in the second stage, children and young people were asked to formally evaluate attributes of the built and social environments (using rating scales and ranking exercises) and to choose between pairs of streets on the basis of suitability for travelling alone (using stated preferences methods). In both stages, carers were also invited to participate.

A comprehensive analysis of the data indicates the attributes that encourage unaccompanied trips are linked to joyful public spaces and "nice" people, like well-kept footpaths, greenery and playgrounds. In London, crowded footpaths and the presence of teenagers in the public space discourage such trips, as these reduce the space to manoeuvre and are related to antisocial behaviour. In Santiago, the presence of strangers drinking alcohol or men on the streets increases fears and makes children's unaccompanied trips problematic. Additionally, girls tend to have more concerns than boys.

The findings also suggest that younger children's perceptions differ considerably from those of carers, reporting more positive views towards a range of features in the environment and the people inhabiting the public spaces. While young people's perspectives tend to converge with the attitudes and beliefs of carers.

Impact Statement

The work in this thesis has potential impacts on academia and public policy. The impacts on academia comprise theoretical (i.e., the gap in the knowledge), pioneering (i.e., begin the discussion) and methodological (i.e., studying children) contributions that could lead to further progresses in the matters this thesis addresses. In detail:

- This thesis explores the combined impacts of the built and the social environments; two spheres that are frequently studied independently. This thesis provides insights to understand the combined impacts and, by doing so, opens new questions that have received little attention in the existing body of work.
- One of the cases in this thesis is Santiago de Chile, a city that, like the rest of Latin America, has received little attention. This work could collaborate to start the discussion of children's unaccompanied and can be a precursor to further research in the field.
- Children were directly involved in this research as participants of the qualitative and the quantitative data collections, identifying their voices which are underrepresented in the literature that studies their travel patterns. The methodological design of the thesis could provide insights into how children should be included and the issues that it implies.

This thesis explores children and unaccompanied mobility, including walking and other forms of active transport and, therefore, the findings could enrich policies that address such relevant matters. Moreover, the findings of this thesis could have a meaningful impact on a number of issues that are highly relevant in the current policy landscape, including:

- Children's gendered travel experiences. The thesis provides findings that could collaborate to "level the field" and ease the access that girls have to the urban spaces.
- Diverse settings. The thesis provides evidence of relevant differences between the cases of study. For instance, children's travel experiences in London and Santiago's wealthy areas are similar but completely different from Santiago's deprived areas. Findings like these could contribute to the creation of more *ad hoc* policies.

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Chapter 1. Introduction

Unaccompanied trips report a number of benefits to children and young people. Unaccompanied trips benefit children and young people's psychological development because it increases self-consciousness, self-worth and problem resolution (Armstrong, 1993; Tranter and Pawson, 2001; Pollard and Lee, 2003), or compromised (e.g., trauma) in dangerous neighbourhoods (Boynton-Jarrett *et al.*, 2008; Fowler *et al.*, 2009; Mikel, 2019). Children and young people travelling unaccompanied improve their environmental knowledge and help them to develop key navigation skills like geographical orientation and spatial knowledge (Van Vliet, 1983; Matthews, 1992; Joshi *et al.*, 1999; Brown *et al.*, 2008; Eisenlohr *et al.*, 2023). They also acquire and strengthen social skills as, when travelling, they interact with other individuals present on the streets (Pollard and Lee, 2003; Rissotto and Giuliani, 2006; Bourke, 2017; Waygood *et al.*, 2017). Children and young people benefit from the constant contact with the public realm¹; yet they have been displaced to marginal and segregated places in cities designed by adults for adults that jeopardise their development (Ward, 1990; Matthews, 1995; Valentine, 1996; Valentine and McKendrick, 1997; O'Brien *et al.*, 2000; Hart, 2002; Barker, 2009; Wood *et al.*, 2019). Furthermore, childhood and adolescence shape the travel behaviour that children and young people will reproduce as adults (Baslington, 2008), and hostile urban environments could keep them away from sustainable transport modes (e.g., walking, cycling).

At least in western societies, the number of children and young people unaccompanied trips has decreased if compared with previous generations; whereas the chauffeured journeys have increased (Hillman *et al.*, 1990; Prezza *et al.*, 2001; Mackett, 2002; Fyhri *et al.*, 2011; Shaw *et al.*, 2015; Cervesato and Waygood, 2019). There is a certain agreement that children and young people's unaccompanied trips has been threatened by urban environments that have become increasingly hostile (Ward, 1990; Hillman *et al.*, 1990; O'Brien *et al.*, 2000; Carroll *et al.*, 2015; Witten and Field, 2020). Due to this, a vast body of literature has sought to identify those environmental factors

¹ Active trips, and walking in particular, can report health benefits as children and young people increase their physical activity and decrease the risks of suffering from diseases associated with sedentary lifestyles like diabetes and obesity (Rosenberg *et al.*, 2006; Cooper *et al.*, 2006; Voss and Sandercock, 2010; Mackett, 2013). Moreover, carrying out active trips during childhood can impact future behaviours and discourage the use of less sustainable means of transport (Faulkner *et al.*, 2010; Mitra, 2013; Eisenlohr *et al.*, 2023).

that can ease and favour children and young people's mobility (Panter *et al.*, 2010; Mitra *et al.*, 2010; Aarts *et al.*, 2013; Wolfe and McDonald, 2016). The existing body of work suggests that many features of the built environment, such as car-centric roads (e.g., not signalised or wide traffic intersections), deteriorated places or lacking urban amenities (McMillan, 2005; Mitra, 2013; Timperio *et al.*, 2018; Smith *et al.*, 2019), hinder children and young people's trips. Likewise, social environments that cannot protect children and young people in the public spaces increase apprehensions and fears and seems to further restricts their mobility (Tranter and Pawson, 2001; Prezza *et al.*, 2001; Wolfe and McDonald, 2016; Francis *et al.*, 2017). However, to this date, that vast body of research has left a number of key matters under-researched. In detail:

- The studies about the built environment are abundant and have successfully proved that its features (e.g., land use, urban amenities) influence children and young people's unaccompanied trips (Panter *et al.*, 2010; Mitra *et al.*, 2010; Aarts *et al.*, 2013; Wolfe and McDonald, 2016), but have put little attention to the mechanisms that could explain why and how that happens (Koskela and Pain, 2000; Figueroa *et al.*, 2019).
- Studies addressing the social sphere² and the combined impacts of the built and the social environment are scarce and have mostly focused on children and young people's permissions and behaviours (Aarts *et al.*, 2013; Rothman *et al.*, 2014).
- Most of the studies focus on industrialised cities in the US, Europe, Australia and New Zealand (Sharmin and Kamruzzaman, 2017; Waygood, 2017). Research about children and young people's unaccompanied trips in Chile and Latin America is scant and has suggested that children and young people's access to the public space is very limited due to a high perception of insecurity.
- Children and young people's views are often underrepresented in the studies that address their patterns of travelling from the perspective of their carers (Tranter and Pawson, 2001; Mitra, 2013; Horton *et al.*, 2014; Marzi and Reimers, 2018).

In this research, I aim to collaborate to redress those gaps by investigating how the intertwined relationship between the built environment and the social sphere influences children and young people's trips in Santiago (Chile) and London (United Kingdom); two capital cities of high-income countries

² In brief, the physical, social and cultural spaces in which a group of people function and interact (Barnett and Casper, 2001). For more details, see Chapter 2.3.

with contrasting cultures (Europe and Latin America) that suffer from high levels of urban inequality. To do so, I have drawn together studies that, from different points of views, have studied children and young people's travels and the factors that influence them—and, throughout this document, I report the results of a mix-methods sequential study in which, first, I invited children and young people (6 to 16 years old) and their carers to participate in a semi-structured interview and have a guided conversation about the environmental features that are relevant for children and young people travelling in London (UK) and Santiago (Chile). Second, with the insights obtained from the analysis of these interviews, I designed a questionnaire with hypothetical scenarios and invited children and young people (8 to 16 years old) and their carers to answer a variety of questions (stated preferences, rating scales, ranking) about the environmental features they think are the best for children and young people's unaccompanied walking trips³. By employing those methods, this thesis makes several methodological contributions. It shows how the inclusion of pictorial activities can enrich both qualitative and quantitative methods and tests the limits of stated preferences as a means to gather data on children and young people's travels. Moreover, the thesis also provides insights on the challenges of working with children and young people with contrasting socio-cultural backgrounds (Santiago, Chile and London, UK) and shows how methods of different nature can provide complementary perspectives to understand a phenomenon.

What counts as an unaccompanied or independent trip is still “hazy” (Mikkelsen and Christensen, 2009; Barker *et al.*, 2009), and a clear definition of the level of independence is still under debate (Horton *et al.*, 2014). Following the findings and definitions of Brown *et al.* (2008) and UNICEF (2018), this thesis considers unaccompanied trips as those where children and young people have the freedom to move and choose among their available options to walk, cycle or use public transport without an adult escort. Throughout this document, the terms unaccompanied, independent or alone trip are used indistinctly to refer to any trip a child or young person does without an adult.

Children, childhood, or the state of being a minor is a process towards adulthood that generally includes anyone under 18 years old (Alderson, 2016a). The condition of being a child is, however, often described as a social construction (i.e., the concept of a “universal child” is non-existent, see

³ This thesis investigates children's unaccompanied trips that have decreased in number in recent decades despite the relevance they have for the early acquisition of skills of different nature (Matthews, 1992; Pollard and Lee, 2003; Waygood *et al.*, 2017). It studies the social and physical factors that may be jeopardising unaccompanied trips and explores young people's experiences to understand how such factors change over time.

Ariès, 1962) because “childhood” is contextual (e.g. local culture), dynamic (e.g. changes over generations) and built on many social categories and experiences (James *et al.*, 1998). As this thesis explores two settings that have significant socio-cultural differences, it adopts a broad definition of childhood –and considers anyone in the age range of primary and secondary school as children and young people, respectively.

1. 1. Research questions and objectives

The research that explores the impacts of the built environment on children and young people’s unaccompanied trips has been abundant but has explored little how and why it does so. The literature investigating the social sphere and the combined impacts of the built and social environments is scant. Moreover, Latin America is understudied, and children and young people’s views are frequently absent from research studies.

This thesis addresses the question of how and why the built and the social environments influence children and young people’s unaccompanied trips in London and Santiago. It does this by following four sub-questions:

- ① What are the conditions under which children and young people are permitted to make unaccompanied trips?
- ② Which attributes of the built and the social environments influence children and young people’s ability to make unaccompanied trips?
- ③ To what extent do the built and the social environments influence children and young people’s unaccompanied trips?
- ④ What are the differences between groups of carers, children and young people’s perceptions of the built and the social environments in each city?

This research aims to achieve a better understanding of the relationship between (a) the built and the social environments and (b) children and young people’s ability to make unaccompanied trips. To address that, this research investigates the cities of London and Santiago, according to the following five objectives:

- ① Understand the separate and intertwined influence of the built and the social environments on children and young people’s unaccompanied trips.
- ② Analyse children and young people’s patterns of unaccompanied trips in London and Santiago.

- ③ Explore qualitatively the impacts of the built and the social environments on children and young people's unaccompanied trips in London and Santiago.
- ④ Quantify the impacts of the built and the social environments on children and young people's unaccompanied trips in London and Santiago.
- ⑤ Identify the differences between groups of carers, children and young people's perceptions of the built and social environments in London and Santiago.

1. 2. Thesis structure

After this introduction that covers the motivation, research questions and objectives of the thesis, **Chapter 2** addresses the theoretical objective of this work (objective 1).

Chapter 3 provides details of the studied cities, London (UK) and Santiago (Chile) and the conditions in which children and young people's trips happen.

Chapter 4 covers the methods and materials used to reach the objectives of the research. This chapter details the principles that guided each method, the design of the instruments, the sample size and recruitment of participants, ethics and protocols, the data collection and the methods of analysis.

Chapter 5 addresses objectives 2 and 3 and explores the permissions required for children and young people to travel alone and the features of the built environment and the social aspects that influence those trips. This chapter reports findings of the exploratory stage, obtained from the analysis of semi-structured interviews with pictorial activities.

Chapters 6 and 7 address objectives 4 and 5 and examine children, young people and carers' preferences for the attributes of the built and the social environment for children and young people's unaccompanied walking trips. Those chapters also provide details of the influence and relevance of the environmental attributes on children and young people's unaccompanied trips, reporting findings of the experimental stage of the thesis (i.e., analysis of the online questionnaire).

Chapter 8 summarises the key findings of this research, describing the limitations of this work and proposing further research topics.

Chapter 2. Literature review

This chapter reports a narrative literature review of the matters that have investigated children and young people's mobilities and the forms in which environmental features influence them. The chapter is organised as a narrative synthesis (Ridley, 2021) where the factors, facilitators and barriers that influence children's unaccompanied trips are addressed in four subchapters. Chapter 2.1 covers children's trips in research studies, travel benefits, companions, permission and licences. Chapter 2.2 covers the studies that have explored the features of the built environment influences on children's travels. Chapter 2.3 addresses studies that have studied the impacts of the social environment on children's trips. Chapter 2.4 describes the few studies that have studied the combined the effects of the built environment and the social sphere on children's unaccompanied trips. Lastly, the concluding part (Chapter 2.5) highlights the approaches and findings that guide this research and the interpretation of its findings.

2. 1. Children's trips: benefits, transport modes, permissions and unaccompanied mobility

The most studied children and young people's trips are those to/from school because education is a compulsory activity, and, consequently, accounts for the majority of trips they completed (see Mackett, 2002; McMillan, 2005; Freeman, 2019). Scholars are now exploring the trips to and from school as different events (Lopes *et al.*, 2014; Webb Jamme *et al.*, 2018) because morning and afternoon trips may be influenced by carers' availability to drive children and young people to school. Other trip purposes such as recreation, shopping or visiting friends and relatives are also studied, but less than school trips—accounting for more than half of all the trips in multiple countries in Europe (England, France, Germany) and Latin America (Brazil) according to Shaw *et al.* (2015). Children's travels often occur during daylight, which has been reinforced by the high perception of social insecurity (Valentine, 1999; Saraví, 2014; Chaudhury *et al.*, 2019) and motorised traffic-related risks (Alonso *et al.*, 2003) that accompanies the hours in which natural light is scant.

The available body of research often separates children's trips between active and passive mobilities; both are understood as umbrella concepts

to discriminate the transport modes requiring physical activity from those that do not. The most studied active modes of transport are walking and cycling, but recent studies have started to include other modes such as kick scooters and skates (Nansen *et al.*, 2015; Mah *et al.*, 2017). Active modes of transport usually require far less infrastructure (i.e., footpaths and cycle paths) than motorised vehicles (e.g., pavement, highways), and therefore, are often described as more “convenient” and “beneficial” means of transport for the broader society (NACTO 2020; Sagaris *et al.*, 2020; Shirazi and Keivani, 2021). Moran *et al.* (2016) have also emphasised the relevance of understanding the significant differences between the modes of active transport in urban areas and suburbs in Israel. For instance, cycling differs from walking as it requires additional equipment, such as a bike and helmet, and specialised infrastructure like cycle paths to reach longer distances. Consequently, it is not evident that policies aiming to increase cycling may also promote walking trips or vice versa.

What counts as an independent trip is still “hazy” (Mikkelsen and Christensen, 2009; Barker *et al.*, 2009). UNICEF (2018), for instance, described an independent trip as children’s freedom to move and choose among their available options to walk, cycle or use public transport. Scholars from the UK have provided further definitions. Brown *et al.* (2008) defined it as those trips performed by a child without an adult escort. Hillman *et al.* (1990) indicate that unaccompanied mobility may also include the vigilance of adults present in the public realm or, in Hart’s words (1979), periodic reports to caregivers. Technology is further shaping traditional understandings of what means to travel without an adult. Features such as mobile phone devices (in the UK, see Mackket, 2013) and GPS watches (in Chile, see Cortés-Morales, 2020) are blurring the limits of independent mobility because children can now travel unaccompanied but be at carers’ reach at all times. A clear definition of what is the appropriate level of independence to be considered ‘unaccompanied’ is still under debate (Horton *et al.*, 2014).

Existing studies often use “common factors” to analyse children’s independent mobility (Horton *et al.*, 2014). Children are often grouped by age, gender, social class or ethnicity of whom is (not) travelling. Horton *et al.* (2014) and others (Hopkins and Pain 2007; Horton and Kraftl 2008; Christensen and Mikkelsen 2009) challenge those approaches indicating that those categories tend to neglect (or fail to identify) the complexity of children’s mobilities and how these are constituted and interact (or intersect) with other sociocultural factors.

Travelling, and particularly completing journeys alone, reports a number of benefits for children. Unaccompanied trips benefit children and young people's psychological development (Armstrong, 1993) and well-being (Pollard and Lee, 2003; Waygood *et al.*, 2017) by increasing self-consciousness, self-worth and problem resolution, but it can also compromise their development (e.g., creating a trauma) for those living in dangerous neighbourhoods (Boynton-Jarrett *et al.*, 2008; Fowler *et al.*, 2009; Mikel, 2019). Children and young people travelling unaccompanied can improve cognitive and navigation skills such as environmental knowledge and geographical orientation (Van Vliet, 1983; Matthews, 1992; Joshi *et al.*, 1999; Shaw *et al.*, 2015; Brown *et al.*, 2008; Eisenlohr *et al.*, 2023) and provide opportunities to acquire the necessary skills to master the complexities and patterns of urban environments (Banerjee and Lynch, 1977; Tranter and Pawson, 2001; Christensen and O'Brien, 2003; Matthews, 2003; Eisenlohr *et al.*, 2023). For children in the UK, these findings have been challenged. Joshi *et al.* (1999) did not find significant differences on the comprehension of the environment between children that travel accompanied to school and those that have more freedom to complete unaccompanied trips to school. More recently, Webb Jamme *et al.* (2018) found inconclusive evidence of the impacts of neighbourhood understanding and sense of community on children's travelling companion patterns. However, Joshi *et al.* (1999) found that children with more freedom to travel unaccompanied employed more landmarks to describe their local environments.

When travelling alone or with an adult, children strengthen their social skills (Rissotto and Giuliani, 2006; Milne, 2009; Waygood *et al.*, 2017) because they interact with different people, build social networks and construct a sense of place and belonging (Bourke, 2017). They develop their identities by meeting, sharing and creating with peers in adult spaces (Matthews, 2003), challenge preconceptions about boys and girls (Sagaris and Lanfranco, 2019) and build their autonomy, courage, knowledge, strength and safeguard needed to deal with different individuals in the city (Jaramillo, 2016). Unaccompanied trips also have economic implications by freeing their carers from the costs and the time of escorting a child (Hillman *et al.*, 1990; Barker, 2011; Mitra, 2013; Waygood *et al.*, 2017). For instance, in the UK, unaccompanied trips could reduce parental time "losses" (Hillman *et al.*, 1990) and be particularly relevant for women who often carry out escorted trips (Barker, 2011).

The decision-making that can lead to an unaccompanied trip varies among families according to their relations, schedules, power dynamics (Barker, 2009; Nansen *et al.*, 2015; Crawford *et al.*, 2017) and socio-cultural contexts (Egli *et al.*, 2018), yet the impacts of those aspects on children's journeys

are (still) an understudied issue (Mitra, 2013; Carver *et al.*, 2014; Jensen *et al.*, 2015). Studies assume that parents are the ultimate decision-makers (or gatekeepers) of children's activities (Hillman *et al.*, 1990), most predominantly at the primary school level (Ahern *et al.*, 2017). The decision process for secondary school children is less clear as, at that stage, they obtain more licences and independence.

2. 1. 1. Permissions and licences

Permissions and licences given by carers are commonly described as “conditional rights” to do activities such as travel to school, use local buses, cross main roads, go out after dark or cycle without an adult (Hart, 1979; Hillman *et al.*, 1990; Kytä, 1997; Valentine, 1997a; Christensen and Mikkelsen, 2013; Smith *et al.*, 2019). Studying the UK, scholars have described a number of relevant factors in the process of granting permissions and licenses to children, including their age (Shaw *et al.*, 2012; 2015) and gender (Valentine, 1997b; O'Brien *et al.*, 2000; Brown *et al.*, 2008).

In the UK, Shaw *et al.* (2012) have identified numerous differences between groups as, for instance, secondary school children hold more licences to travel without an adult (42-83% percent) than primary school children (7-33%). Considering gender, boys in the UK enjoy more freedom than girls; nine per cent of boys and 15% of girls aged 8 to 11 are not permitted to do any activity without an adult (Brown *et al.*, 2008). Also in the UK, Mackett (2013) found that siblings and friends can ameliorate gender differences. His findings indicate that 85% of boys and 81% of girls aged 8 to 11 are allowed to travel with a sibling/friend and without an adult. To the researcher's knowledge, there are no works in Chile studying equivalent matters; yet, in Mexico, a similar pattern is observed with young women enjoying limited freedom of movement compared to their male peers (Saraví, 2014).

Children and young people can negotiate permissions to acquire more privileges (Zeiger, 2003; Visser, 2019). They can also violate permissions by accessing the public space without permission, bending (or breaking) rules, or crossing the physical boundaries set by adults as demonstrations of holding the needed skills to have more privileges (Valentine, 1997b; Christensen and Mikkelsen, 2013; Crawford *et al.*, 2017; Visser, 2019). Nevertheless, previous works (summarised in Horton *et al.*, 2014) have challenged studies that focused on the transgressive children's mobilities or depicted confrontational power relations between children and adults. Those recent works suggest that the majority of children accept and value parents' rules and restrictions about their mobility. Those works also indicate

that children engage considerable periods of time outdoors even under very restrictive spatial boundaries (Christensen *et al.*, 2018).

In western societies, the number of trips without an adult (i.e., unaccompanied) has decreased if compared with previous generations, whereas the escorted journeys have increased (Hillman *et al.*, 1990; Prezda *et al.*, 2001; Christensen and Cortés-Morales, 2017). This phenomenon has been documented in the UK (Mackett, 2002; Mackett *et al.*, 2007; Shaw *et al.*, 2015; Ahern *et al.*, 2017) where the number of school trips accompanied by an adult increased from 64% to 77% for primary school children and from 9% to 17% for secondary school children between 1990 and 2010. Moreover, less than 60% of children aged 11 or less have licences to travel without an adult to other destinations (Mackett *et al.*, 2005; 2007), whereas almost 90% of older children have those permission by the age of fifteen. To the researcher's knowledge, there are no works in Chile studying unaccompanied trips; one study in São Paulo (Brazil), however, suggested that the failed government attempts to encourage unaccompanied trips resulted in more escorted trips (de Sá *et al.*, 2015).

The decrease of unaccompanied trips has been mirrored by the increase of trips completed on foot: the most available and common active mode of transport used by children (Moran *et al.*, 2016). In the UK, and London in particular, children's walking trips represented 35% of the total number of trips completed in 2009. By 2019, the number of trips completed on foot increased and reached 46% of the total (Department for Transport, 2021). In Latin America, however, the number of trips completed walking has diminished over time (Costa *et al.*, 2012; de Sá *et al.*, 2015). In Santiago, 53% of the trips completed by children were on foot in 2006. Six years later, by 2012, the percentage of walking trips decreased to 46% (SECTRA, 2012). Palma *et al.* (2020) in Chile, and other scholars in the US (Schlossberg *et al.*, 2006; Gallimore *et al.*, 2011; Sener *et al.*, 2019), indicate that carer's considerations (e.g., fears, desire to spend more time with a child) are among the main reasons behind the decrease of walking trips.

In the UK, carers' apprehensions include the location of the destinations (i.e., distant facilities), a child considered too young or immature to travel without an adult, the presence of animals (dogs) along the route, worries about traffic accidents, and the fears of strangers (e.g., teenagers, adults) and the harm they may cause to children (e.g., bullying, abduction, assault, molestation) (DfT, 2015; Ahern *et al.*, 2017). In Chile, only one study (Palma *et al.*, 2020) has explored children's trips (commuting to school in Valparaíso, one of the biggest cities in the country). The most relevant barriers for carers

decision on letting a child or a teenager aged 9 to 18 to walk or cycle to school that were identified are: long distances to school, high traffic and high speeds, crime in the area, dangerous traffic junctions, absence of policeman at crossings, absence of adults to walk along with children, lack of pedestrian and cycling infrastructure (i.e., footpaths, cycle paths). The evidence from both countries seems to support the conclusions reached by Faulkner *et al.* (2010). Those authors indicate that children's opportunities to travel without an adult are more related to safety concerns than, for instance, the level of traffic.

Carers often underestimate children's skills. In the UK, Valentine (1997a, 1997b) found that children perceive themselves as capable of managing social interactions and the risks in the environment; conversely, parents consider children much more immature than they are. Reproducing the gendered patterns described earlier, girls in the UK are also perceived to be more at risk than boys and are encouraged to take more precautions (Valentine, 1997a; Brown *et al.*, 2008; Carver *et al.*, 2014b). To reduce the distance between carers' (mis)perceptions, Francis *et al.* (2017) argue that Australian children are taught strategies to avoid strangers and potential conflicts, usually relying on prejudices about the environment and others.

The body of literature also has acknowledged that urban environments have become increasingly hostile for children, discouraging unaccompanied trips (Tranter and Pawson, 2001; Riggio, 2002; Tonucci, 2005; Chaudhury *et al.*, 2019). Studying the UK, Wood *et al.* (2019) argue that the rapid urbanisation that several towns of the country have experienced has been accompanied by the production of spaces and places for motorised traffic and not necessarily other purposes that enrich the life of the cities (e.g., play, hang out). Using qualitative and quantitative methods, several reviews have compiled the many works that have provided evidence of the influence of built and social aspects of the environment on children's travel behaviour (McMillan, 2005; Mitra, 2013, Sharmin and Kamruzzaman, 2017; Marzi *et al.*, 2018). However, as Horton *et al.* (2014) and Christensen and Cortés-Morales (2017) suggest, the existing literature has conceptual and empirical limitations that have simplified the phenomena and have minimised the intertwined forms in which contextual, social and cultural factors influence children's mobility.

Lastly, several authors have indicated that children's views are usually diminished or overlooked in the studies that explore their mobility (Tammarazio and Requena, 2015; Alderson, 2016; Marzi and Reimers, 2018; Murray and Cortés-Morales, 2019; Porter *et al.*, 2020). Other authors add that children's unaccompanied mobility is a complex phenomenon in which carers' views

are overrepresented, missing the insights of those who experience it first-hand (Tranter and Pawson, 2001; Shaw *et al.*, 2012; Mackett, 2013; Mitra, 2013; Horton *et al.*, 2014). Those scholars assert that it is imperative to include children's views as participants (or even co-researchers) and reflect on the biases and adult-centric views that can emerge.

2. 2. The influence of the built environment on children's travel

Since the insights of Jacobs (1961), Gehl (1987), Whyte (1988) and others (Lynch, 1960; Appleyard *et al.*, 1981), much attention has been given to the intricate relationship between the physical structures and the public life. In their work, permeable facades, well-designed public spaces, facilities, shops and other features enrich public life and allow the reproduction of capitals of different nature. More recently, sedentary lifestyles, widespread epidemics like obesity, greenhouse gas emissions and other contemporary issues have renewed the interest to disentangle the effects of the—now called—built environment on human behaviours (Sealens and Handy, 2008; Ewing and Cervero, 2010; McCormack and Shiell, 2011; Valenzuela-Montes and Talavera-García, 2015; Wang and Yang, 2019).

The built environment, as defined by Cervero and Kockelman (1997), comprises all the “physical features of the urban landscape (i.e. alterations to the natural landscape) that collectively define the public realm” (pp. 200). It encompasses “land use patterns, the distribution across space of activities and the buildings that house them; the transportation system, the physical infrastructure of roads, sidewalk, bike paths, etc., as well as the service this system provides; and urban design, the arrangement and appearance of the physical elements in a community” (Saelens and Handy, 2008; pp. 2). Næss (2015) adds that the built environment includes “the geographical distribution, fabric and design of the building stock; the location of different functions (such as residences, workplaces, public institutions and service) relative to each other within the building stock” (pp. 276).

For children, the built environment of western cities has been described as particularly hostile. It is designed by and for adults (for the UK, see Milne, 2009; Wood *et al.*, 2019; for Chile, see Puga, 2006; Herrmann-Lunecke *et al.*, 2021; for elsewhere, see Tonucci, 2005; Witten and Field 2020), restricting children to their local environments and secluding them in usually gated public spaces (Hart, 2002; Krishnamurthy *et al.*, 2018). Children are expected to be invisible in the cities (Matthew, 2003), but there are some attempts to shift this tendency in new developments that include children's views,

needs and concerns in the process of designing public spaces (Elshater, 2018; Krishnamurthy *et al.*, 2018; UNICEF, 2018). Those spaces are starting to proliferate in the UK (Wood *et al.*, 2019) and in Chile (Soto Caro *et al.*, 2021), but are not the norm. For instance in Chile, Puga (2006) indicates that even spaces intensively used by children, such as parks and schools, are designed to maximise the caregivers' surveillance and not to enrich children's experiences and interactions. Developing further the argument, the author indicates that children are under constant adult supervision and, therefore, they are allowed to roam only in highly controlled spaces (e.g. a garden overlooked by the house window). This notion also has increased the apprehensions towards the public space which, due to their dimensions and character, are beyond carers' control.

A vast body of research acknowledges that the built environment delimits children's actions, alters their behaviours, collaborates on the definition of performative rules (i.e., tacit norms of behaviour) and, by doing so, influence in numerous forms their travel patterns (O'Brien *et al.*, 2000; Prezda *et al.*, 2001; Tranter and Pawson, 2001; McMillan, 2005; Mitra, 2013; Timperio *et al.*, 2018). Studies have identified and measured the influence of numerous features of the built environment on (i) the selection of a specific transport mode (Larsen *et al.*, 2009; Mitra, 2013; Waygood *et al.*, 2017), (ii) the attitudes towards walking or public transport services (Lorenc *et al.*, 2008; Foster *et al.*, 2015; Ayllón *et al.*, 2021) and (iii) the licences a child holds to travel unaccompanied (Smith *et al.*, 2019). Like other studies about children's travel behaviour, the research that investigates the built environment mainly explores trips to/from school and gives particular attention to walking and cycling.

On a macro scale, high densities and diverse land uses, both representing proxies of building typologies (e.g. dense buildings versus suburban houses), and the availability of destinations, facilities and services at short distances, seems to affect positively children's active mobility (Kerr *et al.*, 2006; McMillan, 2007; McDonald, 2008; Larsen *et al.*, 2009; Loptson *et al.*, 2012). Investigating street connectivity and building and plot sizes in the UK, the US, Canada and Australia, Panter *et al.* (2008) and Mitra *et al.* (2010) suggest that neighbourhoods with high connectivity in combination with diverse land use positively affect children's active travels. Both features decrease the distances which are necessary to reach facilities and make feasible the use of non-motorised means of transport. In the UK, Easton and Ferrari (2015) found that young people living in areas with a higher density of cul-de-sacs were more likely to use active modes of transport. Meanwhile, Panter *et al.* (2010a) suggest that building density and land use mix are linked to children

walking to school also in the UK. Other studies, however, have also found that active trips can be negatively affected by high densities, mixed land use when associated with a high number of intersections along the route (Davidson and Lawson, 2006; Larsen *et al.*, 2012; Smith *et al.*, 2022). A negative influence of densities on active trips has been also identified in neighbourhoods with high median income (Larsen *et al.*, 2012). Despite the differences described above, scholars agree in that ‘distance’ is one of the most—if not the only—significant variable for determining the level of children’s active and/or unaccompanied trips for cities in the UK (Panter *et al.*, 2010a; Carver *et al.*, 2014a; Chillón *et al.*, 2015; Ahern *et al.*, 2017), Chile (see Palma *et al.*, 2020) and elsewhere (for Australia, see Timperio, *et al.*, 2006; Giles-Corti, *et al.*, 2011; for Ecuador, see Huertas-Delgado *et al.*, 2018; for the US see Yarlagadda and Srinivasan, 2008; Yarlagadda and Srinivasan, 2008).

In the case of unaccompanied trips, land use diversity can have negative (Sharmin and Kamruzzaman, 2017; Zannat *et al.*, 2022) and positive impacts (Tyagi and Raheja, 2021a) on children’s unaccompanied trips. This feature is linked with busy streets and the presence of strangers that can increase fears and reduce the territory within which a child is permitted to roam (Villanueva *et al.*, 2012). In the UK, the literature also suggests that children who have a greater number of accessible destinations in the neighbourhood are more likely to roam unaccompanied (Carver *et al.*, 2014a). Other authors (Giles-Corti *et al.*, 2009; Carver *et al.*, 2014b; De Meester *et al.*, 2014) suggest that mix-use residential areas can increase girls’ probabilities to travel alone. Large areas with one predominant land use (e.g., residential, commercial) and the availability of services and facilities nearby seem to have a positive effect on children’s unaccompanied mobility (Carver *et al.*, 2014b; Sharmin and Kamruzzaman, 2017; Smith *et al.*, 2019). In the UK, a variety of destinations of interest located in close proximity (e.g., friend or relative house, recreational facility) could imply shorter travel distances, reduce the incentives for travelling in cars (Mackett, 2002; Panter *et al.*, 2010a) and can lift some of the restrictions imposed by carers.

At “eye level”, children’s active mobility seems to be positively affected by good quality and well-kept environments (Ward, 1990; Evenson *et al.*, 2006), and the existence of urban amenities such as parks, playgrounds, and greenery like bushes and trees (Evenson *et al.*, 2006; Grow *et al.*, 2008; Panter *et al.*, 2010a; Larsen *et al.*, 2012; Kamargianni and Polydoropoulou, 2014). The positive effect of those features has been also registered studying children’s unaccompanied trips (Veitch *et al.*, 2006; Lin and Chang, 2010; Christensen and Mikkelsen, 2013; Christian *et al.*, 2015; Eisenlohr *et al.*, 2023). Carers and

children associate well-kept environments and urban amenities with better, safer and livelier environments for children (Webb Jamme *et al.*, 2018; Smith *et al.*, 2019; Ploner and Jones, 2020). In contrast, desolated public spaces surrounded by deteriorated places or lacking in urban amenities hinder children's trips (Timperio *et al.*, 2006; Veitch *et al.*, 2006; Day and Wager, 2010; Giles-Corti *et al.*, 2011; Carver *et al.*, 2013; Smith *et al.*, 2019). For instance, in the UK, Ahern *et al.* (2017) describe carers' concerns regarding the lack of bicycle storage. Not directly related to children's mobility, authors in Latin America have detected contradictory spaces, like local parks in Buenos Aires, Argentina (Milstein, 2008; 2013), which are rated as risky by adults but attractive by children. In addition, some authors have indicated that, due to the high fear of crime that prevails in many Latin American cities, some carers consider that the only places where children can roam free are those that are under their direct surveillance (Reis *et al.*, 2005; Saraví, 2014). While not directly related to trips, carers in Chile have fewer concerns when children roam in well-lit public spaces that have natural surveillance (e.g., permeable fences) or are visible from homes (Puga, 2006).

The effect of traffic-related elements of the built environment on children's active mobility has been thoroughly studied. Several authors argue that public policies in Europe and Latin America have encouraged the acquisition of cars and the creation of urban spaces suitable for motorised vehicles, thus creating hostile environments for pedestrians, and, in particular, children and young people (Mackett, 2002; Costa *et al.*, 2012; de Sá *et al.*, 2015; Waygood *et al.*, 2017; UNICEF, 2018; Loo, 2021). Consequently, creating hostile environments for pedestrians, and, in particular, children and young people. Some authors indicate that, in this context of car-orientated cities, pedestrians have been given the responsibilities of avoiding accidents: children must learn in every stage how to behave (Hillman *et al.*, 1990; Poo *et al.*, 2015; Waygood *et al.*, 2017).

Highly congested roads (with more exhaust fumes), high-speed traffic and high-volume of vehicles hinder children's mobility (Evenson *et al.*, 2006; Timperio *et al.*, 2006; 2018; Veitch *et al.*, 2006; Ahlport *et al.*, 2008; Carver *et al.*, 2008; Giles-Corti *et al.*, 2011; Carver *et al.*, 2013; Sharmin and Kamruzzaman, 2017; Huertas-Delgado *et al.*, 2018; Smith *et al.*, 2019). In Chile, carers' barriers to children and young people's active trips include high traffic volume and speed (Palma *et al.*, 2020). Carers in London have similar concerns regarding dangerous traffic on children's routes (Panter *et al.*, 2010b). Better street environments for children have calm traffic. In the UK, this can be either induced by traffic calming measures (e.g., speed bumps, traffic lights) or naturally found in low traffic neighbourhoods not crossed

by highways or busy roads (Panter *et al.*, 2010a). However, Evers and colleagues (2014) suggest that carers may fear traffic despite the presence of traffic calming measures (e.g., traffic lights, marked crosswalks or bump-out crossings).

Traffic junctions are also described as features that significantly affect children's trips. Footpaths located away from traffic (Ahlport *et al.*, 2008; Santos *et al.*, 2013; De Meester *et al.*, 2014; Smith *et al.*, 2019), low junction densities and dead-end streets (Carver *et al.*, 2014b; Sharmin and Kamruzzaman, 2017) reduce the risks of crossing a junction and facilitate children unaccompanied travel. Numerous or busy crossings along the route, not signalised or wide intersections, may discourage children's unaccompanied or walking trips (Hillman *et al.*, 1990; Johansson, 2006; Timperio *et al.*, 2006; Lin and Chang, 2010; Panter *et al.*, 2010; Villanueva *et al.*, 2012; Carver *et al.*, 2013; Kamargianni and Polydoropoulou, 2014; Ahern *et al.*, 2017; Sharmin and Kamruzzaman, 2017; Webb Jamme, 2018; Smith *et al.*, 2019). Carers in the UK reported fewer concerns with unaccompanied children's trips that happen in places with fewer roads to cross (Panter *et al.*, 2010a; Ahern *et al.*, 2017). Parked vehicles on the street also have an effect as those may reduce the visibility of children's crossing the street, increasing the perception of risk (Ward, 1990; Mullan, 2003; Kamargianni and Polydoropoulou, 2014; Smith *et al.*, 2019), but also provides a buffer that may protect children from traffic.

These findings, however, have been questioned by Davison *et al.* (2008) and Ahern *et al.* (2017) for children's mobility and by other authors in other fields, who argue that causalities or the reasons that would explain the impacts of certain features on people's mobility patterns are not clear (Kamphuis *et al.*, 2010; Gallimore *et al.*, 2011; Banerjee and Hine, 2014; Lindelöw *et al.*, 2014; Lamíquiz and López-Domínguez, 2015; Næss, 2015; Van den Berg, 2016; Adkins *et al.*, 2017; Figueroa *et al.*, 2019). For instance, it is not evident whether the support for children's mobility comes from the opportunities to engage in activities that diversity or density provide, or from the indirect consequences of both in the public (e.g. more people present in the public space) and private space (e.g. more eyes on the streets).

2. 3. The influence of the social environment on children's travel

In comparison with the built environment, fewer works have addressed the effects of the social environment on children's trips. Barnett and Casper (2001, p. 465) define the social environment to encompass "the immediate physical

surroundings, social relationships, and cultural milieus within which defined groups of people function and interact.” It is a broad definition that includes social and economic processes, power relationships, social inequality, cultural practices, beliefs about place and community, social relationships within the households, relatives, acquaintances and strangers in the city. They further note that the social environment also includes aspects of the built environment as it is partially shaped by social processes. McNeill *et al.* (2006: p. 1011) argue that the social environment also influences behaviours “by shaping norms, enforcing patterns of social control, providing or not providing environmental opportunities to engage in particular behaviours, reducing or producing stress, and placing constraints on individual choice”.

Like the built environment, the literature has acknowledged that numerous social aspects of the environment shape children’s travel behaviour in the public space and can ease, hinder or suppress their trips (O’Brien *et al.*, 2000; Prezza *et al.*, 2001; Tranter and Pawson, 2001; McMillan, 2005; Mitra, 2013; Goodman *et al.*, 2014; Tammarazio y Requena, 2015; Marzi *et al.*, 2018). The available research about the social environment has mostly focused on the impacts of social support, cultural context, affinity and ties with the community, social trust and fear of strangers on children’s mobility.

A number of scholars point out that the feeling of having social support provides more freedom to children in Europe (Prezza *et al.*, 2001), Canada (Holt *et al.* 2015; Mah *et al.*, 2017), the US (McDonald *et al.*, 2010), Australia (Crawford *et al.*, 2017; Love *et al.*, 2020) and Latin America (Gough and Franch, 2005; Huertas-Delgado *et al.*, 2018). This support can come from relatives, peers and peers’ relatives travelling with children; or from acquaintances (e.g., relatives, neighbours) present in the spaces where children are travelling (Visser, 2019; Porter *et al.*, 2020; Wales *et al.*, 2021). The presence of acquaintances in the public space or along the routes that children follow provides natural surveillance, increasing the perception of safety (Hüttenmoser, 1995; Larouche, 2018), especially among carers (Prezza *et al.*, 2001; Foster *et al.*, 2015).

The existing body of literature points out that parental perception of social support is a relevant factor for children’s trips. At a cultural/national level, societies in which strangers are entitled to give advice and educate children in the public realm tend to promote children’s unaccompanied trips (Hillman *et al.*, 1990; Tranter and Pawson, 2001). For instance, Hillman *et al.* (1990) report that in German cities the wellbeing of children is seen as a collective responsibility of every adult present in the public realm. In contrast, in the United Kingdom caregivers and guardians are seen as the only ones

responsible for the care of their children in the public realm. Due to those cultural differences, children from Germany tend to hold more licenses (i.e. freedom to roam) than their English peers. More recently, scholars have reported that carers from Cape Town (South Africa) and Delhi (India) feel that they have a collective responsibility in taking care of children travelling in the neighbourhood (Benwell, 2013; Tyagi and Raheja, 2021b). However, the feeling was rare among carers in the Australian city of Perth; the predominant belief in this city is that other adults could be potential predators and should not interfere (Foster *et al.*, 2014).

The neighbourliness or ties within a community, high social trust and social cohesion positively affect children's unaccompanied trips (Freeman 2010; Sampson 2012). Lin *et al.* (2017) found an association between the cohesion of the local community and children's unaccompanied trips. Children, young people and carers have diverse and extensive social networks tend to have more freedom to travel alone (Hüttenmoser 1995; Prezza *et al.*, 2001; McDonald, 2007; Mikkelsen and Christensen, 2009; Wolfe and McDonald, 2016). Studying the UK, Brown *et al.* (2008) found that children, young people, and, particularly, girls with numerous friends enjoy greater degrees of independence. Social networks usually consist of neighbours, but can include acquaintances and other members of the community like shop owners (Veitch *et al.*, 2006; Mikkelsen and Christensen, 2009; Wolfe and McDonald, 2016; Crawford *et al.*, 2017). As mentioned earlier, it has been suggested that cohesive communities that care about children provide safety and reduce potential threats posed by strangers (Carver *et al.*, 2013; Crawford *et al.*, 2017). However, studying urban and rural areas in the UK, Carver *et al.* (2014b) suggest that the odds of a child walking unaccompanied may not be associated with the perception of the neighbourhood and social support.

Studying youth (older than 14 years old) in low and middle-income neighbourhoods of Brazil, Gough and Franch (2005) suggest that low-income teenagers have more ties with their neighbours, tend to travel more on foot or by bicycle and prefer the intimate spaces of their neighbourhoods. Conversely, teenagers living in middle-income neighbourhoods have fewer ties with their neighbours, travel more in cars and frequent private spaces for consumption or recreation (e.g. shopping malls, sports clubs). In both cases, behaviours are shaped by fear of violence. Fear of being profiled, excluded and expelled from spaces to which they 'do not belong' for low-income teenagers; and fear of being assaulted, for middle-income teenagers.

While in the public realm, children have frequent encounters with strangers of difference ages, gender and appearance (Hillman *et al.*, 1990; Prezza *et al.*, 2001; Timperio *et al.*, 2006; Valentine, 2008; Carver *et al.*, 2013; Francis *et al.*, 2017; Smith *et al.*, 2019), with a variety of behaviours, performing different actions and activities that bring life to cities (Ward, 1990; Webb Jamme, 2018). Children are usually taught to be aware of the strangers they may encounter along their routes to prevent potential risks (harassment, bullying, harm), therefore, the present of strangers represents a strong restriction to children's independence (Moran *et al.*, 1997; Carver *et al.*, 2008; Smith *et al.*, 2019; Love *et al.*, 2020).

The negative impacts of “stranger danger” have been detected in the UK (Moran *et al.*, 1997; Valentine, 1997a; O'Brien *et al.*, 2000), in Latin America (for the case of Brazil see Gough and Franch, 2005) and other parts of the world (Veitch *et al.*, 2006; Mammen *et al.*, 2012; Carver *et al.*, 2013; Foster *et al.*, 2014; Villanueva *et al.*, 2014; Smith *et al.*, 2019; Suess *et al.*, 2020)—and has been described as one of the greatest concerns of carers (Mitra, 2013; Foster *et al.*, 2014; Wolfe and McDonald, 2016; Francis *et al.*, 2017; Smith *et al.*, 2019). Some authors have suggested that improving carers' perception of the social environment can lead to an increase in children's unaccompanied trips (Schoeppe *et al.*, 2015), yet there is no agreement in the literature because fear of strangers is a multifaceted issue that has not received proper attention (Pain, 2006; Foster *et al.*, 2014; Smith *et al.*, 2019). For instance, as children grow into teenagers in the UK, they obtain more independence and spend more time outside with friends while, at the same time, their group may be considered a risk to others in the view of adults (Matthews *et al.*, 2000; Milne 2009; Day and Wager, 2010; Goodman *et al.*, 2014; Horton *et al.*, 2014). Additionally, as children become young people and gain more independence, carers tend to modify their defensive attitudes and worry less about strangers (Panter *et al.*, 2010). This, however, is less common for female young people as their carers fear they could be molested or assaulted (Shaw *et al.*, 2012; Lopes *et al.*, 2014). Strangers can also support children's independence. Nansen *et al.* (2015) and Francis *et al.* (2017) suggest that carers in Australia prefer public spaces with people present who could ‘naturally’ supervise children travelling. However, crowded spaces increase carers' perception of danger; and the limit (or gradient) to determine when a busy street becomes unsafe is unclear.

Children using public space face an intricate, and sometimes contradictory, set of behavioural rules when encountering strangers. For instance, children in the UK are taught to not speak with adults which, as Milne (2009) asserts, can be impractical because children need to speak with them to develop

social skills. Lastly, fear of strangers can be particularly acute for girls who are disproportionately affected by the transmission of fears from caregivers and peers (Valentine 1997b; Hart, 2002; Katz, 2006; Brown *et al.*, 2008; Foster *et al.*, 2014; Villanueva *et al.*, 2014; Crawford *et al.*, 2017; Furneaux and Manaugh, 2019).

2. 4. Relationships between the built and the social environment

In other fields, a growing body of qualitative literature has considered the interactions between the built environment and the social sphere. Koskela and Pain's work (2000) indicate that individuals in the UK and Finland infer the social qualities of places from features of the environment; that is, the patterns of presences and absences and the potential activities that they could encounter. Studying Santiago de Chile, Figueroa *et al.* (2019) argue that pedestrians infer the qualities of the communities and potential risks from the features of the built environment. In their work, the built environment reflects personal experiences, the trajectory of the communities and latent conflicts affecting people's perception and inducing changes in walking behaviour. Bostock (2001) and Benediktsson (2018) provide evidence of how neglected and deprived environments trigger emotional responses in pedestrians who live and walk in disadvantaged places of the UK and the US. In both studies, travelling on foot is unpleasant and difficult. In all these studies, the built environment in interaction with the social sphere induce changes in behaviour.

A few studies have discussed the combined effects of the built environment and the social sphere on children's permissions and behaviours. Aarts *et al.* (2013) and Rothman *et al.* (2014) have found positive and neutral impacts of the combination of diverse (e.g. land use) and well-provided neighbourhoods and cohesive social networks. Other scholars have found that the type of neighbourhood (e.g. suburb) can have positive or negative effects depending on their neighbourhood social structures (Prezza *et al.*, 2001; Cosco and Moore, 2002; Kemperman and Timmermans, 2014).

2. 5. Recent trends in the literature

Table 2.1 summarises recent studies (2010-onwards) on children's unaccompanied trips¹, considering the studied countries, the participants' characteristics and sample size, and the collected data and analysis. Among

¹ This review also considers studies about children and young people's active trip behaviours to evaluate a wider range of methods and locations.

the reviewed works, most come from North America (US and Canada, more than 35 studies) and Europe (more than 30 studies). Only six studies are from South America. Australia is the country that has more studies about children and young people's travel behaviour (13 studies), followed by the UK (10 studies) and New Zealand (7 studies). Only one study is from Chile. Moreover, more than half of the studies focuses on urban environments (43 studies), followed by suburbs (26 studies) and rural areas (17 studies). In addition, most of the studies about suburban and rural areas are comparisons with urban environments (26 studies).

Most works have studied children aged between 10 to 12 years old (60 studies), followed by those aged between 7 to 15 years old (17 studies). Children and young people between 4 to 6 and 16 to 18 have been also studied, but in a smaller proportion (5 studies). Carers participants took part in 50 of the identified studies, with only 32 studies exploring solely the views of children and young people.

The majority of the reviewed studies employ quantitative methods; mostly surveys and questionnaires (60 studies) and databases or on-site surveys about objective measures of the built environment (17 studies). Fewer studies (less than 25) use a qualitative data collection method like interviews and focus groups. Only seven of the eighty-two studies employ any combination of mixed methods, frequently combining a questionnaire with interviews and cognitive mapping. The qualitative data is often explored through thematic and content analyses. Meanwhile, the quantitative data is primarily analysed using descriptive statistics and regression models (e.g., multinomial logistic regression models, Poisson regression model, ordinal regression models). Only eleven studies use any version of a logit model (nested logit, binary logit, mixed logit, hybrid choice model).

Table 2.1. Recent literature on children and young people's travel behaviour (2010-2023).

Author(s)	Study area	Participants (age) - sample size (N)	Data collection and analysis method	Studied behaviour
Eisenlohr et al. (2023)	Los Angeles & San Diego, US	Children (10-11) N=239 Carers of children N=239	Surveys, cognitive mapping, photo evaluation, focus group, physical environment audit; descriptive statistics, Poisson regression models	Children's independent trips, active travel
Zannat et al. (2022)	Chattogram City, Bangladesh	Carers of children (n/a) N=398	Travel diaries, spatial information; descriptive statistics, multinomial logistic regression model	Children's independent trips
Hasanzadeh et al. (2022)	Auckland, New Zealand	Children (8-13) N=1,102	Mapping survey with softGIS, accelerometer data; individualized exposure-based model, hierarchical linear models	Active travel
Tyagi and Raheja (2021a)	Kolkata, India	Carers of children (7-12) N=384	Questionnaire, objective measures of the built environment features with GIS; statistical analysis, multinomial logistic regression	Children's independent trips
Tyagi and Raheja (2021b)	Delhi, India	Carers of children (7-12) N=15	Semi-structured interviews; content analysis	Children's independent trips
Ayllón et al. (2021)	Huesca, Spain	Children (8-12) N=1,106	Questionnaire; descriptive statistics, receiver operating characteristic, Multivariate analysis of variance, multivariate hierarchical regression	Children's independent trips
Wales et al. (2021)	Sweden (suburbs)	Children (10–11) N=16	Place mapping and walking interviews; thematic analysis	Children's independent trips
Egli et al. (2020)	Auckland, New Zealand	Children (8–13) N=1,102	GIS survey with closed and open questions; descriptive statistics, content analysis, theme analysis	Active travel
Palma et al. (2020)	Valparaíso, Chile	Carers of children (9-12) and young people (13-18) N=195	Self-reported questionnaire; descriptive statistics, chi-square and t-student tests	Active travel
Waygood et al. (2019)	Canada, Japan and Sweden (urban areas, rural areas, suburbs)	Children (10–12) N= 425	Survey; partial least squares structural equation modelling	Travel satisfaction

Visser (2019)	Feijenoord district, Rotterdam, Netherlands	Young people (13-18) N=26 Carers of young people N=21	Semi-structured interviews; grounded theory-based analysis	Children's independent trips
Smith et al. (2019)	Auckland, New Zealand (urban area, suburbs)	Carers of children (8-13) N=940	Survey with open-ended questions, objective measures of the built environment features with GIS, accelerometer data; content analysis, descriptive statistics, inferential analysis, non-parametric tests, mixed effects logistic regression modelling	Children's independent trips
Sener et al. (2019)	Texas, US (urban area, rural area)	Children (5-15) N=2,783 Carers of children N=4,886	Travel survey; Multinomial logit model, Poisson count regression model	Active travel
Furneaux and Manaugh (2019)	Riverdale, Toronto, Canada	Children (9-13) N=18 Carers of children N=16	Semi-structured interviews, cognitive mapping, neighbourhood audit; content analysis, themed analysis, analysis based on Lynch's theory of imageability	Children's independent trips
Chaudhury et al. (2019)	Auckland, New Zealand (urban area, suburbs)	Children (9-13) N=140	Walking and home interviews; deductive thematic analysis	Children's independent trips
Cervesato and Waygood (2019)	Québec City, Canada (urban area, rural area, suburbs)	Carers of children (9-11) N=1294	Travel survey; binary logistic regression	Children's independent trips
Porskamp et al. (2019)	Otago, New Zealand (rural area)	Young people (n/A) N=73 Carers of young people N=20	Interviews, focus groups; thematic analysis	Children's independent trips, active travel
Webb Jamme et al. (2018)	San Diego, US	Children (10-11) N=135	Surveys, cognitive mapping, focus groups, field observations; descriptive analysis, inferential analysis.	Walking
Singh and Vasudevan (2018)	Kanpur, India	Children (n/a) and carers of children N=1,238	Questionnaire; travel mode choice multinomial logit model	Active travel
Lucken et al. (2018)	Alameda County and Richmond, California, US	Carers of children (n/a) N=245	Survey; discrete choice models (binary model), multinomial logit model	Active travel
Huertas-Delgado et al. (2018)	Riobamba, Ecuador	Carers of children and young people (9-18) N=381	Questionnaire; descriptive statistics, statistical tests, logistic regression model	Active travel

Bourke (2017)	Dublin, Ireland	Children (9-11) N=20	Interviews; thematic analysis	Children's independent trips, active travel
Mah et al. (2017)	British Columbia, Canada (suburbs)	Children (10-12) N=341 Carers of children N=341	Questionnaire; descriptive statistics, statistical tests, multivariable logistic regression	Active travel
Lin et al. (2017)	Auckland, New Zealand (urban area, suburbs)	Children (8-13) N= 254 Carers of children N=239	Travel diary, survey, accelerometer data; multilevel regression models	Children's independent trips
Francis et al. (2017)	Perth, Australia (suburbs)	Carers of children (4-12) N=34	Focus group; content analysis	Children's independent trips
Crawford et al. (2017)	Victoria, Australia (metropolitan areas, regional areas, urban areas, suburbs)	Children (8-15) N=132 Carers of children N=12	Focus group; thematic analysis	Children's independent trips
Ahern et al. (2017)	West Yorkshire, UK	Carers of children (4-12) N=20	Semi-structured interviews; framework analysis	Active travel
Wolfe and McDonald (2016)	Oakland and Berkeley, California, US	Carers of children (10-14) N=305	Survey; linear regression models, Ordered logit models	Children's independent trips
Moran et al. (2016)	Rishon LeZion, Israel (urban area, suburbs)	Children (10-12) N=573	Survey, objective measures of the built environment with GIS; descriptive statistics, bivariate and multivariate logistic regression	Active travel
Ermagun and Samimi (2016)	Tehran, Iran	Carers of children (12-17) N=3,441	Questionnaire; multinomial logit models, nested logit models	Children's independent trips
Tammarazio and Requena (2015)	Buenos Aires, Argentina	Children (7-13) N= 28	Walking interviews; ethnographic analysis	Active travel
Schoeppe et al. (2015)	Queensland, Australia	Carers of children (8-12) N=1,293	Survey; descriptive statistics, ordinal regression analyses	Children's independent trips
Nansen et al. (2015)	Melbourne, Australia (suburbs)	Children (11-13) N=48	Observation, focus groups, walking interviews; thematic analysis	Children's independent trips

Ghekiere et al. (2015)	Flanders, Belgium (urban area, rural area, suburbs)	Children (11-12) N=305 Carers of children N=305	Questionnaire; descriptive analysis, statistical tests, hierarchical Bayes analyses	Active travel
Easton and Ferrari (2015)	Sheffield, UK (urban area, semi-rural area, suburbs)	Children (11-16) N=26,709	Census data; multilevel analysis, multilevel model, network analysis	Active travel
de Sá et al. (2015)	São Paulo, Brazil	Children (6-11) and young people (12-17) N=27,483	Travel survey; descriptive analysis, stratification	Active travel
Christian et al. (2015)	Perth, Australia	Carers of children (8-15) N=181	Survey, objective measures of the physical environment; multivariable logistic regression model	Children's independent trips
Chillón et al. (2015)	Norfolk, UK (urban area, rural area)	Children (10-14) N=2,064	Questionnaire; descriptive analysis, statistical test, receiver operating characteristic curve analyses	Active travel
Carroll et al. (2015)	Auckland, New Zealand (urban area, suburbs)	Children (9-12) N=140	Travel diaries, walking interviews, focus groups, accelerometer data, objective measures of the physical environment; descriptive statistics, thematic analysis	Children independent trips
Shawn et al. (2015)	Australia, Brazil, Denmark, England, Finland, France, Germany, Ireland, Israel, Italy, Japan, Norway, Portugal, South Africa, Sri Lanka and Sweden	Children (7-15) N=18,303 Carers of children N=n/a	Questionnaire; comparative analysis	Children's independent trips
Carver et al. (2014a)	Norfolk, UK (urban area, rural area)	Children (9-10) N=1,121 Carers of children N=1,121	Surveys, objective measures of the physical environment; statistical test, bivariate logistic regression analyses	Children's independent trips
Carver et al. (2014b)	Victoria, Australia	Children (8-15) N=271	Survey, accelerometer data; linear regression analyses	Children's independent trips, active travel
Villanueva et al. (2014)	Perth, Australia	Children (10-12) N=1,480 Carers of children N=1,314	Questionnaire, objective measures of the built environment with GIS; principal components analysis, factor analysis, bivariate and multivariate analyses	Children's independent trips

Rothman et al. (2014)	Toronto, Canada	Children (4-12)	Observational counts, census, parcel level data, objective measures of the built environment; descriptive statistics, multicollinearity, negative binomial regression	Active travel
Lopes et al. (2014)	Lisbon, Silves and Redondo, Portugal (urban area, rural area, suburbs)	Children (8-15) N=1,099 Carers of children N=1,099	Questionnaire; descriptive statistics, statistical tests, ANOVA	Children independent trips
Kemperman and Timmermans (2014)	Netherlands	Children (4-11) N=4,293	Travel diary, physical environment data, survey; Bayesian belief network	Active travel
Kamargianni and Polydoropoulou (2014)	Greece (urban area, rural area, insular area)	Young people (12-18) N=1,988	Questionnaire; hybrid choice model	Active travel
Horton et al. (2014)	South-east England, UK (villages)	Children and young people (9-16) N=175	Interviews, walking interviews; thematic analysis	Active travel
Goodman et al. (2014)	London, UK	Young children (12-18) N=118	Interviews, focus groups; constant comparative method analysis	Children's independent trips
Foster et al. (2014)	Perth, Australia	Children (10-12) and carers of children N=1,231	Questionnaire; Unadjusted bivariate associations, principal components analysis, logistic regression	Children's independent trips
Evers et al. (2014)	Eugene, Oregon, US (urban area)	Carers of children (8) N=61	Survey; logistic regression models	Active travel
de Meester et al. (2014)	Flanders, Belgium	Children (10-12) and carers of children N=736	Survey, accelerometer data; descriptive statistics, statistical tests, multiple linear regression	Active travel
Santos et al. (2013)	Porto, Portugal	Children (11-12) and carers of children N=354	Questionnaire; descriptive statistics, statistical tests, principal components analysis	Children's independent trips
Mackett (2013)	Britain	Children (10-13) N=n/a	Travel diaries, accelerometers; hierarchical classification	Children independent trips, Active travel
Kamargianni and Polydoropoulou (2013)	Cyprus	Young people (12-18) N=4,174	Survey; descriptive statistics, hybrid choice model	Active travel

Christensen and Mikkelsen (2013)	Copenhagen, Denmark (suburb)	Children (girls, 10-13) N=n/a	Interviews, participant observation, walking interviews with GPS technology, survey; ethnographic analysis	Mobility
Carver et al. (2013)	Victoria, Australia (urban area, rural area)	Children (8-11) N=430 Young people (12-16) N=258 Carers of children and young people N=n/a	Questionnaire; descriptive analysis, bivariate logistic regression	Children independent trips, Active travel
Benwell. (2013)	Cape Town, South Africa (suburbs)	Children (6-12) N=65 Carers of children N=20	Interviews, walking interviews, focus groups, brainstorming diagrams, cognitive mapping, pictorial exercises (drawing, photographs)	Children independent trips
Aarts et al. (2013)	four medium-sized cities, The Netherlands (urban area)	Carers of children (4-12) N=5,963	Questionnaire; multilevel multinomial logistic regression analyses	Active travel
Villanueva et al. (2012)	Perth, Australia	Children (10-12) N=1,480 Carers of children N=1,314	Questionnaire, cognitive mapping; descriptive analysis, bivariate comparisons, multivariate logistic regression	Children's independent trips
Shaw et al. (2012)	London, Stevenage, Nottingham, Winchester, Hook Norton and Chipping Norton, UK and Köln, Witten, Wuppertal, Langerfeld and Bochum, Germany (urban areas, rural areas, suburbs)	Children (7-11) N=798 Young people (11-15) N=1,030 Carers of children N=1,292	Survey, interview, secondary analysis of existing surveys; descriptive analysis	Children's independent trips
Noland et al. (2012)	New Jersey, US (urban areas, rural areas, suburbs)	Carers of children (n/a) N=2,118	Survey, objective measures of the built environment with GIS; descriptive analysis, mixed logit model	Active travel
Mitra and Buliung (2012)	Toronto, Canada	Children (11-12) N=2,190	Transportation survey, objective measures of the built environment with GIS; binomial logistic regressions, scale effects	Active travel

Mammen et al. (2012)	Toronto and Hamilton, Canada	Carers of children (6-14) N=1,016	Questionnaire; descriptive statistics, multinomial logistic regression	Children's independent trips
Loptson et al. (2012)	Saskatoon, Canada (urban areas, semi-suburban area, suburbs)	Children (10-14) and their carers N=24	Interviews; thematic analysis	Active travel
Larsen et al. (2012)	London, Ontario, Canada	Children (12-14) N=614	Survey, objective measures of the built environment with GIS; statistical tests, logistic regression	Active travel
Kyttä et al. (2012)	Turku, Finland	Children (10-12) and young people (13-15) N=1,837	Questionnaire, objective measures of the built environment with GIS; logistic regression analysis	Active travel
Costa et al. (2012)	Florianopolis, Brazil	Children (7-10) N=4,168	Questionnaire; statistical tests	Active travel
Carver et al. (2012)	Victoria, Australia (urban area, rural area)	Children (8-11) N=430 Young people (12-16) N=258 Carers of children and young people N=n/a	Questionnaire; descriptive analysis, regression analysis	Children's independent trips, active travel
Yoon et al. (2011)	Los Angeles, US	Children (0-15) N=3,483	Travel survey, objective measures of the network; a binary logit models	Active travel
Seraj et al. (2011)	Los Angeles, Riverside and Orange County, US (urban areas, suburbs)	Children (n/a) N=1,000	Travel survey; multivariate ordered response model	Active travel
Giles-Corti et al. (2011)	Perth, Australia	Children (10-13) N=1,480 Carers of children N=1,332	Survey, objective measures of the street and pedestrian network; walkability index, multivariate analyses, logistic regression models	Active travel
Gallimore et al. (2011)	Irvine, Minnesota, US (urban areas, suburbs)	Children (9-10) and their carers N=n/a	Survey, street audit; statistical tests, univariate analyses of variance and covariance, principal components analysis	Active travel
Fyhri (2011)	Denmark, Finland, Great Britain and Norway (urban area, rural area)	Children and young people (6-16) and their carers N=n/a	Travel survey, survey, policy documents; descriptive analysis	Children's independent trips, active travel

Bwire (2011)	Dar es-Salam, Tanzania (urban areas, suburbs)	Children (7-15) and their carers N=284	Questionnaire; descriptive analysis	Children's independent trips
Panter et al. (2010a)	Norfolk, UK (urban area, rural area)	Children (9-10) N=2,012 Carers of children N=n/a	Questionnaire, objective measures of the built environment with GIS; descriptive statistics, multilevel statistical models	Active travel
Panter et al. (2010b)	Norfolk, UK (urban area, towns, villages)	Children (9-10) N=2,064 Carers of children N=n/a	Questionnaire, objective measures of the built environment with GIS; descriptive statistics, multilevel statistical models	Active travel
Voss and Sandercock (2010)	East England (urban areas, rural areas)	Children (10-15.9) N=6,085	Questionnaire, 20-m shuttle run test, BMI, body mass and stature; descriptive statistics, ANOVA, ANCOVA,	Active travel
Mitra et al. (2010)	Toronto, Canada	Carer of children (11-13) N=3,767	Travel survey; binomial logit models	Active travel
McDonald et al. (2010)	San Francisco, US (suburbs)	Carers of children (10-14) N=432	Survey; descriptive statistics, direct matching	Active travel
Lin and Chang. (2010)	Taipei, Taiwan (urban areas, suburbs)	Children (11-13) N=330	Survey, objective measures of the built environment with GIS; descriptive statistics, nested logit models	Children's independent trips, Active travel
Faulkner et al. (2010)	Toronto, Canada (urban areas, suburbs)	Carers of children (9.8 mean age) N=37	Interviews; thematic analysis	Active travel

2. 6. Quantitative methods and children studies

When designing a data collection, the literature acknowledges that long questionnaires, or those with numerous complex questions, may fatigue participants, adding error to the models or producing incomplete observations, thus resulting in poor data (Flowerdew and Martin, 2005). This is particularly critical regarding children participants, who may feel fatigued earlier compared to adults (Malhotra and Birks, 2008).

Rating scales and ranking

Rating scale questions are commonly used in marketing and educational disciplines to inquire on child views (Malhotra and Birks, 2008), with limited experiences in transport and urban settings (Alton *et al.*, 2007; Waygood *et al.*, 2019). Smiley scales are commonly used in questionnaires for children, but are not exempt from academic questioning, as the happy-unhappy levels range may be ineffective (Hall *et al.*, 2016). However, smiley faces have proved to be an adequate scale to communicate child judgments, demonstrating similar results as text-only responses (Reynolds-Keefer *et al.*, 2009), being also less time-consuming and less cognitively demanding (Strange *et al.*, 2018). Lastly, the literature suggests limiting the number of rating questions to no more than 30; a number of questions that fits on two sides of an A4 paper or its online survey equivalent (Brace, 2008; Rowley, 2014).

Ranking questions are commonly used in educational contexts for children and young people to order a set of attributes, but not in transport settings where this type of questions are commonly used to inquire about adults' preferences for transport systems (Duarte *et al.*, 2010; Mayo and Taboada, 2020). Some authors (Bradley and Daly, 1994) suggest designs of ranking questions with no more than five attributes, depending on the complexity of those objects.

Stated preference

To the researcher's knowledge, the experience of using stated preference experiments with children is scant in transport studies (Kamargianni and Polydoropoulou, 2013; Ghekiere *et al.*, 2015), although the technique is commonly applied in marketing studies (Heard *et al.*, 2016; Hartmann *et al.*, 2017).

Regarding the design of stated preference questions, some transport studies concluded that a large number of attributes and attribute levels may cause substantial errors, with an apparent cognitive limit of 6 attributes for adults

(Hensher, 2006; Ortúzar and Willumsen, 2011). In the same field, only one study in mode choice that has successfully questioned children of 12 years old was identified. This study had a questionnaire designed with 7 attributes and 2 choice situations (Kamargianni and Polydoropoulou, 2013)

Stated preference experiments have been using for many years images in questionnaires to illustrate (Hensher and Mulley, 2015) and improve participant comprehension (Vriens *et al.*, 1998; Iglesias *et al.*, 2013) of included variables (children in particular, see Brace, 2008); reduce misinterpretations (Kamargianni and Polydoropoulou, 2013) and reduce participant cognitive load (McBride and Dosher, 2002) compared to text-only questions. Images can lead to better discrete choice models from hypothetical attributes estimates (Rizzi *et al.*, 2012) but can also be limiting and add errors to the methodology. Scholars have found that images may not be significantly different to using text-only questions (Arentze *et al.*, 2003), or the illustrated attributes may convey several meanings (Iglesias *et al.*, 2013). Additionally, the physical environment may have “potentially disturbing details” (Jansen *et al.*, 2009), dynamic elements too complex to illustrate, such as moving pedestrians and vehicles (Hurtubia *et al.*, 2015), or visual information that can be interpreted as more relevant than written information (Jansen *et al.*, 2009). To overcome those issues, the literature recommends that the researcher should identify potential errors beforehand and adjust the images accordingly (e.g., using neutral colours, see Hurtubia *et al.*, 2015).

2. 7. Conclusions

Research studies have outlined the vast number of benefits for children travelling alone, including the contributions to their health, the development of social skills and psychological well-being, and its economic implications for the family and the society. Children and young people’s unaccompanied trips, however, are declining in recent decades, to some degree, due to cities that have become increasingly hostile to them. Numerous scholars have investigated the influence of the features of the built environment on children’s travel patterns and have identified social and physical features that seem to be significant for children’s trips (see Table 2.2), and their unaccompanied journeys.

According to the literature, the most significant features of the built environment for children and young people’s trips are the presence of urban amenities such as bicycle racks, playgrounds, bushes and trees (Veitch *et al.*, 2006; Evenson *et al.*, 2006; Milstein, 2008; 2013; Lin and Chang,

Table 2.2. Significant attributes from the literature review.

Attribute	Attribute levels for Santiago	Relevant authors
Facades	Medium density houses* Low density houses**	Ward (1990), Reis <i>et al.</i> (2005)
Private property division	Permeable fences Closed fences	Chile: Puga (2006, 1990), Iglesias <i>et al.</i> (2013, 2014), Rossetti <i>et al.</i> (2019)
Quality of footpaths	Well-kept footpaths Dirty footpaths Neglect footpaths	Ward (1990), Evenson <i>et al.</i> , (2006) and Iglesias <i>et al.</i> (2013)
Greenery	Trees Grass No greenery	Evenson <i>et al.</i> (2006), Lin and Chang (2010) and Kamargianni and Polydoropoulou (2014), Rossetti <i>et al.</i> (2019)
Urban amenities	Playground Bus stop No urban amenities	Evenson <i>et al.</i> (2006), Veitch <i>et al.</i> (2006), Milstein (2008; 2013), Panter <i>et al.</i> (2010a), Christensen and Mikkelsen, (2013) and Eisenlohr <i>et al.</i> , (2023)
Facilities	School Local shops Off-licence No facilities	Carver <i>et al.</i> (2014), Wolfe and McDonald (2016) and Smith <i>et al.</i> (2019)
Crossings	Signalised crossing Zebra crossing Dropped kerbs	Hillman <i>et al.</i> (1990), Panter <i>et al.</i> (2010a), Carver <i>et al.</i> (2013), Kamargianni and Polydoropoulou (2014), Ahern <i>et al.</i> (2017), Webb Jamme <i>et al.</i> (2018) and Smith <i>et al.</i> (2019)
Vehicle lanes direction	One way traffic Two way traffic	Timperio <i>et al.</i> (2018), Palma <i>et al.</i> (2020)
Traffic composition	Car traffic Car and bus traffic	Giles-Corti <i>et al.</i> (2011), Timperio <i>et al.</i> (2018), and Palma <i>et al.</i> , (2020)
Parked vehicles	Parked on the footpath	Ward (1990) and Smith <i>et al.</i> (2019)
Strangers' age	Children Teenagers Adults Elderly people	Hillman <i>et al.</i> , (1990), Valentine, (1997a); O'Brien <i>et al.</i> , (2000), Prezza <i>et al.</i> (2001), Gough and Franch, (2005), Timperio <i>et al.</i> (2006), Valentine (2008), Carver <i>et al.</i> (2013) and Smith <i>et al.</i> (2019)
Strangers' activities	Chatting Walking Drinking alcohol Standing	Ward (1990), Webb Jamme <i>et al.</i> (2018) and Smith <i>et al.</i> (2019)
Strangers' gender	Male Female	Valentine (1997) and Prezza <i>et al.</i> (2001)
Density of people	Crowded footpath Uncrowded footpath	Francis <i>et al.</i> (2017)

*Low rise four storeys typology in an urban setting with a density of 150 dwellings/ha as modelled by Three Dragons *et al.* (2016).

** Low rise two storeys typology in an urban setting with a density of 50 dwellings/ha (ibid).

Source: author's own

2010; Panter *et al.*, 2010a; Christensen and Mikkelsen, 2013; Kamargianni and Polydoropoulou, 2014; Eisenlohr *et al.*, 2023), the diversity of facilities available in the neighbourhoods (e.g. land use mix, see Panter *et al.*, 2010a; Carver *et al.*, 2014a; Smith *et al.*, 2019; retail and grocery stores, see Wolfe and McDonald, 2016), the level of maintenance of the public space (Ward, 1990; Evenson *et al.*, 2006), the form in which the arrangement of the streets prioritises pedestrians and slows down motorised traffic (Ward, 1990; Timperio *et al.*, 2006, 2018; Panter *et al.*, 2010; Giles-Corti *et al.*, 2011; Carver *et al.*, 2013; Smith *et al.*, 2019; Palma *et al.*, 2020), and the topography of the route (Timperio *et al.*, 2006).

In the case of the social aspects of the environment, the relevant features identified in the literature are diverse and include the collective responsibility (i.e. social trust) of adults over children present in the public realm (Hillman *et al.*, 1990; Carver *et al.*, 2013) and the presence of ties (e.g., relatives, neighbours, acquaintances, see Veitch *et al.*, 2006; Brown *et al.*, 2008; Mikkelsen and Christensen, 2009; Wolfe and McDonald, 2016; Crawford *et al.*, 2017) and networks of support in the communities where children move (Prezza *et al.*, 2001; Tranter and Pawson, 2001; Gough and Franch, 2005; McDonald *et al.*, 2010; Loptson *et al.*, 2012; Holt *et al.*, 2015; Crawford *et al.*, 2017). A number of other aspects are related to the patterns of presence and absence of public spaces; the activities that occur in them (Ward, 1990; Smith *et al.*, 2019), the people that occupy them (Prezza *et al.*, 2001; Timperio *et al.*, 2006; Valentine, 2008; Smith *et al.*, 2019) and the natural surveillance they provide (Francis *et al.*, 2017). Lastly, the works that have studied social aspects highlight the relevance of fears (Valentine, 1997a; O'Brien *et al.*, 2000; Gough and Franch, 2005; Veitch *et al.*, 2006; Carver *et al.*, 2013; Smith *et al.*, 2019) and how they disproportionately affect girls and female young persons (Valentine, 1997a; 1997b; Brown *et al.*, 2008; Saraví, 2014).

However, an emerging body of work argues that it is still not clear why and how those features influence travel patterns. Most studies have also explored social aspects and features of the built environment separately and have put little attention on combined impacts. Such gaps suggest that future studies should look for the causal mechanisms that could explain the influences of social and physical features, broaden the scope to identify intertwined impacts to collaborate in the creation of urban spaces that ease children and young people's trips and, ultimately, enrich their experience and development. Lastly, the vast majority of the works come from Europe, North America and Oceania (Australia and New Zealand), leaving other regions, like Latin America, understudied and obscuring the relevance of contextual socio-cultural factors.

Chapter 3. Studied cities

This chapter introduces the studied cities, London in the United Kingdom, and Santiago de Chile, two capital cities of high-income countries with contrasting cultures (Europe, Latin America), high levels of urban inequality and places where children's travel are part of the public agenda¹. It describes the general aspects of the studied cities, such as population, and provides details of significant matters like children's trips. Both cities are briefly compared in the last section of this chapter.

3. 1. London, United Kingdom

With a population of 67.1 million people, the United Kingdom is one of the most populated countries in Europe (Office for National Statistics – ONS, 2021). The country ranks 13th in the Human Development Index with a value of 0.932 (United Nations Development Programme – UNDP, 2022)—and has a PIB per capita (PPP) of 45,852 USD (World Bank, 2022), a life expectancy at birth of 81.3 years (United Nations Statistics Division, 2019) and a mean of 13.4 years of schooling (United Nations Educational, Scientific and Cultural Organization – UNESCO, 2020). The country has an above-average GDP per capita among the OECD members, has a GINI coefficient of 0.351 and has 18,6% of its population living under the national poverty threshold (World Bank, 2022). Eighty-four per cent of the total population live in cities and 23% of urban households live on a relatively low income (Department for Work and Pensions – DWP, 2019).

In the Better Life Index (Organisation for Economic Co-operation and Development - OECD, 2020), an index measuring the well-being, the UK ranks above average of the OECD countries. The same index shows that 94.1% of the population believe they can find support from friends in case of need, with no gender differences. The country also has an average of 17.5 years of education for those aged 5 to 39 years and a 500 PISA score (Programme for International Student Assessment), which is above several OECD countries and reflects the better quality and access of the

¹ Additionally, the researcher is from Santiago and was studying in London, thus having experience with the culture of both cities.

UK education. Lastly, households spend 26% of their disposable income on housing, which is higher than the OECD average.

3. 1. 1. Overview of the city

London is located in a basin of the River Thames, and is elevated a few meters above sea level with a handful of places surpassing 100 meters, like Hampstead Heath and Highgate. More than 3,000 green areas and parks are scattered across the city which, favoured by the temperate oceanic climate, cover nearly 18% of the urban area (Greater London Authority, 2022). Due to its latitude, daylight can last up to 16 hours and 40 minutes during summer and as little as 8 hours in winter.

London is the largest city in the United Kingdom. The city is an international financial hub and is often characterised as one the trendiest places in the world. As such, global markets, migration and other related phenomena have transformed London's socioeconomic structures, pressuring its markets and urban spaces. About 9 million people live in it on 1,572 km², resulting in 5,727 persons per square kilometre, one of the highest densities in the country (ONS, 2021). It is also the youngest regions in the UK, with a median population age of 35.8 years old. Children between 6 to 16 years old represent 14% of the total population. Of them, 51% are boys and 49% are girls. Moreover, the city is diverse as 41% of its population belongs to minorities.

For administration purposes, the government in the city is divided into 32 borough councils and the City of London, brought together by the Greater London Authority headed by the Mayor of London. The boroughs provide education, housing, social and environmental services, among others, while the Mayor develops the strategies for the city in areas like transport and air quality. Population across the boroughs varies greatly. The most populous (Barnet) has almost 400,000 people and the smallest (Kensington and Chelsea) has 157,000 people (not considering the special case of the City of London which has only 11,000 inhabitants) (ONS, 2021).

Although reports consider London one of the wealthiest cities in the world (Sassen, 2001; PricewaterhouseCoopers, 2009; McKinsey Global Institute, 2011), it is also the most income and wealth unequal city in the UK, with a GINI coefficient of 0.7 (ONS, 2020). Half of its wealth is owned by the richest 10% of the households. In contrast, middle-income groups have shrunk in recent years and more than a quarter of its population (27%, above the 21% of the country) lives below the poverty threshold after taking into

account housing costs. Land prices are among the highest in the country, which is linked to a growing housing shortage (Greater London Authority, 2018). The insufficient number of affordable houses, in combination with the difficult access to affordable housing, has pushed vulnerable people to live in expensive dwellings found in the private rented sector (Sassen, 2001). The 80% of the cheapest new homes are enough to cover just 8% of the population in need, with rents that represent 72% of the people's earnings compared to the 29% in the rest of England (Tinson *et al.*, 2017; Greater London Authority, 2018). Additionally, residential and commercial gentrification and the expulsion of fragile groups are threats in many iconic neighbourhoods and well-established trends in others (Hamnett, 2003; Lees *et al.*, 2010).

By 2019, London had 102 crimes per 1,000 people. The most common crimes are theft (28 crimes per 1,000 residents), violence and sexual offences (25 crimes per 1,000) and vehicle offences (14 crimes per 1,000); all worse than the UK average rates (Metropolitan Police Service, 2022). By 2021 crime rates decreased by 13.7%; theft, violence and sexual offences and vehicle offences remained the most common crimes (Brighton Analytics Limited, 2022). The boroughs that have the worst statistics are Westminster, Kensington and Chelsea, and Camden. On the contrary, Richmond upon Thames, Harrow and Bexley have the best numbers.

Transport is an important issue as London is one of the most congested urban areas in Europe (INRIX, 2021). Thirty-five per cent of the total trips are completed using private vehicles, despite car ownership in London being one of the lowest in the country (56% of the households own at least one car). The high congestion from which the city suffers has led to pioneering, yet drastic, measures such as a congestion charge, a continual investment in public transport projects and "healthy streets" initiatives (TfL, 2020). Walking is the second most preferred way of moving around the city, responsible for 33% of trips. The city also has a wide range of paved and accessible footpaths to ease walking, covering the neighbourhoods, the riverbanks and parks. Twenty-eight per cent of the trips are completed using the bus fleet of more than 9,000 vehicles, the London Underground (11 lines, 272 stations and 402 kilometres), the London Overground (6 lines, 112 stations and 167 kilometres) and other public transport services (TfL, 2021; 2022).

Like the rest of the world, London was badly hit by the COVID-19 pandemic and many restrictions of movement were introduced to reduce its spread. In March 2020, schools were closed and non-essential travel, indoor and outdoor gatherings were limited (Children's commissioner, 2020; IfG, 2021).

People were asked to stay indoors and, if outside, observe distance from others. After a severe increase in COVID-19 cases, a national lockdown came into force on the 23rd March of 2020. Children began attending classes remotely, with a limited re-opening of schools to support essential workers. By January 2022, and with 76% of the population vaccinated, all COVID-19 related restrictions were lifted. However, people were asked to use face coverings on public transport and in other crowded settings, including school communal areas (BBC, 2022).

3. 1. 2. Children's mobility in London

The National Travel Survey (Department of Transport, 2021) is an instrument used in the UK to gather information about people's travel behaviour, using a number of variables such as the number of trips per person, travel purpose, distance and travel mode. For London, the 2019 version (the last version before the COVID-19 pandemic) indicated that children aged 5 to 10 years old travelled 2.21 times per day on average (see Table 3.1). Girls travelled slightly more (2.23 trips) than boys (2.2 trips). Young people (11 to 16 years old) completed 1.92 trips per day, less than children. Among young people, boys completed slightly more trips (1.94 trips) than girls (1.9 trips). The average travelled distance per trip was 4.99 km. Boys travelled longer distances (4.55 km per trip) than girls (3.75 km per trip). Among young people, girls travelled longer distances (7.76 km) than their male peers (4.88 km). On average, children travelled 1.6 km to school; whereas young people travelled 4.8 km (see Table 3.3). Travel time was 18.5 minutes for children and 28.8 minutes for young people (see Table 3.1). Female young people travelled 32 minutes on average, more than boys of the same age range (26.1 minutes).

Table 3.1. Trips per capita, distance and time of travel for children in London.

	Total	Boy	Girl
Trips per capita			
Primary school (5-10 years old)	2.21	2.20	2.23
Secondary school (11-16 years old)	1.92	1.94	1.90
Total	2.09	2.09	2.08
Average distance (km per trip)			
Primary school (5-10 years old)	4.20	4.55	3.75
Secondary school (11-16 years old)	6.21	4.88	7.76
Total	4.99	4.68	5.38
Average travel time (minutes)			
Primary school (5-10 years old)	18.5	19.0	17.7
Secondary school (11-16 years old)	28.8	26.1	32.0
Total	22.5	21.7	23.5

Source: adapted from Department for Transport (2021).

According to the survey, children and young people's main travel purpose was "education"; half (50%) and three fifths (60%) of the total trips completed by children and young people respectively had such purpose (see Table 3.2). If the data is disaggregated, education accounts for a large portion of the trips completed by boys (51%), girls (49%), male young people (62%) and female young people (58%). Moreover, only 4.3% of children aged 5-10 years travelled unaccompanied to school, compared with 42.8% of young people aged 11-16. The survey includes leisure travel, yet children's play on the street is not included (NTS, 2021).

Table 3.2. Mode of travel and trip purpose for children in London.

Trip purpose	All children		Boy		Girl	
<i>Child age</i>	5-10	11-16	5-10	11-16	5-10	11-16
Education	50%	60%	51%	62%	49%	58%
Other escort	16%	4%	15%	5%	18%	3%
Visiting friends at private home	7%	7%	8%	5%	6%	9%
Personal business	7%	6%	7%	7%	7%	5%
Entertainment / public activity	5%	6%	4%	4%	8%	8%
Shopping	3%	6%	4%	5%	3%	8%
Sport: participate	3%	4%	3%	6%	3%	2%
Other including just walk	3%	2%	4%	1%	1%	3%
Visiting friends elsewhere	2%	1%	2%	1%	3%	1%
Day trip	2%	1%	2%	1%	1%	2%
Holiday: base	1%	1%	1%	1%	1%	1%
Escort education	0%	0%	1%	0%	0%	1%
Business	0%	1%	0%	1%	0%	0%
Commuting	0%	0%	0%	0%	0%	0%

Mode	All children		Boy		Girl	
<i>Child age</i>	5-10	11-16	5-10	11-16	5-10	11-16
Car / van passenger	37%	20%	34%	15%	41%	27%
Walk	52%	38%	53%	45%	51%	29%
Bus in London	7%	29%	7%	31%	7%	27%
Surface Rail	0%	6%	0%	4%	0%	8%
Bicycle	1%	2%	2%	2%	1%	1%
Other private transport	1%	2%	2%	1%	0%	2%
Other public transport	2%	3%	2%	2%	1%	6%

Average school trip length in London (km)						
5-10 years						1.6
11-16 years						4.8
Percent travelling alone to school in England						
5-10 years						4.3%
11-16 years						42.8%

Source: adapted from Department of Transport (2021).

“Other escort trips” represented 16% of the total trips completed by children and 4% of younger people. Meanwhile, among the purposes that represent less than 10% of trips completed by children and young people, “personal business” (7%) and “visiting friends in a private home” (8%) were the most relevant for younger boys. “Sports” was also significant, but for older children (6%). “Entertainment/public activity” (8%), “visiting friends in a private home” (9% for older girls, 6% for younger girls) and “shopping” (8% for secondary school girls) emerged as the most relevant purposes for girls. As the literature from the UK suggests, children multiply the places where they go as they grow; they visit places within the limits of the neighbourhoods but also go to places located farther like shopping malls and other places of consumption (Matthews *et al.*, 2003; Milne, 2009; Christensen *et al.*, 2018). Boys tend to complete more trips for personal reasons (e.g., sports and personal business) and girls more trips related to social and public activities (e.g., visiting others, entertainment/public activity), highlighting the well-known influence of gender (O’Brien *et al.*, 2000; Brown *et al.*, 2008) on children’s travel patterns.

Further differences arose when examining transport mode. Among children, the most common transport mode is walking (52% of trips), followed by car/van trips (37% of trips, see Table 3.2). Boys walk slightly more (53%) than their female peers (51%), and girls complete more trips (41%) in cars than their male peers (34%). Male young people walk (45% of the total trips) and ride buses (31% of the total trips) more often than female young people (29% walking, 27% riding buses). Female young people, by contrast, travel more in cars (27% of the total trips) than boys of the same age. Likewise, female young people travel more on surface rails (8%) and other public transport services (6%) than males (4% surface rail, 2% other public transport services). Compared to the above modes of transport, cycling is less relevant for boys (2%) and girls (1%).

3. 2. Santiago de Chile

Located in South America, Chile is one of the most developed countries of Latin America. It has a population of 19.7 million people (Instituto Nacional de Estadísticas – INE, 2021) and a Human Development Index of 0.851 (UNDP, 2022), a PIB per capita (PPP) of 25,068 USD (World Bank, 2022), a high life expectancy of 80 years (United Nations Statistics Division, 2019) and 10.6 mean years of schooling (UNESCO, 2020). The population living in cities in Chile is 87.5%, higher than most of the countries of the region (United Nations Statistics Division, 2019). The national GINI coefficient is

0.441 (World Bank, 2022), but, despite that income inequality, only 10.8% of the population live in poverty. Urban regions show lower percentages of people living under the poverty threshold (10.4%) compared to rural areas (13.8%, see Ministerio de Desarrollo Social y Familia, 2021b).

Chile ranks worse than the OECD averages in most of the topics covered by the Better Life Index (OECD, 2020). The ranking shows that only 85% of the population believe they would receive support from friends in case of need. In terms of education, people between 5 to 39 years old have more years of education than the OECD average (17.5 years). However, the PISA score (443) and the number of adults that completed upper secondary education is lower than the OECD average. If compared with other OECD countries, Chileans expend less of their disposable income on housing (18%).

3. 2. 1. Overview of the city

Santiago is the largest city of Chile. It is located in the central region of the country, beside the Andes Mountain range but without a coastal front. It is 500 metres above sea level and has a continental Mediterranean climate with hot and long summers and short and cold winters, with less than ten days of rain per year. Green areas and parks are unevenly distributed in the city, covering 4.6% of the territory (Reyes and Figueroa, 2010). Daylight can last 14 hours during summer and 10 hours in winter. Santiago contains a significant proportion of the industry and financial services of Chile. It is also one of the wealthiest cities in the country. Migration of recent years is transforming the socio-cultural architecture of Chile and Santiago that has absorbed a good part of the influx. In 837 km² of territory, the city of Santiago is home to 7.1 million people, with a population density of 462 people per square kilometre. The population median age is 35.6 years, 14% of them being children of 16 or younger, and 67.2% being people between 17 to 64 years old. Among the population between 5 and 16 years, 49% are girls, and 51% are boys (INE, 2017).

The administration of the territory in Santiago is divided into 34 communes, each headed by democratically elected majors. The population across the communes varies greatly; small communes have less than 80,000 inhabitants and large communes have more than 500,000 inhabitants. The functions of the communes include the delivery of State and local social programs, the provision of primary health services, primary and secondary education, the maintenance of the public spaces, among others. However, the communes have extremely unequal budgets. The wealthiest commune has an available budget per person of 1,213 USD (981,000 CLP). In contrast, the poorest

commune has only 183 USD (148,000 CLP) per habitant (Henriquez, 2019). This inequality affects the capacity that each commune has to develop and implement policies and programs.

The provision of basic services (e.g., drinkable water, electricity, sanitation) is provided universally, facilities like health centres and schools are spread across the territory and public transport reaches all the neighbourhoods of the city (UNICEF and WHO, 2017; SECTRA, 2014; MINEDUC, 2018; MINSAL, 2018). Urban infrastructure, such as sidewalks and paved roads and squares and parks are, to different degrees, present in every neighbourhood (Greene *et al.*, 2017). However, the quality of urban infrastructures varies across the city, due to clear patterns of inequality and segregation.

Santiago is one of the most unequal regions of the country, with a GINI of 0.51 (SEREMI, 2017). In fact, the wealthiest households earn 27.6 times more than the poorest families (Ministerio de Desarrollo Social y Familia, 2021a). It is also a socially and geographically segregated city, where rich families live in the seven wealthiest communes located in the northeast (Sabatini, 2000; Hidalgo, 2007). Wealthy families can easily access well-maintained urban spaces and live nearby high-quality services and job sources (CChC and PUC, 2019). In contrast, poorer families live in small, and often overcrowded, houses and neighbourhoods that, produced under the umbrella of social housing policies, are located in the margins of the city; distant from job sources and services of good quality (Morales and Rojas, 1987; Valenzuela *et al.*, 2008). In Santiago, living in deprived areas means coping with neglected public spaces; feeling isolated, abandoned by the State and having fewer opportunities to progress and achieve success (Sabatini *et al.*, 2001; Sabatini and Wormald, 2013; Figueroa and Forray, 2015). Moreover, for children and teenagers, the disadvantages are translated into low expectations which can lead to drug addiction, school dropout, youth unemployment or teenage pregnancy (Tironi, 2003; Rodríguez and Sugranyes, 2004).

As several authors have pointed out (Segura, 2009; Gómez and de Aguilar, 2015), this socio-territorial polarisation had fuelled the high perception of insecurity that the residents of Santiago experience in their everyday lives. Despite that Chile is one the safest countries in the Americas (see UNODC, n.d.) and individuals seem to trust the institutions, fear is a powerful driving force and, as such, influences many aspects of Santiago's public life (Dammert and Malone, 2003; Figueroa and Forray, 2015; Paydar *et al.*, 2017). By 2020, victimization and crime reports shrunk compared to previous years (INE, 2021), yet the perception of insecurity has worsened as people's trust on the police and the institutions has decreased in recent years (Subsecretaría

de Prevención del Delito, 2020). The crimes reported to the police with the highest incidence (INE, 2019) are robbery (31.3 per 10,000 people), fraud (23.3 per 10,000 people) and violence (12.8 per 10,000).

Santiago has a diverse transport provision, with a range of public transport services including subway, buses, taxis and shared cars (“colectivos” in Spanish) services. In detail, the public transport system is composed of a subway network (7 lines, 140 kilometres and 136 stations see Metro de Santiago, 2020), a growing network of commuter rails (20.8 kilometres and 10 stations see Tren Central, 2019) and a bus fleet of almost 7,000 vehicles and 379 lines (DPTM, 2020). The city also has a vast network of footpaths, streets, highways and—an increasing provision—of cycling paths. This has been translated into a “healthy” travel mode share in which 39% of the trips are made by walking or cycling, 30% are completed by public transport and just 26% in private vehicles. Nevertheless, this condition is in jeopardy as motorised vehicle ownership increased 60% in the last ten years.

During the COVID-19 pandemic, travel was limited to reduce the spread of the virus. Schools were closed in March 2020, and remote learning became the standard (MINSAL, 2020). These measures were accompanied by mandatory face coverings in closed and open spaces, ‘safe distancing’ and lockdowns during critical periods. Unlike other countries that enforced nation-wide lockdowns, the Chilean government decided to implement this harsh measure by communes; yet this rapidly proved ineffective in controlling the spread of the disease and a citywide lockdown came into force by the 25th March (Pauta, 2020). This lockdown and the others that followed demonstrated that the disease was disproportionately affecting those suffering from socioeconomic disadvantage. People were confined in small and packed houses, in neighbourhoods that rarely have public spaces of good quality. Due to material privation and limited access to the internet, many children were unable to attend on-line school classes, potentially resulting in a higher school dropout and an increase in child labour (UNICEF-PNUD-OIT, 2021). By January 2022, with more than 91% of the population vaccinated, COVID-19 measures are still in place, with face coverings and “social distancing” being mandatory. Policies regarding school closures during the vacation period (December to March) are not clear.

3. 2. 2. Children’s mobility in Santiago

The Ministerio de Transporte y Telecomunicaciones (Ministry of Transport and Telecommunications in English) commissions a travel survey for Santiago (Encuesta Origen-Destino or EOD) every ten years since 1991.

The EOD survey gathers data through a household questionnaire in which a trained interviewer registers the trips completed by all family members. The last report was published in 2012 (SECTRA, 2014). Additionally, the survey focuses on the mode and purpose of individual's trips and details about trip companions are not reported. Children between 6 to 16 years old complete an average of 2.31 trips per day (see Table 3.3), with children travelling slightly more (2.32) than young people (2.30). Considering gender, boys travel more than girls regardless of their age. In detail, boys complete 2.33 trips per day while girls do 2.31 trips. In secondary school level, boys complete 2.32 trips, and girls do 2.28 trips. The average distance travelled by children is 2.71 km, with differences if the child gender and age is considered. Boys travel 2.33 km and girls travel 2.41 km, while male young people travel 3.37 km and girls travel 3.20 km. Travel time is 23.5 minutes for children and 28.8 minutes for young people. Female young people also travel for a longer time (29.5 minutes) if they are compared with boys of the same age (28.4 minutes).

Table 3.3. Trips per capita, distance and travel time for children in Santiago.

	Total	Boy	Girl
Trips per capita			
Primary school (6-12 years old)	2.32	2.33	2.31
Secondary school (13-16 years old)	2.30	2.32	2.28
Total	2.31	2.32	2.30
Average distance (km per trip)			
Primary school (6-12 years old)	2.35	2.33	2.41
Secondary school (13-16 years old)	3.34	3.37	3.20
Total	2.71	2.71	2.69
Average travel time (minutes)			
Primary school (6-12 years old)	23.5	23.5	23.5
Secondary school (13-16 years old)	28.8	28.4	29.5
Total	25.5	25.3	25.7

Source: adapted from SECTRA (2014)

The EOD also reports the frequency of each trip purpose (see Table 3.4). “Education” is the most common purpose among children and young people (64% of the total trips)—and there are no relevant differences if age and gender are considered. Trips related to “shopping” are more frequent among girls (13% for girls, 12% for female young people) than boys (12% boys, 9% for male young people). “Sports and entertainment” journeys represent 13% of the total trips completed by boys and 9% of girls. The same purpose represents 12% and 7% of the total trips completed by male and female young people, respectively. The purpose “visiting friends and relatives” is slightly more common among boys (6% for boys, 7% for male young people) than girls (5% for girls, 6% for female young people). Lastly, “other

purposes,” “other escort trips”, “work” and “health” represent less than 5% of the trips. The survey (SECTRA, 2012; Observatorio Social Universidad Alberto Hurtado 2014a; 2014b) considers the travel purpose “entertainment”, yet the available documentation does not state if it includes children’s play on the street.

Table 3.4. Mode of travel and trip purpose for children in Santiago.

Mode	All children		Boy		Girl	
<i>Child age</i>	6-12	13-16	6-12	13-16	6-12	13-16
Walking	47%	44%	46%	45%	47%	43%
Car / motorcycle passenger	23%	18%	23%	17%	22%	19%
School van	16%	4%	15%	3%	17%	5%
Public transport buses	9%	23%	10%	22%	8%	23%
Subway	1%	4%	1%	4%	1%	4%
Other public transport	2%	3%	2%	2%	2%	3%
Bike	2%	3%	2%	4%	2%	2%
Other private transport	1%	1%	1%	1%	1%	1%

Trip purpose	All children		Boy		Girl	
<i>Child age</i>	6-12	13-16	6-12	13-16	6-12	13-16
Education	64%	64%	63%	64%	65%	64%
Shopping	12%	11%	12%	9%	13%	12%
Sport or entertainment	11%	10%	13%	12%	9%	7%
Visit friends or relatives	6%	6%	6%	7%	5%	6%
Other purposes	4%	5%	4%	4%	5%	5%
Accompany (other escort)	2%	2%	2%	2%	2%	2%
Work	0%	1%	0%	1%	0%	1%
Health	1%	2%	1%	1%	1%	2%

Source: adapted from SECTRA (2014)

Children’s most frequent travel mode is walking (see Table 3.4), with boys and girls walking for 47% of their trips, and young people walking for 44% of their trips. Private motorised transport (car and motorcycle passenger) is the second most frequent transport mode, accounting for 23% of the trips share for children and 18% for young people. Gender differences are evident in walking trips, with girls travelling on foot more (47%) than their male peers (46%). In contrast, female young people travel more on private motorised vehicles (19%) than male peers (17%). School vans are mostly used by children (16% of trips), whereas young people used this mode much less

(4% of trips). The public transport buses represent 9% of the trips completed by children and 23% of the total trips of young people. Other relevant modes for children are the subway (4% of secondary school children) and bicycles (4% of secondary school boys).

To the researcher's knowledge, no information has been reported on the conditions for (un)accompanied child trips in Santiago.

3. 3. Conclusions

London and Santiago are two high-income capitals of Europe and Latin America that, even showcasing high PIB per capita, life expectancies and years of education, still suffer from deep-rooted inequalities. A similar per cent of the population of the cities is below 17 years old (14%), but they experience very different everyday lives.

People in London experience more rainy days, precipitation and variation of daylight hours in a year compared to people in Santiago. Local governments in both cities have similar responsibilities, such as the maintenance of their area and education services, with boroughs in London having a smaller gap between most and least populous boroughs compared to Santiago. Both cities are very unequal in their income distributions, certain parts of London are impoverished—and Santiago is, in addition, highly segregated with well-off people residing in central and well-served neighbourhoods and poor individuals living in a deprived periphery. The most common crimes in London are theft, violence and crime, whereas in Santiago are robbery, fraud and violence. The above suggests that experiences of travelling in both cities are marked by similar phenomena (e.g., insecurity, inequalities) that, however, are reflected in different ways in the urban environment.

Children and young people in London complete fewer trips per day compared to their peers in Santiago (see Table 3.5), yet they travel further distances. The transport mode share of children and young people trips is equivalent in both cities, with walking being the predominant transport mode; boys walk more than girls in London, and there are no significant gender differences in Santiago. The second most relevant means of transport is car/van passenger for primary school children, and public transport for young people in secondary school. Girls in London travel more by car than boys, which was also the case for young people in secondary school in Santiago.

A reduced number of children in London travel unaccompanied to school, but the number is significantly higher among young people. This provides clear evidence that children gain more independence as they become older,

multiplying their destinations and visiting places located further from the neighbourhoods where they live. The data from Santiago is insufficient to draw conclusions of that nature, but shows that children walk more than young people. The trend is similar in London, suggesting, on the one hand, that young people can occupy other means of transport (e.g., public transport) and, on the other, that children are more in contact with their local environment when travelling.

Table 3.5. Summary of children's travel data in London and Santiago.

London				Santiago		
Travel data year	2019 (travel diary)			2012		
<i>Trips per capita</i>	<i>Total</i>	<i>Boy</i>	<i>Girl</i>	<i>Total</i>	<i>Boy</i>	<i>Girl</i>
Primary school	2.21	2.20	2.23	2.32	2.33	2.31
Secondary school	1.92	1.94	1.90	2.30	2.32	2.28
Total	2.09	2.09	2.08	2.31	2.32	2.30
<i>Average distance (km per trip)</i>	<i>Total</i>	<i>Boy</i>	<i>Girl</i>	<i>Total</i>	<i>Boy</i>	<i>Girl</i>
Primary school	4.20	4.55	3.75	2.35	2.33	2.41
Secondary school	6.21	4.88	7.76	3.34	3.37	3.20
Total	4.99	4.68	5.38	2.71	2.71	2.69
<i>Average travel time (minutes)</i>	<i>Total</i>	<i>Boy</i>	<i>Girl</i>	<i>Total</i>	<i>Boy</i>	<i>Girl</i>
Primary school	18.5	19.0	17.7	23.5	23.5	23.5
Secondary school	28.8	26.1	32.0	28.8	28.4	29.5
Total	22.5	21.7	23.5	25.5	25.3	25.7

London							Santiago					
Mode	Primary school			Secondary school			Primary school			Secondary school		
	Total	Boy	Girl	Total	Boy	Girl	Total	Boy	Girl	Total	Boy	Girl
Walk	52%	53%	51%	38%	45%	29%	47%	46%	47%	44%	45%	43%
Bicycle	1%	2%	1%	2%	2%	1%	2%	2%	2%	3%	4%	2%
Car / van passenger	37%	34%	41%	20%	15%	27%	39%	39%	39%	22%	20%	24%
Public transport	9%	9%	8%	39%	36%	41%	12%	13%	12%	30%	29%	30%
Other private transport	1%	2%	0%	2%	1%	2%	1%	1%	1%	1%	1%	1%
Trip purpose	Total	Boy	Girl	Total	Boy	Girl	Total	Boy	Girl	Total	Boy	Girl
Education	50%	51%	49%	60%	62%	58%	64%	63%	65%	64%	64%	64%
Accompany (other escort)	16%	15%	18%	4%	5%	3%	2%	2%	2%	2%	2%	2%
Sport or entertainment	9%	7%	11%	10%	10%	10%	11%	13%	9%	10%	12%	7%
Shopping	3%	4%	3%	6%	5%	8%	12%	12%	13%	11%	9%	12%
Visit friends or relatives	9%	9%	8%	8%	7%	10%	6%	6%	5%	6%	7%	6%
Other purposes	12%	13%	11%	11%	11%	11%	5%	5%	6%	7%	6%	9%

Source: Author's own based on Department of transport (2021) and SECTRA (2012).

The primary purpose of child trips in both cities is “education.” The trips purposes “other escort trips”, “visiting friends in a private home” and “other purposes” like personal business were more common among children from

London. Trips related to “sport or entertainment” and “shopping” were more common in Santiago. Lastly, similar gendered patterns were observed in the data from both cities: girls travel more for shopping and boys complete more journeys to practice sports. The pattern coincides with the findings of Shaw *et al.* (2015) and suggests that educational trips are relevant for children and young people, yet other purposes can also be significant as, through them, children and young people remain connected with the local communities and access to amenities that enrich their everyday lives.

Lastly, the pandemic has severely affected both cities and the travel experiences of children and young people. Daily lives and, especially school attendance, have been severely disrupted by the measures enforced to control the spread of the disease, which very likely reduced the number of school trips and increased the frequency and relevance of others (e.g., entertainment). London has returned to “normal” faster than Santiago, showcasing the different strategies that the countries have followed to return to pre-pandemic conditions.

Chapter 4. Methods and materials

To address the questions and objectives outlined in Chapter 1, this research studies two metropolises: Santiago de Chile, the capital and the largest city of the country, and London, the largest city of the United Kingdom. The research follows an inductive approach and uses mixed methods which, by collecting data using methods of different nature (i.e., qualitative and quantitative), allows the analyst to develop and expand a more complete understanding of a particular phenomenon (Greene *et al.*, 1989; Johnson and Onwuegbuzie, 2004; Creswell, 2014).

The mixed methods approach in this research has a sequential design (Tashakkori and Teddlie, 2010), that is, a qualitative method preceding a quantitative method. This research also follows a “parallel design” (Creswell, 2014) in which the phenomenon is studied using qualitative methods and inductive and theory-developing perspectives and, later, re-examined with quantitative tools designed with a deductive approach. In addition, the design is “convergent” (Creswell, 2014) because the findings are enriched by the qualitative and the quantitative stages.

The qualitative stage addressed objectives 2 and 3 from Chapter 1: analyse children’s patterns of unaccompanied trips in London and Santiago (objective 2) and explore the impacts of the built and the social environments on children’s unaccompanied trips (objective 3). It involved (see Figure 4.1): (i) the review of the pertinent literature; (ii) the researcher training in qualitative methods (i.e., concepts and techniques), (iii) the design of a semi-structured interview, with supporting visual prompts, adapted for child and carer participants to be conducted in Santiago and in London, (iv) the definition of the areas of study and the design of the recruitment strategy, (v) the study of the ethical implications and the delineation of protocols, (vi) the conducting of the interviews, (vii) the coding of the responses and (viii) the thematic analysis of the responses. Through the sequence of methods, this stage aimed to address a number of relevant matters for this thesis, including: the definitions and concepts of childhoods, the accompanied and unaccompanied journeys performed by children, the permissions or licenses needed by a child to access the public realm and the negotiations carried out by them, and the perceptions and attitudes of children and parents to social and physical aspects of the environment.

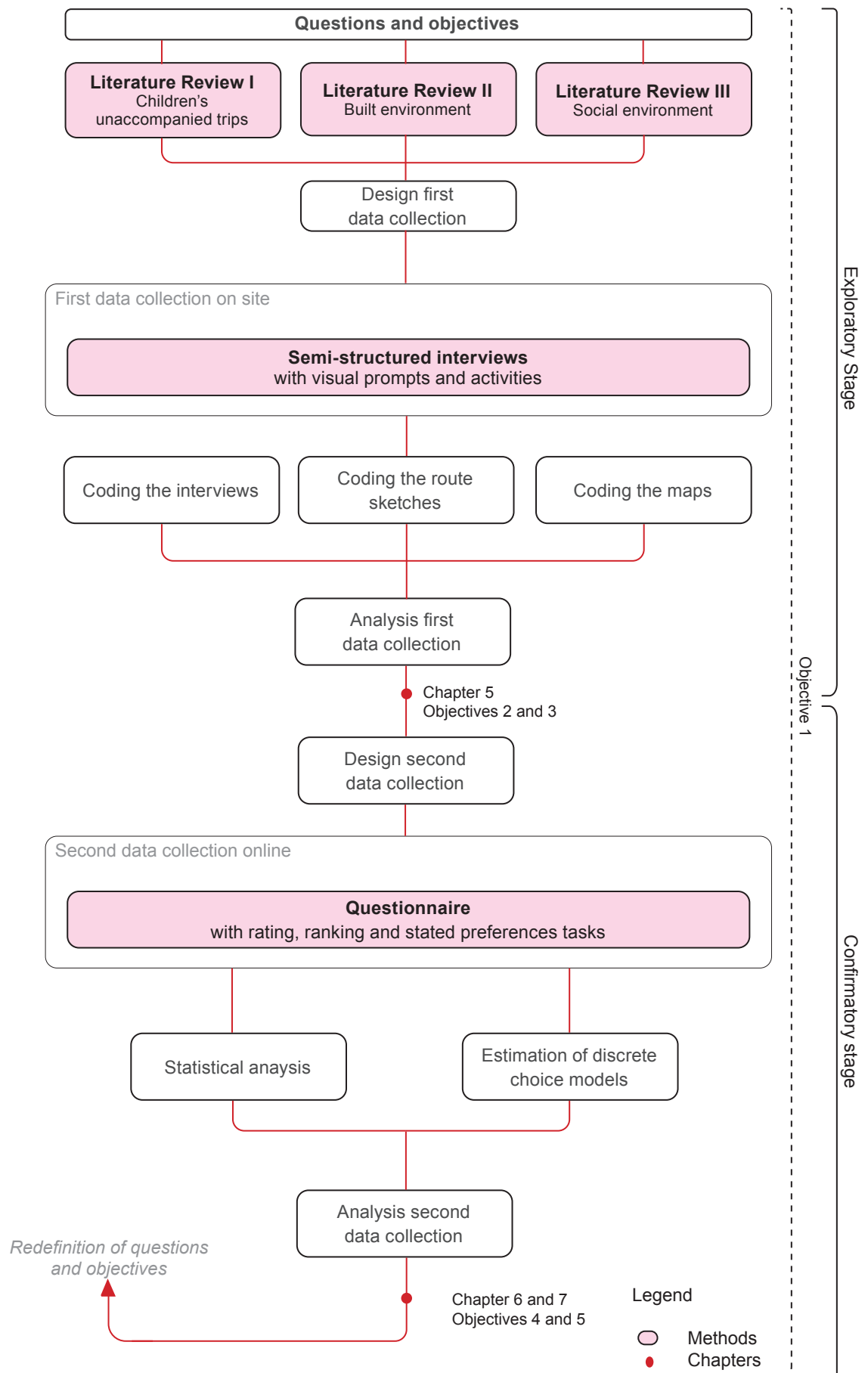


Figure 4.1. Scheme of the methodological design.

Source: author's own.

The quantitative stage addressed objectives 4 and 5 detailed in Chapter 1; quantify the impacts of the built and the social environments on children's unaccompanied trips in London and Santiago (objective 4), and identify the differences between groups of carers and children's perceptions of the built and social environments (objective 5). Following the knowledge acquired in the previous qualitative stage, this stage included (see Figure 4.1): (i) the review of the attributes of the built and the social environment that may influence children's trips in the literature and the qualitative stage, (ii) the selection and adaptation of those attributes to represent street environments in London and Santiago, (iii) the design of a questionnaire adapted for child and carer participants, (iv) the estimation of the required sample size, and the design of the recruitment strategy, (v) the assessment of the ethical implications and the delineation of protocols¹, (vi) the conducting of the questionnaire and (vii) the analysis of the data using statistical methods and discrete choice modelling methods (stated preferences).

Figure 4.1 summarises the methodological design of the thesis, illustrating the relationship between the aims, the stages and the methods employed.

4. 1. Design of the qualitative stages

4. 1. 1. Design of the semi-structured interview

The qualitative phase comprised semi-structured interviews conducted in Santiago and London, in which carers and children were invited to talk about those environmental conditions—physical and social—which are relevant for children's mobility according to means of transport (e.g. motorised, non-motorised), level of independence (e.g. accompanied by peers, siblings, unaccompanied), time of the day (e.g. morning, afternoon, night), nature of the trip (e.g. mandatory, optional), purpose (e.g. study, visit) and time of the year (e.g. summer, winter).

Semi-structured interview topics

Semi-structured interviews are open-ended conversations between the participants and the researcher that follow a topic guide (or semi-structured questionnaire) that is “adapted” during the conversation according to the matters that emerge (Mason, 2002). The topic guide used in this research is shown in Table 4.1.

¹ As the qualitative stage was performed beforehand, it provided insights into the ethical assessment and the recruitment protocols in the quantitative stage

Table 4.1. Topic guide.

Section		Objective	Support material
(i)	Interview opening	Introducing the interview with carers, gather sociodemographic information, and warming up the conversation by inquiring about the general views on the neighbourhood. In the case of carers in London, sociodemographic questions are inquired using a complementary survey.	Survey ²
(ii)	Children's daily routine and trip behaviour	Characterise the child daily routine and the general conditions in which they have contact with the public space. In the case of child participants, this topic serves to introduce the interview, proving to be an easy task to warm up the conversation.	Schedule form
(iii)	Neighbourhood environment	Identify the aspects of the built and the social environment that support child trips.	Child: blank paper, colour pencils. Red, yellow and green stickers ³ . Carer: printed maps of the household area and highlighters
(iv)	Territorial range	Identify geographical limits of the permissions granted or denied to children. Only carers, guardians of the access to the public space, are inquired about the current limits imposed on the mobility range of a child.	Printed maps of the area and highlighters
(v)	Community environment	Identify the people and the activities that affect child trips.	-
(vi)	Street environment	Identify the features of the built environment that support child trips.	Set of black and white street images
(vii)	Recommendations	Identify further comments and future trends from the perspective of the participants.	-

Source: author's own

The interview was organised in two sections: the first for children and the second for carers. As children have a different comprehension level as compared to carers, and they may feel fatigued after a long conversation (as tested in the pilot stage, see section 4.1.2), the complexity of the questionnaire was reduced for them. Of the list of topics, children were asked about all

² This instrument was used only in London as it replicates a well-known and proven UK survey to collect sociodemographic information about the different levels of deprivation. There is no equivalent instrument in Chile.

³ This material was used only in London as the idea to use stickers to help children express their preferences emerged as one of the learnings of the interviews carried out in Santiago.

topics excepting (i) and (iv), as those are general to the household or closely related to carers.

Each topic had between two to four opening questions and between one and three follow-up questions to elicit and continue the conversation. The final questionnaire which guided the interviews is shown in Appendix 10.1. Some topics such as (ii) "children's daily routine and trip behaviour" and (v) "street environment" included visual aids that supported the questions. These support materials are described in the next section.

Support material

Five topics in the interview used support material like visual aids and surveys to prompt the conversation and provide complementary information (see Table 4.1).

Topic (i) "interview opening" aimed to gather sociodemographic information (e.g., income, family members age and gender, number of vehicles) from carers. As poverty and deprivation⁴ greatly vary within neighbourhoods in London, additional questions were added (see Appendix 10.2) to collect sociodemographic information and the household level of deprivation according to the Poverty and Social Exclusion in the UK Survey (Gordon, 2017). In the case of Santiago, socially deprived households were those are those located in one of socio-economically disadvantaged communes according to the *Índice de Pobreza Multidimensional* (Multidimensional Poverty Index in English, see MDS, 2017), and in a *Zona Prioritaria* (Priority Zone in English, see MINVU, 2012). A Priority Zone is a territory that has low levels of investment, is experiencing physical decline, and suffers from numerous social problems (e.g., overcrowding, school dropout, youth unemployment, domestic violence).

In the case of the topic (ii) "children's daily routine and trip behaviour", the child participant was invited to describe a typical week. The data, in particular, the characteristics of the trips described by the child (e.g., origin, destination, purpose, type of company, stages) was compiled in a schedule form (Figure 4.2). Carers, in turn, filled the form with any activities and journeys that a child forgot and reported the approximate time in the day in which the activities happened. Children and young people were asked:

4 For the purpose of the analysis, deprived neighbourhoods in London included those that were located in one of the most deprived areas according to the Index of Multiple Deprivation (MHCLG, 2019). In Santiago, deprived neighbourhoods were those located in a disadvantaged commune or a Priority Zone (MINVU, 2012). By contrast, the neighbourhoods in the other extreme are least deprived or wealthy (i.e., areas of mostly high-income households).

“how is a typical school day?”, “and a typical weekend day?” and “is there a day that you do something different? What do you do that day?”. Carers were asked to complement this information by providing the time of those activities. This part of the interview took around 10 minutes.

[illegible]

Figure 4.2. Schedule form.

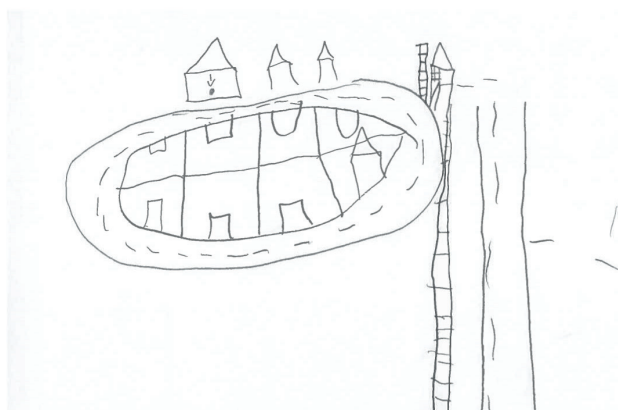
Source: author's own

After filling in the schedule form, in topic (iii) "neighbourhood environment", child and young people participants drew the route of their favourite journey among those described in the schedule (see examples in Figure 4.3). Children and young people were asked to choose among the previous trips their favourite one. Then, they were asked to draw the things of the environment of that route that caught their attention, like trees, houses, and fences, among others. The interviewer and carer assisted the child if he/she had trouble remembering or choosing a trip. Children and young people were given white sheets of paper and a pencil box with 12 different colours. They (children and young people) drew the route on a table or the floor. Following this activity, the interviewer asked the child about the sketched elements, whether they liked or disliked them, and why (i.e., "what is that thing you draw?", "why do you draw it?", "why do (don't) you like it?"). Participants in London had green, red and yellow circle-shaped stickers to highlight the

elements they liked, disliked or considered neutral as shown in Figure 4.3. This part of the interview took between 10 to 30 minutes.

Carers, in turn, highlighted the child's favourite route on printed maps⁵. Street maps were retrieved from Google Maps, and covered the surrounding area of the household on different scales (50, 100, 200, 500, 1000 and 2000 meters). Carers were also asked to "describe the surroundings of the route (path, street) the child drew in the map. This part of the interview took less than 15 minutes. Later, these maps were used in the topic (vi) "territorial range" to explore the limits within which the child was permitted to travel unaccompanied, either walking, cycling or on public transport, asking carers to highlight the borders on the map (i.e., "when walking or cycling, which are the limits in which the child(ren) can move?", "when using other transport means, which are the limits in which the child(ren) can move?"). This part of the interview took around 15 minutes.

Santiago (boy – 9 years old)



London (girl - 11 years old)

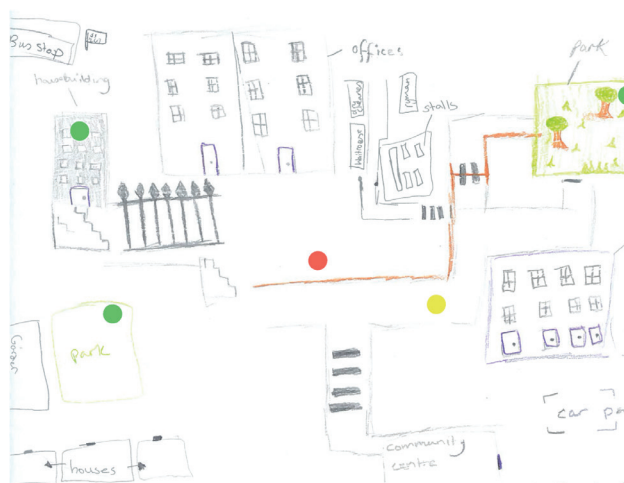


Figure 4.3. Examples of child route drawings in Santiago and London.

Source: author's own

⁵ The carers' maps are not shown in this document to keep children's routes confidential.

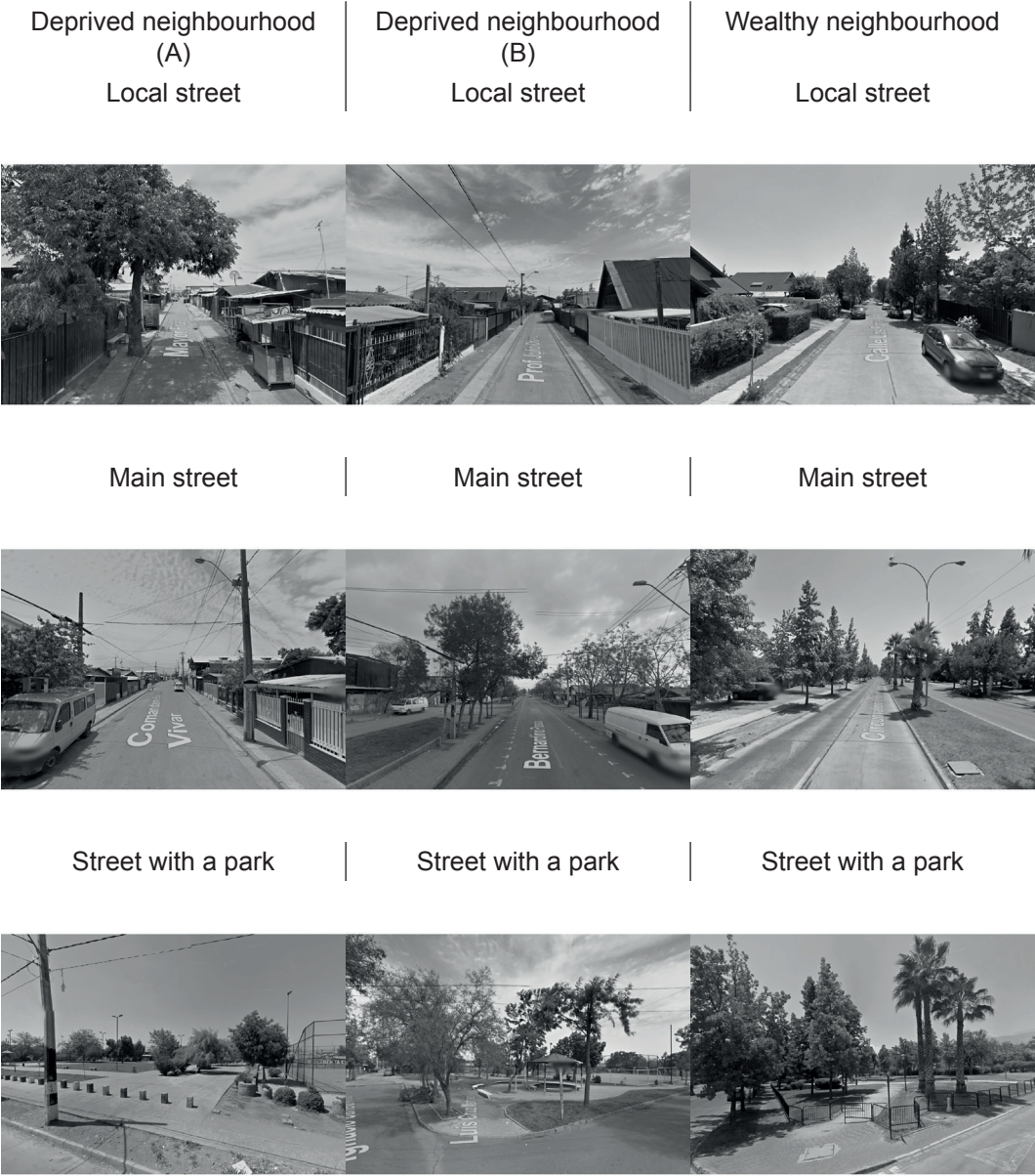


Figure 4.4. Santiago street images.

Source: Google street

The last visual aid, from the topic (vi) "street environment", consisted of two sets of photographs, each with three images⁶ of the streets in each city. Each set of images depicted three situations: a local street, a main street and a street bordering a park, to converse about a range of public spaces that are available in the city. In particular, local streets were selected among those that have one or two vehicle lanes, a space for car parking, footpaths beside the road, and houses of one or two-story in Santiago and low-rise of two or three-story in London. The images covered a range of features observed in a street environment, such as greenery, urban amenities and transport infrastructure of varied quality (e.g., well-kept and neglected parks).

⁶ Images were obtained from Google Street.

The images depicting the local and main streets were drawn from the centre of the road, providing a wider perspective of the street environment but a limited view of the facades. Conversely, images of parks had a vehicle lane on half of the frame and the park on the opposite side. The images were printed in grayscale to avoid colour bias due to distinctive physical features, weather or brightness.

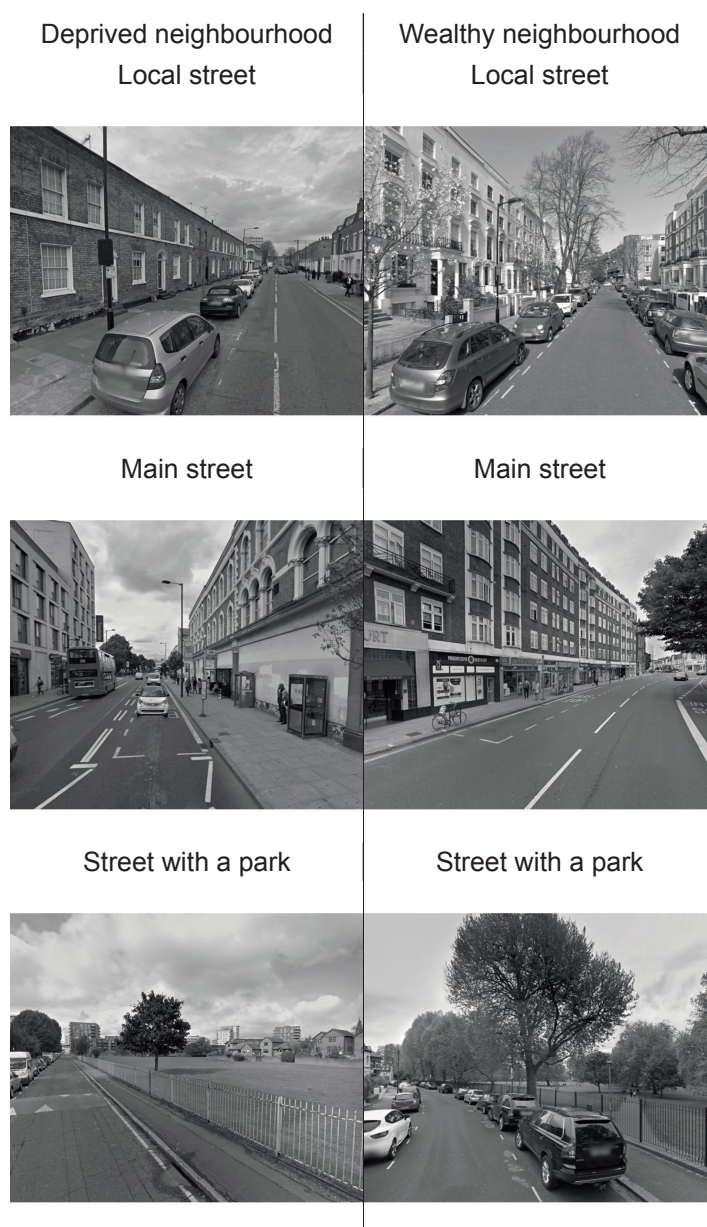


Figure 4.5. London street images.

Source: Google street

Each set of images showed two different neighbourhoods; one featuring the streets in, or close to, the area where the participants lived, to talk about known environments, and another of a contrasting place for participants to discuss unfamiliar places. Due to the high levels of socioeconomic segregation in Santiago and their reflection on the quality of the public space (Hidalgo, 2007, Figueroa *et al.*, 2019), the selected images represented the streets of

a commune of high-income (i.e., Las Condes) and another that has mostly deprived neighbourhoods within its limits (i.e., La Pintana) (see Figure 4.4). In London, the selection of the street images was carried out in accordance with the Index of Multiple Deprivation (MHCLG, 2019), which measures deprivation in the domains of income, crime and living environment, among others. The selected street images were located in some of the most deprived neighbourhoods in the boroughs of Hackney and Tower Hamlets, and in some of the least deprived in the boroughs of Hammersmith and Fulham and Kensington and Chelsea (see Figure 4.5).

With each image, children and young people were asked “do you like this place?”, “who do you think use that place?”, “how are they?”, “would you go alone through that place?”. Carers were asked similar questions, except for the last one, which was replaced by “would you let the child(ren) go alone through that place?”. This part of the interview took between 15 to 30 minutes.

4. 1. 2. Piloting the interview

Seven children, six carers and two teachers took part in the pilot interviews. They were asked to examine the questions and supporting activities: their coherence and clarity, the flow of the conversation, in addition to practical limitations or issues when interviewing children. The teachers revised and suggested modifications to the questions, training and accompanying the interviewer in the conduction of the pilot interviews. Child and young person participants mentioned that they enjoyed all the interview activities. They naturally reflected on the images of other streets and sketched their favourite route as visual support to their descriptions. Carers stated, with surprise, that the questions obligated them to reflect on decisions taken for granted. Similarly to children, they valued the use of images as visual cues of the relevant elements in a street environment.

While positive in general, the pilots made evident a number of issues related to the length and complexity of the information sheets, the consent form and the ethical protocols, the order of the questions and activities, the length of the interview and the fatigue of the participants, the conducting of the conversation and the management of participant expectations. Those issues led to a revised version of the interview that included the following changes:

- » To ease the comprehension of what it would mean to take part in the study, a succinct information sheet and consent form for parents were created. Two new simplified and child-friendly versions of the

information sheet - for children aged 6 to 10 and young people aged 11 to 16 years old - were also prepared (see Appendix 10.3).

- » To reduce the complexity of the interview, some questions were deleted. Others were rephrased and combined, emphasising relevant topics such as the features of the built environment and the community.
- » To address children's fatigue, the interview was designed to last 40 minutes with several tasks of up to 15 minutes (the observed concentration span). In the cases of carers, the interview was designed to last 60 minutes.
- » To keep the child engaged and concentrated, the interview was divided into two parts: the child section and the carer section. Children were interviewed first, with carers present during the child interview.
- » To address socio-cultural differences, the vocabulary of the questions was adjusted for each city.
- » To accommodate children's varying trips and activities, the schedule was redesigned, adding more space in the boxes.
- » To guide younger children (6 to 8 years old) on the sketch task in topic (iii) "neighbourhood environment", an instruction sheet with visual signs was created with the recommendations of a teacher (see Appendix 10.4).

Additionally, the pilot served as a training experience for the interviewer, helping him to:

- » Perceive if a child feels unsettled, discomforted or distracted, and learn how to keep them involved (e.g., demonstrating genuine interest in their views). The interviewer learnt techniques to manage children from a primary school teacher.
- » Give children the space to skip questions, stop answering or end the interview at any time.
- » Find creative ways to keep children engaged with the interview, encouraging creative forms of expression (e.g., drawing, dramatizing) and permitting interruptions to request the assistance of carers.
- » Manage children and carers expectations beforehand. In particular, about the duration of the conversation.
- » Adjust the conversation to different family situations, like those with more than one child.
- » Notice problems and facilitate the support from carers to children that were having problems with particular questions or tasks.

4. 2. Design of the quantitative stage

4. 2. 1. Design of the questionnaire

The quantitative stage comprised an online questionnaire conducted in Santiago and London. This questionnaire aimed to study of the relevance of physical and social aspects of street environments (i.e., attributes) for a child's unaccompanied walking trip. Participants were invited to value and compare fictional street environments with a selection of attributes identified in the literature and from the qualitative stage. As some attributes were different for Santiago and London, the responses were treated independently. In addition, some similar environmental attributes were presented to both groups, with a "generic city" street environment scenario.

The studied attributes, (see Table 4.2.), were selected from the literature review in Chapter 2 and the most relevant and frequently mentioned features and aspects of a street environment from the qualitative stage. Some aspects were excluded in this stage (see Chapter 5) because they rarely influence or restrict a child unaccompanied walking trip. In detail, facades, the most commonly found built environment feature in the studied areas is *medium density houses* and *low density houses* in London, and *permeable fences* and *closed fences* in Santiago. The quality of footpaths features is *well-kept* or *dirty*, adding the *neglected footpath* levels in Santiago as those are commonly found in the city. The attributes linked to the greenery in an environment includes *trees*, *grass* and a combination of both as those were usually referred for participants in the qualitative stage. Among the several urban amenities, the selection included *playgrounds*, *bus stops* and a combination of both. The facilities inquired are specific to the context of each city, with London contemplating the attributes *a variety of shops*, *a pub* and a combinations of both, while in Santiago these are *a school*, *local shops* and *an off-licence*.

One set of attributes are specific to the road (see Table 4.2). In London, the attributes are *signalised* and *zebra crossings*, and in Santiago the presence of *vehicles parked on the footpath*. The generic city explored the preferences for the aspects of road in more detail, including the attributes for type of crossings as *dropped kerbs (informal crossing)* and *zebra crossings*, roads with *one-way* or *two-way traffic*, and the traffic composition with *car and bus traffic* or *car traffic only*.

Likewise, the most relevant aspects of the social environment were strangers' activities including *chatting*, *walking*, *drinking alcohol* and *standing*, and the

Table 4.2. Attributes and attribute levels.

Type of attribute	Attribute	Attribute levels for London	Attribute levels for Santiago	Attribute levels for the Generic City
Common attributes for London, Santiago and the Generic City (street link)	Quality of footpaths	(1) Well-kept footpaths (2) Dirty footpaths	(1) Well-kept footpaths (2) Dirty footpaths (3) Neglect footpaths (4) Dirty and neglected footpaths	(1) Well-kept footpaths (2) Dirty footpaths
	Greenery	(1) Trees and grass (2) Trees (3) Grass (4) No greenery	(1) Trees and grass (2) Trees (3) Grass (4) No greenery	(1) Trees and grass (2) Trees (3) Grass (4) No greenery
	Urban amenities	(1) Playground (2) Bus stop (3) Bus stop and Playground (4) No urban amenities	(1) Playground (2) Bus stop (3) Bus stop and Playground (4) No urban amenities	(1) Playground (2) Bus stop (3) Bus stop and Playground (4) No urban amenities
	Facilities	(1) Variety of shops (2) Pub (3) Variety of shops and pub (4) No facilities	(1) School (2) Local shops (3) Off-licence (4) No facilities	
	Strangers' activities	(1) Chatting (2) Walking (3) Drinking alcohol (4) Standing	(1) Chatting (2) Walking (3) Drinking alcohol (4) Standing	(1) Chatting (2) Walking (3) Drinking alcohol (4) Standing
	Strangers' age	(1) Children (2) Teenagers (3) Adults (4) Elderly people	(1) Children (2) Teenagers (3) Adults (4) Elderly people	(1) Children (2) Teenagers (3) Adult (4) Elderly people
Particular attributes for London	Facades	(1) Medium density houses* (2) Low density houses**		
	Crossings	(1) Signalised crossing (2) Zebra crossing		
	Density of people	(1) Crowded footpath (2) Uncrowded footpath		
Particular attributes for Santiago	Private property division		(1) Permeable fences (2) Closed fences	
	Parked vehicles		(1) Parked on the footpath (2) No parked vehicles	
	Strangers' gender		(1) Male (2) Female	
Particular attributes for the Generic City (street junctions)	Crossings			(1) Zebra crossing (2) Dropped kerbs
	Vehicle lanes direction			(1) One way traffic (2) Two way traffic
	Traffic composition			(1) Car traffic (2) Car and bus traffic

*Low rise four storeys typology in an urban setting with a density of 150 dwellings/ha as modelled by Three Dragons *et al.* (2016). ** Low rise two storeys typology in an urban setting with a density of 50 dwellings/ha (ibid).

Source: author's own.

persons of different ages including *children*, *teenagers*, *adults* and *elderly people*. In particular for London, the attributes included the density of people; *crowded footpath* and *uncrowded footpaths*. Meanwhile, a specific attribute for Santiago is the gender of the strangers being *male* or *female*.

The fictional street environments were created by combining a selection of attribute levels, shown in the questionnaire in an image and text, as shown in the example of Figure 4.6.



Figure 4.6. Example of a fictional street environment in London.

Source: author's own

The questionnaire started with a set of short questions about the sociodemographic characteristics of the participants. As suggested by Rizzi and Ortúzar (2003), the inclusion of individual characteristics permits a greater level of heterogeneity in statistical models. In detail, the questionnaire asked:

- » Child and carer age and gender,
- » Household aggregated location, number of children aged 8 to 16 years old, neighbourhood aggregated wealth in Santiago based on Correa (n.d.), and the Index of Multiple Deprivation (IMD) in London. The explored domains of the IMD included the measures of (Ministry of Housing Communities and Local Government - MHCLG, 2019):
 - Income domain, with the proportion of the population in low income.
 - Crime domain, with the risk of victimisation including harassment, assault and distress.
 - Living environment domain, including outdoor environment (air quality and road traffic accidents) and indoor environment (housing in poor condition such as neglected facades).

Furthermore, the participants were asked about the details of the child's last walking trip, later used as a baseline in the hypothetical scenarios. In detail, they were asked if the child travelled accompanied or unaccompanied and, if accompanied, the relationship the companion had with the child; the trip purpose, mode of travel (if different from walking), travel time, if the child crossed a busy street and the main reasons for them for travelling (un)accompanied.

4. 2. 2. Statistical and discrete choice theory

Quantitative methods, given their deductive nature, offer a range of techniques to evaluate the effects of an individual or a group of attributes on children's walking trips. The first method used was rating scales, aiming to measure the relevance of each attribute, followed by a stated preference⁷ discrete choice experiment designed to understand the effect of a combination of attributes. The third method was a question that sought to verify the modelled preferences for combined attributes—and the fourth method was a rank of the relative order of the attributes in a choice situation. Rating scale methods uses descriptive statistics and test of hypothesis to analyse and contrast the results. The stated preference experiment and the ranking can be analysed using well known discrete choice methods. Finally, the verification task can be analysed using general statistics.

Descriptive statistics and test of hypothesis

The rating scales and the ranking variables are ordinal, as they reflect the participant order of preference for each studied attribute. Due to the nature of the ordinal variables, it is practically impossible to know the distance between intervals (e.g., most comfortable, very uncomfortable) and the statistical distributions of the variables (Svensson, 2001). Therefore, the analyst requires descriptors such as mode, median, interquartile range, frequency tables and charts, and non-parametric tests of hypothesis to analyse and interpret the data.

The tests of hypothesis can determine if the collected data is statistically different for studied groups. Kruskal Wallis H tests if the medians or mean rank of a depending variable (i.e., attributes) of a group of independent variables (e.g., female or male participants) are statistically and significantly

⁷ Discrete choice experiments usually have two forms (Louviere *et al.*, 2000); revealed preferences (RP) that observe actual choices (e.g., commuting by car instead of on public transport) and stated preferences (SP) that generate data from hypothetical choices (e.g., participants had to choose if they prefer to commute by car or a new public transport service which may be available in the future).

different. To calculate the H statistic, the analyst needs to order the data from smallest to largest, rank the ordered values and sum each rank value to each subgroup element. These calculated values correspond to R_i in the equation:

$$H = \frac{12}{N(N+1)} \sum_{i=1}^j \frac{R_i^2}{n_i} - 3(N+1) \quad (1)$$

Where N is the total number of observations, j the total number of subgroups, and n_i the number of elements in s subgroup i . If the assumptions of the test are satisfied⁸, the obtained H value is tested against the χ^2 distributions for $k-1$ degrees of freedom (i.e., number of different elements in a group minus one). If $p > 0.05$, there is no significant statistical evidence to reject the null hypothesis of a different median for the studied group with a 95% of confidence.

To test if two samples (i.e., groups) are independent, the analyst can use the Pearson χ^2 test after the acceptance of two assumptions⁹. This test is calculated as:

$$\chi^2 = \sum_{i=1}^n \frac{(O_i - E_i)^2}{E_i} \quad (2)$$

With O_i is equal to number of observations collected for group i (i.e., observed frequency); E_i is the expected number of observations for group i (i.e., expected frequency), and n the number of groups. The obtained value is tested against the χ^2 distribution for $k-1$ degrees of freedom. If $p > 0.05$, the null hypothesis is not rejected, hence the measures (e.g., response to a rating scale task) are significantly independent of the studied groups with a 95% of confidence.

Discrete choice models

Based in the random utility theory (Domencich and McFadden 1975; Williams 1977), discrete choice modelling methods aim to find the probability of an

⁸ The Kruskal Wallis test have four assumptions (Lund Research, 2018): (i) the dependant variable is ordinal or continuous, (ii) the independent variable categories are unrelated, (iii) the observations in each group are independent, and (iv) the distribution of each group has a similar shape (i.e., variability).

⁹ The Pearson χ^2 test have two assumptions (ibid.): (i) the dependant variable is ordinal or continuous, and (ii) the categorical variables are independent.

individual of choosing an option (i.e., alternative) from a range of discrete alternatives as a function of the relative attraction of that alternative and their sociodemographic characteristics. These models assume that (Louviere *et al.*, 2000; Ortúzar and Willumsen 2011):

- (1) The individuals q of a given homogeneous population are utility maximisers, have perfect information about the alternatives and will rationally choose the alternative that gives them the higher utility U_{iq} (i.e., preferred option).
- (2) The individual and the alternatives have a collection of attributes X . Additionally, the available alternatives are part of a set $A=\{A_1...A_i...A_N\}$, where an individual q will face $A(q)\in A$ of alternatives available for them.
- (3) Each available alternative A_i for an individual q has an associated utility U_{iq} .
- (4) The individual q will choose the alternative with the maximum utility.

As the modeller is an external observer of the individuals' choice experience, s/he can only know a part of the previous attributes of the system; therefore, the utility can be assumed to be represented by the following equation (Louviere *et al.*, 2000; Ortúzar and Willumsen, 2011):

$$U_{iq} = V_{iq} + \varepsilon_{iq} \quad (3)$$

In which (i) V_{iq} is the systematic or representative part (function of the measurable attributes x), and (ii) ε_{iq} is the random component part, reflecting idiosyncrasies and particularities of the individuals, the choice task and the errors made by the modeller. The systematic part of the utility is usually represented as a linear function as follows:

$$V_{iq} = \sum_k \theta_{ki} x_{kqi} \quad (4)$$

Where θ_{ki} are the utility parameters (i.e., marginal utility) of the k attribute of the i alternative; and x_{kqi} are the corresponding attributes for the q individual. Moreover, and related to the previous assumption (4), an individual will choose the A_i only if (Louviere *et al.*, 2000; Ortúzar and Willumsen, 2011):

$$U_{iq} \geq U_{jq}, \forall j \in A(q) \quad (5)$$

Transformed by the previous equations in:

$$V_{iq} - V_{jq} \geq \varepsilon_{iq} - \varepsilon_{jq} \quad (6)$$

Therefore, the probability of choosing alternative i becomes:

$$P_{iq} = \text{Prob}\{\varepsilon_{iq} \leq \varepsilon_{iq} + (V_{iq} - V_{jq}), \forall j \in A(q)\} \quad (7)$$

Where ε has a distribution unknown to the modeller. Considering the residuals of a certain distribution $f(\varepsilon)=f(\varepsilon_1, \dots, \varepsilon_N)$, a general expression of the P_{iq} become:

$$P_{iq} = \int f(\varepsilon) d\varepsilon \quad (8)$$

Different assumptions of the distributions of ε can generate different discrete choice models such as the MNL model which is described in the next section.

Multinomial logit models

The multinomial logit model (MNL) assumes that ε_{iq} distributes independently and identically (IID) Gumbel (mean zero and variance σ), and the probability that an individual q chooses the alternative i is given by (McFadden, 1974; Ortúzar and Willumsen, 2011):

$$P_{iq} = \frac{e^{\lambda V_{iq}}}{\sum_{j \in A(q)} e^{\lambda V_{jq}}} \quad (9)$$

Where P_{iq} is a probability to be estimated in the model (i.e., the dependant variable), and $\lambda=\pi/(\sigma\sqrt{6})$ is the scale factor related to the standard deviation with distribution IID Gumbel. As λ cannot be estimated separately from the parameters θ of a model, it is normalised to the value of one.

To estimate MNL models as a function of the characteristics of an individual (e.g., age, gender) or context (e.g., neighbourhood), models could be parametrised as coefficients in the utility parameters using systematic taste variations (Ortúzar and Willumsen, 2011):

$$\theta_{k iq} = \theta_{ki} + \sum_m \theta_{kimq} x_{m,q} \quad (10)$$

With m equal to the characteristic or context to be modelled for the k th attribute.

Mixed logit models

Discrete choice models could be utilised to estimate assumptions such as correlations between alternatives or random taste variations by using other model structure that overcome the limitations of MNL models (Louviere *et al.*, 2000). Mixed Logit (MMNL) structures permit the estimation of more complex and flexible models considering the correlation between alternatives or between responses of a given individual (i.e., pseudo-panel effect) among others. Nonetheless, as Train (2009) suggests, these models are more difficult to estimate and interpret.

A MMNL structure could be applied to any model by expressing the choice probabilities as an integral of the Logit probabilities over a distribution of parameters as (Ortúzar and Willumsen, 2011):

$$P_{iq} = \int L_{iq}(\theta) f(\theta) d\theta \quad (11)$$

Where $L_{iq}(\theta)$ represents a typical MNL probability for a set of parameters θ with a density function $f(\theta)$ (i.e., the mixing distribution). As these probabilities are a “more flexible version” of MNL models, they can be obtained by fixing the density function $f(\theta)$ of the estimated parameters $\theta=b$, and zero for $\theta \neq b$.

The MMNL models could be applied in two forms: Error Components (EC) or Random Coefficients (RC). The EC form includes two error terms in the utility function U_{iqt} (Ortúzar and Willumsen, 2011): the ε_{iqt} error with traditional IID Gumbel distribution, thus allowing the estimation of the MNL probabilities; and η_{iqt} with a distribution to be chosen by the modeller accordingly to the phenomena. Consequently, the utility function is given by:

$$U_{iqt} = V_{iqt} + \eta_{iqt} Y_{iqt} + \varepsilon_{iqt} \quad (12)$$

With Y_{iqt} representing a set of unknown attributes for individual q in choice situations $t=1, \dots, T$.

The random coefficients (RC) form makes explicit that the marginal utility parameters (θ) are different for each individual in the sample (i.e., θ_q), in a utility function given by:

$$U_{iqt} = \theta_q X_{iqt} + \varepsilon_{iqt} \quad (13)$$

Where the parameters θ vary over each q individual with a density of $f(\theta)$.

The previous error forms are equivalent; for instance, it is possible to obtain an EC structure from the RC structure by decomposing θ_q to its mean (b) and deviations (s_q) as (Ortúzar and Willumsen, 2011):

$$U_{iqt} = bX_{iqt} + s_q X_{iqt} + \varepsilon_{iqt} \quad (14)$$

Where the EC structure is defined by $X_{iqt} = Y_{iqt}$

Estimation of discrete choice models

The most commonly used method of estimation of discrete choice models is the maximum loglikelihood. As described by Ortúzar and Willumsen (2011) this method is based on the idea that “a particular sample has a higher probability of having been drawn from a certain population than from others” (pp.275). Consequently, the maximum loglikelihood method will estimate a set of parameters that reproduce the observed sample most often.

Given a sample, the likelihood function maybe written as (Ortúzar and Willumsen, 2011):

$$L(\theta) = \prod_{q=1}^Q \prod_{A_i \in A(q)} P_{iq}^{g_{iq}} \quad (15)$$

Where $g_{iq}=1$ if A_i is the chosen alternative of q , and $g_{iq}=0$ in any other case.

To maximise $L(\theta)$, it is first partially differentiated with respect to the parameters θ , equating its derivate to zero, to later obtain a more manageable structure which have the same optimum θ^* ; $l(\theta)$, the natural logarithm of $L(\theta)$. Therefore, equation (11) could be rewritten as:

$$l(\theta) = \log L(\theta) = \sum_{q=1}^Q \sum_{A_i \in A(q)} g_{iq} \log (P_{iq}) \quad (16)$$

The estimated parameters θ^* are asymptotically distributed $N(\theta, S^2)$, with:

$$S^2 = - \left(E \left(\frac{\partial^2 l(\theta)}{\partial \theta^2} \right) \right)^{-1} \quad (17)$$

Exploded logit

Ranking data can be analysed using logit probabilities (Train, 2002). By converting the ranking into implicit choices, the analyst can ‘explode’ the ranking into several choice observations. For instance, an individual rank a set of alternatives (A, B, C and D) like C, D, A and B. The probability of that rank could be re-written as (Train, 2002):

$$\text{Prob}(C, D, A, B) = \frac{e^{V_C}}{\sum_{j=A,B,C,D} e^{V_j}} \frac{e^{V_D}}{\sum_{j=A,B,D} e^{V_j}} \frac{e^{V_A}}{\sum_{j=A,B} e^{V_j}} \quad (18)$$

Which can be modelled as a MNL model (Ortúzar and Willumsen, 2011).

Modelling outputs/results

By the application of the previous estimation procedures, the obtained results are the utility parameters, their t-test values and measures of a model goodness of fit (Louviere *et al.*, 2000).

Utility parameters and t-test values

By estimating¹⁰ the utility V_{ik}^* , an estimate of the θ_{ik}^* is obtained. This can be interpreted as the weight of the k th parameter of alternative i . Given all estimated θ^* for alternative i , and all the attributes X of individual q , the utility V_{ik}^* can be calculated using equation (4).

To test if a parameter θ_{ik}^* is significantly different from zero, t-test (analogous to a similar test used in regression analysis, Louviere *et al.*, 2000) could be used to contrast it with the null hypothesis $\theta_{ik}^*=0$. In practice, a t-test value of θ_{ik}^* larger than 1.65 will reject the null hypothesis with 90% confidence level (1.96 for 95% of confidence level), therefore, accepting that the parameter θ_{ik}^* has a significant effect in the model.

Ortúzar and Willumsen (2011) suggest a procedure to interpret the values of the estimated θ^* parameters and their t-test values. It first requires the division of those parameters in two groups; (i) **policy parameters**, which are theoretically relevant and/or essential for forecasting probabilities with

¹⁰ Each estimated parameter is denoted by the superscripts (*).

the models, and (ii) **other parameters**, which may be expendable for policy evaluation (e.g., gender), or if there is not enough theoretical background to support its inclusion or rejection. In consequence, it is recommended that policy and other parameters with correct sign should be included in the models (see Table 4.3) even if the policy parameters are not significant (t-test cannot reject the null hypothesis). However, if other parameters are not significant, the inclusion of them in the models could be rejected. Furthermore, policy parameters with the wrong sign, either significant or not, require re-estimation of the models; meanwhile, the analogous issue with other variables can be rejected in the model.

Table 4.3. Selection of variables.

		Policy parameters	Other parameters
Correct sign	Significant	Include	Include
	Not significant	Include	May reject
Wrong sign	Significant	Problem	Reject
	Not significant	Problem	Reject

Source: Adapted from Ortúzar and Willumsen (2011)

Likelihood ratio test (LR)

To compare two models, or evaluate the contribution of a set of parameters, the LR test could be used. Given a base model with estimated parameters θ_r^* and a loglikelihood $l(\theta_r^*)$, the estimation of a new model (i.e., the restricted version of the base model) will include (sub)sets of parameters θ^* and a resulting $l(\theta^*)$. To test if the contribution of the new parameters is zero, the LR statistic is obtained from (Ortúzar and Willumsen, 2011):

$$LR = -2\{l(\theta_r^*) - l(\theta^*)\} \quad (19)$$

Which asymptotically distributes χ^2 , with r equals the number of restrictions to the parameters (i.e., degrees of freedom). Rejecting the null hypothesis will imply that the new version of the model is preferred to the restricted version; in other words, the restricted version is a worst structure of the model.

A special version of the LR test verify if an estimated model is superior to an equally likely model, that is, a model with all parameters equal to zero. In this case, the null hypothesis states that all estimated parameters are $\theta^*=0$, with a LR obtained from:

$$LR = -2\{l(0) - l(\theta^*)\} \quad (20)$$

Where the degrees of freedom k are equal to the number of estimated parameters θ^* , rejecting the null hypothesis if LR is larger than the critical value of $\chi^2(k, 95\%)$.

Likelihood ratio index (ρ^2)

Analogous to the R^2 index in regression models, the ρ^2 statistic could be estimated as (Louviere *et al.*, 2000):

$$\rho^2 = 1 - \frac{l(\theta^*)}{l(0)} \quad (21)$$

The statistic ρ^2 lies between the values 0 (no fit model) and 1 (perfect model fit). Most common values range between 0.2 to 0.4 are considered good model fits and equivalent to R^2 of 0.7 to 0.9 in regression models (Louviere *et al.*, 2000; Ortúzar and Willumsen, 2011). An improved version of this index ($\bar{\rho}^2$) is proposed by Ben-Akiva and Swait (1986) by considering the degrees of freedom of a model (i.e., the number of estimated parameters) obtained from:

$$\bar{\rho}^2 = 1 - \frac{l(\theta^*) - K}{l(0)} \quad (22)$$

With K equal to the number of parameters in a model.

Average Marginal Effects (AME)

The marginal effect is an inferential statistic (Onukwugha *et al.*, 2015) that estimates the rate of change of a dependant variable (i.e., alternative) relative to the change of an independent variable (i.e., attribute). As Hensher *et al.* (2005) describe, marginal effects can be interpreted as the “change in probability given a unit change in a variable, “ceteris paribus” (pp. 393), and, for an MNL model, is then given by:

$$M_{X_{ikq}}^{P_{iq}} = \frac{\partial P_{iq}}{\partial X_{ikq}} \quad (23)$$

Where X_{ikq} is the k th attribute for the alternative i and individual q . The average marginal effect (AME) estimate is then the result of estimating the marginal effect for each observation, and then averaging this results (Onukwugha *et al.*, 2015).

First Preference Recovery (FPR)

Also named ‘prediction of success’ (Louviere *et al.*, 2000), the FPR measures the number of times an individual observation q in the dataset chooses the alternative with the highest utility, divided by the number of individuals Q in the sample. The FPR value can be compared with the chance recovery (CR) and the expected FPR values as (Ortúzar and Willumsen, 2011):

$$CR = \frac{\sum_q (\frac{1}{N_q})}{Q} \quad (24)$$

$$E(FPR) = \frac{\sum_q P_q}{Q}$$

Where N_q and P_q are the choice set and the highest probability (i.e., best alternative) for of individual q , respectively. To interpret these values, it is suggested that the values:

FPR $\approx$ CR $\approx$ E(FPR) (i.e., all values are close), then the model is reasonable but uninformative,

FPR $\approx$ E(FPR) $>$ CR (i.e., FPR and E(FPR) are close and larger than CR), then the model is reasonable and informative, and

FPR $\neq$ E(FPR) (i.e., FPR and E(FPR) are not similar), then the model should be rejected.

4. 2. 3. Design of the questionnaire

The questionnaire comprises a set of questions to explore participant preferences for selected attributes of fictional street environments. The street environments were elaborated using a set of attributes and attribute levels to represent selected features of the physical and the social environment (Table 4.2). The relevance of those attributes are weighted and compared through different types of questions, allowing for a comprehensive understanding of the effects on children’s unaccompanied walking trips. The final questionnaire

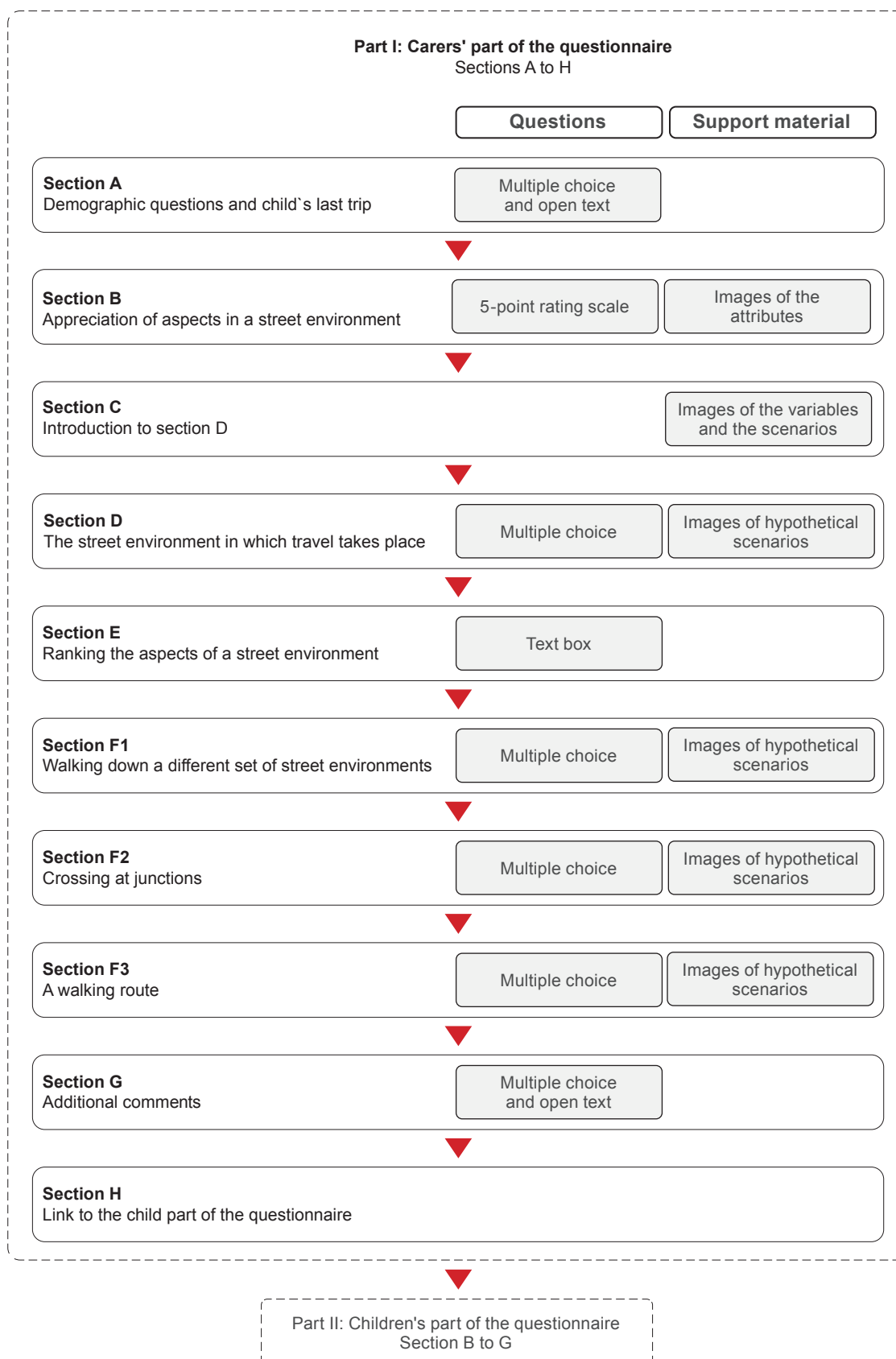


Figure 4.7. Flowchart of the questionnaire.

Source: author's own

had eight sections (from A to H), following the order shown in Figure 4.7. The questionnaire was divided into two parts, the first directed to carer participants and the second to children, which may be assisted by a carer if needed.

Each section is described below.

Section A: Demographic questions and child's last trip. With multiple choice and open text questions, this section inquired about the participant socio-demographic characteristics and provides information about the child's last walking trip. This section was shown only to carers.

Section B: Appreciation of aspects in a street environment. . As shown in the example of Figure 4.8, a 5-point rating scale was used to evaluate how comfortable participants feel to let their child walk unaccompanied through a given area with specific conditions. Each question in this section inquired about one attribute level. The scale used smiley faces to represent the studied levels, from most happy to most unhappy, to relate to the child attitudes.

(2) Appreciation of the aspects in an environment

Imagine that your child needs to go to a **new school**, within walking distance during daytime.

We will show you images of the aspects of a street environment.

How **comfortable** do you feel letting your **child walk unaccompanied** along a street with:

Signalised crossing



Very comfortable


☐

Fairly comfortable


☐

Neutral


☐

Fairly uncomfortable


☐

Very uncomfortable


☐

I don't know


☐

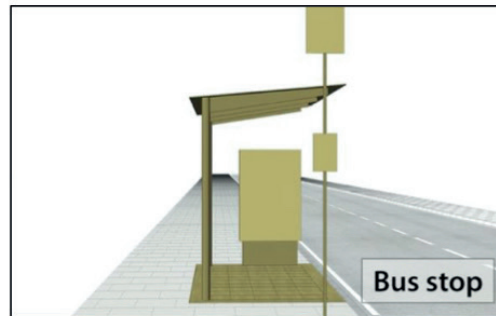
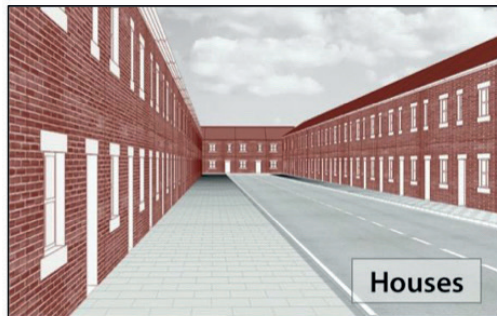
Figure 4.8. Example of the questionnaire's section B.

Source: author's own

Section C: Introduction to the next section. Each feature of the environment shown in the previous section was depicted independently. This section (see Figure 4.9) prepared the participants to see multiple attributes combined in a fictional environment, as will be shown in Section D.

Introduction to the next section

Previously you were shown several **individual** aspects of a given street,
For example,



For the next questions, you will see **streets as a whole**.



Figure 4.9. The questionnaire's Section C.

Source: author's own

Section D: The street environment in which travel takes place. By using a stated preference task, the participants were asked to choose, between two fictional streets, the option they would prefer for their child to walk unaccompanied (see Figure 4.10). If the participants answered “both streets are acceptable,” they were asked for their preference between one of the two streets.

(3) The street environment in which travel takes place

Imagine that your child needs to go to a **new school**, within walking distance during daytime.

There are alternative routes so her journey could be made in different types of streets.

You will see four pairs of street environments and **none** involves crossing the road.

First pair

Which street would you prefer your child to **walk down unaccompanied**?

Please select one option

	
Physical aspects in the image (a) Houses that look like the image above (b) Dirty footpaths (c) A bus stop and a playground (d) A variety of shops and a pub (e) Zebra crossing Street A	Physical aspects in the image (a) Houses that look like the image above. (b) Well-kept footpaths (c) A playground (d) No shops or pubs (e) Signalised crossing Street B

☐ Street **A**

☐ Street **B**

☐ **Both** streets are acceptable

☐ **Neither** of the streets are acceptable

☐ **I don't know**

Figure 4.10. Example of the questionnaire's section D.

Source: author's own

Section E: Ranking the aspects of a street environment. Participants were asked to rank the attributes shown in the previous section in order of importance for their child's unaccompanied walking trip. This task shows all the included attributes at the same time (see Figure 4.11), with a brief description of the levels included in each attribute.

Section E - Ranking the aspects of a street environment

When you chose a street for your child to walk down unaccompanied, how important were the aspects of the street environment?

Please rank the following aspects in order of importance from 1 (most important aspect) to 5 (least important aspect):

- ☐ Houses
- ☐ Quality of footpaths (well-kept, dirty)
- ☐ Environment (a playground, a bus stop)
- ☐ Commerce (a variety of shops, a pub)
- ☐ Pedestrian crossing (signalised crossing, zebra crossing)

Figure 4.11. Example of the questionnaire's section E.

Source: author's own

Section F1: Walking down a different set of street environments. Using a stated preference task like in section D, the participants evaluated two hypothetical scenarios of a generic street environment (see Figure 4.12). In this case, the hypothetical scenarios were generated from a subset of common attributes from London and Santiago, presented to the respondents in both cities to understand if their underlying preferences were similar (i.e., generic city environment).

(5) Walking down a different set of street environments

This time the child has **a different set of alternative routes** to go to a new school, within walking distance during daytime.

None of the routes involve crossing the road.

Again, you will see four pairs of street environments.

First pair

Which street would you prefer your child to **walk down unaccompanied**?

Please select one option

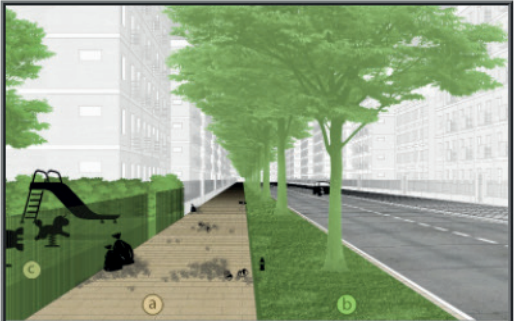
 Physical aspects in the image (a) Well-kept footpaths (b) Trees (c) A bus stop and a playground With the following Social aspects (d) Teenagers walking Street A	 Physical aspects in the image (a) Dirty footpaths (b) Trees and grass (c) A playground With the following Social aspects (d) Adults chatting Street B
☐ Street A ☐ Street B ☐ Both streets are acceptable ☐ Neither of the streets are acceptable ☐ I don't know	

Figure 4.12. Example of the questionnaire's section F1.

Source: author's own

Section F2: Crossing at junctions. As an extension of section F1, the participants were given a stated preference task in which they evaluated two fictional scenarios of a road junction (i.e., street crossing) in a generic street environment (see Figure 4.13). Each fictional pair of street junctions consisted in a set of attributes observed in London and Santiago.

(6) Crossing at junctions

So now we would like to get your views on different types of pedestrian junctions.

Imagine that your child has a set of alternative routes with **different types of crossing facilities** for a journey to a new school, within walking distance during daytime.

This time we will only present you with two pairs of choices.

First pair

Which crossing would you prefer your child to **cross unaccompanied**?

Please select one option

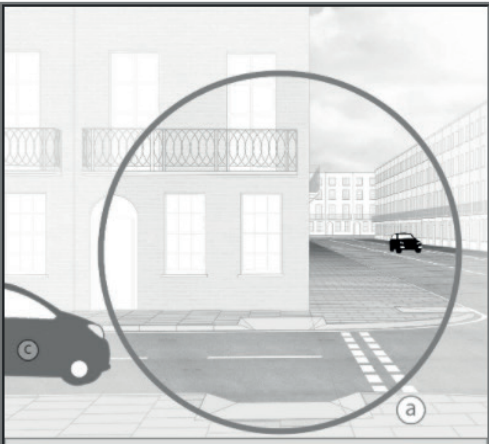
	
(b) One way traffic in a two-lane road 	(b) One way traffic in a two-lane road 
Physical aspects in the image (a) Zebra crossing (b) One way traffic in a two-lane road (c) CAR and BUS traffic Crossing A	Physical aspects in the image (a) Dropped kerbs (informal crossing) (b) One way traffic in a two-lane road (c) CAR traffic Crossing B
☐ Crossing A	☐ Crossing B
☐ Both crossings are acceptable	☐ Neither of the crossings are acceptable
☐ I don't know	

Figure 4.13. Example of the questionnaire's section F2.

Source: author's own

Section F3: A walking route. Participants were shown a chosen street link from section F1 and a junction from section F2 as part of a walking route (see Figure 4.14) and asked to decide if they would let the child walk unaccompanied on that route. This task is shown twice with different street links and junctions.

Section F3 - A street environment in which travel takes place

Finally, we would like to show you two pairs of routes that have a street and a crossing, and ask you to tell us if you would let your child walk unaccompanied.

Again, imagine that your child goes to a new school, within walking distance during daytime.

First pair

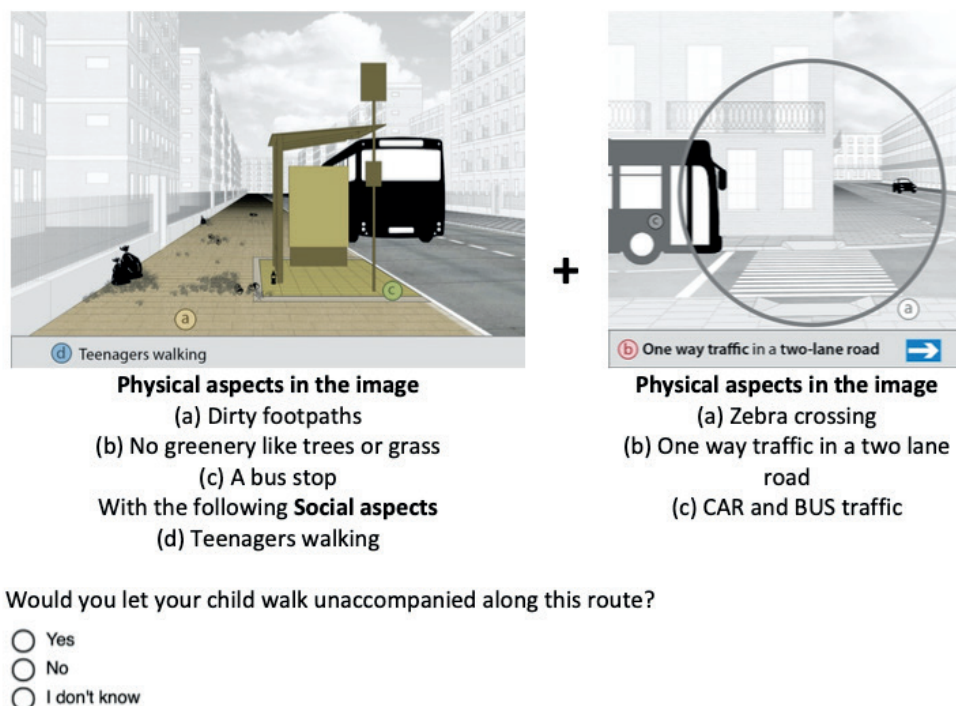


Figure 4.14. Example of the questionnaire's section F3.

Source: author's own

Section G: Additional comments. Open questions enquired about the opinion of participant regarding the previous tasks.

Section H: Link to the child part of the questionnaire. This section provided instructions to the carer participant on how pass on the questionnaire to the child participant (see Figure 4.15). Additionally, carers were asked to stay and support the child, in case he or she had difficulties reading or answering the questions.

Thank for completing this part of the questionnaire!

Now we would like to know the views of **your child aged 12** about the same questions.

Please invite your girl to answer the following questions.

Please stay with her at least for the first question.

If your child is not available now, you can return to the questionnaire later. To do so, just click the link of the questionnaire in the same computer/tablet/smartphone and web browser.

If your child has difficulties reading or answering questions, **you can help her** by explaining the questions and the images.

Figure 4.15. Example of the questionnaire's section H.

Source: author's own

Most of the questions in the questionnaire used images to exemplify street environments. The following section will refer to the design of those images, which were central to illustrating the selected street attributes to child and carer participants.

Design of the questionnaire's images

The images were drawn using computer-aided design and drafting software AutoCAD 2017 and raster graphics editor Photoshop version 22.5. The baseline image was based on photographs of an typical street¹¹ in London and Santiago (see Figures 4.16 and 4.17), as appropriate, and was later “deconstructed”, deleting “noise” (e.g., shadows) and adding layers containing relevant information (e.g., aspects of the environment).



Figure 4.16. London's street environment photographs and baseline images.

Source: author's own

¹¹ A fairly plain (i.e., uncluttered) street was picked to add different attributes on it, and measure the impact of those features.



Figure 4.17. Santiago's street environment photographs and baseline images.

Source: author's own

The researcher tested the images' accuracy and "legibility" in the pilot stage (see section 4.2.4). After the pilot, these were amended so that street images included only physical attributes, as children younger than 12 misinterpreted social aspects such as the activities performed by strangers. Social aspect attributes were represented only in the text boxes, as shown in Figure 4.18.

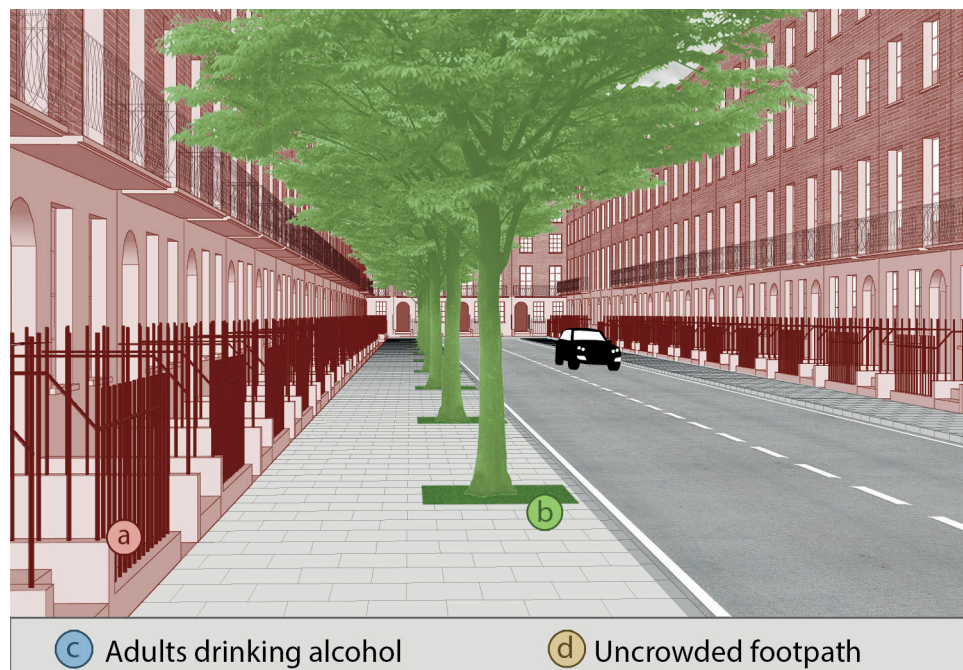


Figure 4.18. Example of an image with social aspects.

Source: author's own

Stated preference, rating and ranking task design

The number of questions in a **stated preference** (SP) experiment is usually determined by the number of attributes, the attribute levels and the number of

choice situations (i.e. pairwise choices) (see Louviere *et al.*, 2000; Ortúzar *et al.*, 2011). The **stated preference** task in section D (first experiment) covers three attributes particular to London, three particular to Santiago, and six common to both cities (Table 4.4). As the total number of attributes exceeds the recommended number of variables in the literature (Hensher, 2006), they were divided into two groups with five attributes for each respondent. Additionally, one of these attributes is common to every choice situation and might be used to create a joint model (Ortúzar and Willumsen, 2011). The **stated preference** task in sections F1 (second SP experiment) and F2 (third SP experiment) have five and three attributes, respectively.

Table 4.4. Number of questions and attributes inquired in the questionnaire.

Section	Type of question	Number of questions	Set (Block number)	Inquired attributes (number of levels)	
				London	Santiago
D	Stated preferences	4	Set A (1 to 3)	Facades (2)	Facades (2)
				Quality of footpaths (2)	Quality of footpaths (4)
				Urban amenities (4)	Urban amenities (4)
				Facilities (4)	Facilities (4)
				Crossings (2)	Parked vehicles (2)
		6	Set B (4 to 6)	Facades (2)	Facades (2)
				Greenery (4)	Greenery (4)
				Strangers' activities (4)	Strangers' activities (4)
				Strangers' age (4)	Strangers' age (4)
				Density of people (2)	Strangers' gender (2)
F1	Stated preferences	4	1 to 4	Quality of footpaths (2)	
				Greenery (4)	
				Urban amenities (4)	
				Strangers' activities (4)	
				Strangers' age (4)	
F2	Stated preferences	2	1 to 4	Crossings (2)	
				Vehicle lanes direction (2)	
				Traffic composition (2)	
F3	Stated preferences	2	-	Selection based on F1 and F2	
Total number of questions:		12 / 14			

Source: author's own

Each possible combination of attributes (i.e., full factorial design, see Louviere *et al.*, 2000) for section D's task has 81,920 ($2^3 4^2 \times 2^3 4^2$) choice situations in the case of London and 131,072 ($2^2 4^3 \times 2^2 4^3$) in the case of Santiago. The same estimation for section F1 resulted in a of 262,144 ($2^1 4^4 \times 2^1 4^4$) combinations, and 64 ($2^3 \times 2^3$) for section F2. The resulting choice situations exceed what a participant can usually respond in a questionnaire, and includes dominant or unrealistic choice situations (Ortúzar and Willumsen, 2011). The literature suggests the use of smaller and more informative designs by selecting a subset of all the possible combinations, like those including all main effects (which usually explain 70-90% of the variance, see Louviere *et al.*, 2000, p. 94). If the analyst has an idea of the estimates of the attributes (i.e., priors), scholars recommend the use of **efficient designs**; nevertheless, if no prior

information exists, they suggest the use of **orthogonal designs** (Rose and Bliemer, 2013).

To the researcher's knowledge, no other studies have generated estimates of the effect of the built and social environment attributes on children's trips; therefore, the first version of sections D, F1 and F2 of the questionnaire used **orthogonal designs**. These designs require the number of attributes and attribute levels to generate a subset of independent choice situations¹² for an optimum of nine or ten pairwise choices (Hensher *et al.*, 2001; Caussade *et al.*, 2005; Hensher, 2006). Orthogonal designs ensure attribute level balance by showing the attributes and attribute levels the same number of times in the stated preference exercise. Attribute level balance is determined as the minimum common multiple between the mix of attribute and attribute levels (Hensher *et al.*, 2005; ChoiceMetrics, 2018). Designs with numerous choice situations can split the choice situations into blocks¹³ to reduce the choice tasks to a number that participants can manage.

The orthogonal design for section D resulted in 10 and 12 independent choice situations, for the set of attributes A and B, respectively. As the number of choice situations is larger than what scholars recommend, a block design was used. The final design has six blocks with four pairwise; three blocks for attributes set A and B (see Table 4.4) to assure attribute level balance. Consequently, each participant faced 4 pairwise choices (i.e., scenarios). After a similar process, section F1 explored five attributes with two to four levels, resulting in sixteen independent choice situations. Block designing, in this case, resulted in four blocks; therefore, participants faced four pairwise choices (i.e., scenarios). Section F2, with three attributes of two levels each, had a minimum of four independent choice situations. A block design applied to section F2 task resulted in four blocks with two pairwise choices¹⁴; each participant was faced with 2 scenarios. The designs of the above tasks, shown in Appendix 10.5, were obtained from the software NGene version 1.1.1.

After collecting enough data for developing preliminary models in the pilot stage, the researcher generated an efficient design for sections D, F1 and

12 The minimum number of independent choice situations is given by $K/(J-1)$ with K equal to the number of attributes (plus constants), and J equal to the number of alternatives (ChoiceMetrics, 2018).

13 The blocking process splits the number of choice situations by segmenting the design into smaller "blocks" (Hensher *et al.*, 2005; Ortúzar and Willumsen, 2011; ChoiceMetrics, 2018). The segmentation picks one attribute that is common to all situations and orthogonally cofounded it with all the other attributes to generate a design that is not correlated within attributes. Each block has a lower number of choice situations that satisfies attribute level balance and orthogonality.

14 The initial attributes set in section F2 included 4 attributes of 2 levels each, resulting in the design of 4 blocks. However, after the pilot experience, one of the attributes was dropped. The final studied set has 3 attributes.

F2 of the questionnaire using the software NGene. This type of design generates a choice experiment that minimises the asymptotic standard errors, thus obtaining larger t-ratios for the model parameters (Rose and Bliemer, 2007). Efficient designs are often preferred because they reduce the sample size needed to achieve statistically significant parameters. These designs require the specification of the objective model and an a priori value for those parameters (Huber & Zwerina, 1996); however, even if those a priori (or prior) values are misspecified, these types of design still result in better models.

The most common measure to evaluate different efficient designs is the D-error, which is minimised by combining the attributes and attribute levels in different ways (Ortúzar and Willumsen, 2011).

After a pilot stage (see next section), an initial MNL mode, with the structure shown in section 4.4.2, were estimated for sections D, F1 and F2 (see Table 4.5). The efficient designs used the priors obtained in the pilot stage to generate the experimental design, considering the same number of choice situations and blocks as in the orthogonal designs. Utilizing the software NGene version 1.1.1, the efficient design D-error values are shown in Table 4.5. The designs can be seen in Appendix 10.6.

Questionnaires' section F3 **stated preference** task mixed two previously shown cases from section F1 and F2, and participants faced only two scenarios (see Table 4.4).

The **rating** questions (questionnaire's section B) inquired about one attribute level at a time, requiring 36 questions to cover all studied attributes. Participants were shown a selection of the attributes due to the design of section D's blocks, which resulted in a number of question responses in section B being below the limit suggested in the literature (see Table 4.6). Section B has fourteen or sixteen questions, depending on the inquired attributes (i.e., block). The pilot stage (see section 4.2.4) permitted the researcher to evaluate the level of participant fatigue, and adjust the design of the section accordingly

Table 4.5. Parameter priors from modelling the pilot stage dataset and D-error values.

Questionnaire section		D	D	D	D	F1	F2
City		London	London	Santiago	Santiago	Generic city	Generic city
Blocks		1 to 3	4 to 6	1 to 3	4 to 6	1 to 4	1 to 4
D-error		1.01	1.06	1.00	1.14	0.79	1.46
Attribute	Attribute level	Estimate	Estimate	Estimate	Estimate	Estimate	Estimate
Model constant	Neither option	-1.39	-0.14	-1.23	-0.61	1.01	-1.53
Facades	Medium density houses	2.98	0	-	-	-	-
	Low density houses	0	0	-	-	-	-
	Permeable Fences	-	-	0.18	0	-	-
	Closed Fences	-	-	0	0	-	-
Quality of footpaths	Well-kept footpaths	0	-	0	-	0	-
	Dirty footpaths	0	-	-0.25	-	-1.17	-
	Neglect footpaths	-	-	-0.26	-	-	-
	Dirty and neglected footpaths	-	-	-0.51	-	-	-
Greenery	Trees and grass	-	1.74	-	1.26	1.77	-
	Trees	-	1.08	-	0.97	0.96	-
	Grass	-	0.66	-	0.29	0.81	-
	No greenery	-	0	-	0	0	-
Urban amenities	Playground	-0.58	-	-0.2	-	0.71	-
	Bus stop	-2.63	-	1.29	-	0.09	-
	Bus stop and playground	-3.21	-	1.09	-	0.8	-
	No urban amenities	0	-	0	-	0	-
Facilities	Variety of shops	0	-	-	-	-	-
	Pub	-1.73	-	-	-	-	-
	Variety of shops and pub	-0.1	-	-	-	-	-
	School	-	-	0.19	-	-	-
	Local shops	-	-	-0.54	-	-	-
	Off-licence	-	-	-2.29	-	-	-
	No Facilities	0	-	0	-	-	-
Strangers' activities	Chatting	-	0	-	0.19	2.65	-
	Walking	-	-0.2	-	2.26	2.56	-
	Drinking alcohol	-	-1.84	-	0	0	-
	Standing	-	0.58	-	0	2.8	-
Strangers' age	Children	-	0	-	0	0	-
	Teenegers	-	-0.82	-	-1.29	-1.04	-
	Adults	-	0	-	-2.14	-0.83	-
	Elderly people	-	1.2	-	-2.38	-0.59	-
Crossings	Signalised crossing	0	-	-	-	-	-
	Zebra crossing	0	-	-	-	-	0.97
	Dropped kerbs	-	-	-	-	-	0
Parked vehicles	Vehicles Parked on Footpath	-	-	-0.44	-	-	-
	No Parked Vehicles	-	-	0	-	-	-
Density of people	Crowded footpath	-	-0.33	-	-	-	-
	Uncrowded footpath	-	0	-	-	-	-
Strangers' gender	Male (stranger)	-	-	-	0	-	-
	Female (stranger)	-	-	-	0	-	-
Vehicle lanes direction	One-way traffic	-	-	-	-	-	1.29
	Two way traffic	-	-	-	-	-	0
Traffic composition	Car traffic only	-	-	-	-	-	1.44
	Car and bus traffic	-	-	-	-	-	0

Source: author's own

Table 4.6. Number of questions and attributes inquired in the questionnaire.

Section	Type of question	Number of questions	Set (Block number)	Inquired attributes (number of levels)	
				<i>London</i>	<i>Santiago</i>
A	Demographic	13	-	-	-
B	Rating	14	Set A (1 to 3)	Facades (2) Quality of footpaths (2) Urban amenities (4) Facilities (4) Crossings (2)	Facades (2) Quality of footpaths (4) Urban amenities (4) Facilities (4) Parked vehicles (2)
		16	Set B (4 to 6)	Facades (2) Greenery (4) Strangers' activities (4) Strangers' age (4) Density of people (2)	Facades (2) Greenery (4) Strangers' activities (4) Strangers' age (4) Strangers' gender (2)
C	-	0	-	-	-
E	Ranking	1	-	<i>Same as in Section B</i>	
G	Additional comments	3	-	-	-
H	-	0	-	-	-
Total number of questions:		31 / 33			

Source: author's own

The design of the task in section E had one **ranking** type of question in which participants had to order the five attributes showed in section D; consequently, participants had to consider a relatively small subset of all the studied attributes (see Table 4.6).

4. 2. 4. Piloting the questionnaire

Four teachers, two in London and two in Santiago, took part in the pilot stage. Teachers in both cities provided similar comments, including:

- » Phrasing, use of language and vocabulary of instructions and questions must be simple and use plain language, as young or immigrant children may have difficulties understanding what is being asked. The teachers provided detailed feedback on the questionnaire wording.
- » Using colourful images with text descriptions in the questionnaire may help children's comprehension of the inquired attributes.
- » Incorporation in the opening a polite and friendly welcome message addressing children, and detailed instructions explaining carers' role (i.e., support).

Moreover, teachers asserted that children of 8 years old and above should understand the questions and content (i.e., attributes of the street environment), but the questionnaire may be highly complex for younger children. They indicated that some questions, images and text can be confusing and should be adapted to be easy and clear, by using examples and avoiding negative statements. Furthermore, children below that age

rarely travel unaccompanied (see Chapter 3). These issues were tested in the pilot stage involving participants.

The researcher invited colleagues and acquaintances to answer and comment on the questionnaire before the participant pilot stage. They suggested adding a "save and continue" feature, as some participants may feel the questionnaire is too long to answer in one go. Colleagues suggested including a "nothing is important" alternative (see Ortúzar and Willumsen, 2011) to avoid forced choices and modify some repetitive questions. Other recommendations prioritised a questionnaire that feels coherent and natural, design a friendlier experience, modify some instructions and questions to be intelligible, avoid colloquial words and remove typos. Colleges also suggested the "birthday method" to help families with many children decide which child should answer: the one with the closest birthday to the date when the questionnaire was being conducted (Gaziano, 2011).

Two pilots were conducted with carers and children. Nine families participated in the first pilot in Santiago, four living in a deprived area and five from a wealthy area. A total of 9 carers and 12 children completed the questionnaire, with child participants aged between 6 to 16 years old. The main conclusions of those pilot were:

- » Carers showed no sign of fatigue after completing the questionnaire; neither did older children. However, younger participants (6 years old) had trouble comprehending the questions and showed signs of fatigue after the first half of the questionnaire.
- » Participants correctly identified and interpreted the majority of the studied attributes (e.g., *teenagers walking*¹⁵), recognising the similarity of the depicted streets to areas they knew. However, some participants had trouble isolating attributes with complex or confusing designs, or those casting a shadow on the pavement.
- » Children up to 12 years old had trouble correctly interpreting the social aspects, depicted as shadows on the images. In particular, they misinterpreted stranger's activities showed as shadows on the images. The same issue was also observed in some adults.
- » Older children and carers understood all the questions, only requiring clarification in section B, the rating scale questions, because it showed too many attributes at once. Younger children (7 years old and younger) were unable to understand questions in sections B and D by themselves, requiring further instructions and clarifications.

15 The term "*teenagers walking*" was well understood by the participants from London. In the case of Santiago, the employed term was "*asdolescentes caminando*" that also was well understood.

-
- » Carers answering before children resulted in an adequate order as adults had the chance to evaluate the questionnaire complexity and the child capacity to interpret and answer the questions. Furthermore, the order of the participants kept carers engaged with the study while supervising or guiding the child.

Subsequently, only children aged 8 or older were invited to participate, because of the struggles observed in younger children during the pilots and the comments made by teachers. To simplify the images, shadows cast by physical elements were deleted and social aspects were described only in text boxes. To reduce participants' burden answering section B, questions were reorganised into smaller groups of up to 5 questions. As some children may still require assistance to complete the questionnaire, carers, who have a better understanding of the needs and capacities of the child, were asked to provide support if they feel it pertinent.

The second pilot involved 20 families (11 in Santiago, 9 in London). The main outcomes were:

- » Participants perceived the questionnaire neither long nor short, with clear and easy to follow questions, and understood the wording of all the questions; yet some seemed repetitive, wordy and boring.
- » Carers confirmed that a child would be able to answer the questionnaire by themselves, but 8-year-old children may need assistance.
- » Participants accurately identified the attributes represented in the images. Furthermore, carers found it informative to have images of street environments. Two participants found them irrelevant.

The results of the second pilot with the participants provided enough support to have confidence in sending the questionnaire to a wider population. Additionally, the answers of this pilot stage provided enough data for preliminary models used to generate the parameter priors for the efficient design.

4. 3. Data collection and sample characteristics

4. 3. 1. Qualitative stage

The child participants ranged from 6 to 16 years old, covering three stages: (i) the beginning of primary school (6-7 years old), (ii) the period and routines in primary school (8 to 10 years old in London, 8 to 12 in Santiago), and (iii) the promotion to secondary school (11 to 16 years old in London, 13-16 in Santiago). Those ranges were defined in accordance with the available

literature shown in Chapter 2. Carers' age was not restricted to enrich the research, and include single-parents or grandparents and aunts who have caring responsibilities.

Due to the high socio-spatial segregation and the profound inequalities from which Santiago suffers (see Chapter 3), interviewed participants were recruited in two different areas of the city. In the southern periphery, participants inhabited two neighbourhoods (cases A and B, see Figure 4.19) that are located at more than fifteen kilometres from the city centre, and belong to one of the most isolated, poor and stigmatised districts of Santiago: La Pintana. Of these, Case A is classified as a Priority Zone in the current Chilean policies and is the target of programmes of urban upgrade (MINVU, 2012) due to low levels of investment (public and private), the high incidence of drug addiction, domestic violence, teenage pregnancy and other metrics linked to social vulnerability. Case B was in a similar category until the program of urban regeneration *Quiero mi Barrio* ("I love my neighbourhood" in English) finished its implementation in 2012 (MINVU, n. d.). Both neighbourhoods are served only by bus services and, despite that car ownership is increasing, walking still is the predominant means to travel (SECTRA, 2012).

Set in Las Condes, one of the richest municipalities in Chile (see Figure 4.19), Case C is located fourteen kilometres from the historic quarter and just four kilometres from its financial expansion eastward. It is considered a suburban residential area and has been built by private real-estate developers since 1981. Several elite schools, high-quality universities, private clinics, shopping malls and small retail parks¹⁶ are located in this area. This area is served by bus services, has a high car ownership and has good access to a nearby highway and to the subway network (both located less than two kilometres away).

London has a concentration of the most deprived Local Authorities in the country (Noble *et al.*, 2019), is the third in household wealth (Wealth and Assets Survey, 2019) and, as described in Chapter 3, is one of the most diverse cities in the world (Greater London Authority, 2018). To capture that diversity and to explore contrasting urban experiences, the recruitment was not limited to a particular area. In detail, participants lived in the central boroughs of Camden, Islington and Westminster, in the inner London boroughs of Hackney, Hammersmith and Fulham, and Southwark, and in the Outer London boroughs of Barnet, Brent and Waltham Forest (see Figure

16 Similar to "strip malls" in North America, shops are arranged in a row or L-shape with a footpath in front of a parking lot facing a main road.

4.20). Local facilities and transport hubs (i.e., subway stations, bus stops) were within walking distance of the place of residence of most participants. In addition, all the studied areas had parks, greenery, urban furniture and facilities (e.g., shops, restaurants, pubs); meanwhile, central areas also had cultural and artistic venues such as museums and theatres.



Figure 4.19. Santiago study cases.

Source: author's own

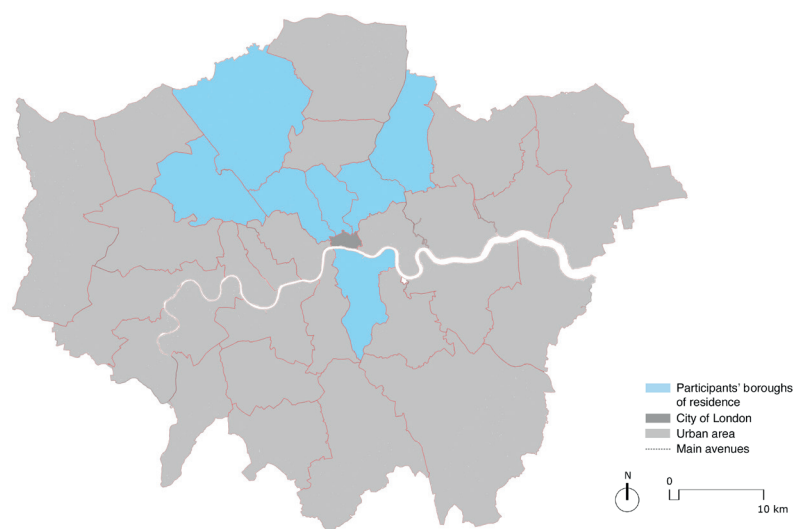


Figure 4.20. London study cases (in blue).

Source: author's own

Five of the recruited families lived in one of the 20% most deprived areas in the UK, and three lived in one of the 50% least deprived areas. Moreover,

four families lived in areas described as one of the 20% with more police-reported crimes such as assaults. Four resided in areas that exhibit one of the higher indexes of low-income households (i.e., income deprivation) and eight in one of the most deprived living environments of the country, with a high number of traffic accidents, poor air quality and inferior indoor environments.

Sample size

Thirty interviews were expected to be completed in each city (Santiago and London). However, that number was expected to change during the data collection; it could increase, if new phenomena continued appearing, or decrease, if empirical saturation emerge earlier (Mason, 2002). The data collection stage ended with 47 interviews in London and 105 in Santiago. The large number reached in Santiago was largely due to the significant differences found between the participants living in wealthy areas and those from deprived neighbourhoods.

Recruitment strategy

Participants were recruited using snowball sampling (Noy, 2008). As pointed out by Geddes *et al.* (2018), this method is used to reach populations that are, for different reasons, inaccessible to the researcher. Carers of children were invited to take part in the study with their child(ren). They were approached through gatekeepers (e.g. institutions such as schools, local leaders from the neighbourhood), social network apps (i.e., Facebook) and potential participants in the researcher's network. As with any recruitment, the final sample may be biased because those keen to take part in the research study or those who are able to access, or capable to use, technologies like mobile phones and social networks may share some characteristics that are not representative of the wider population (Mason, 2002; Browne, 2005; Flowerdew and Martin, 2005). Those who act as gatekeepers also may have a biased social network, over-representing a particular group, and can deliberately select contacts among their acquaintances.

In London, a formal letter, that contained a description of the research, and an invitation addressed to carers were sent to schools, non-academic institutions (e.g. sports clubs, libraries) and social network groups of interest (e.g., Hackney parents). The recruitment was further extended in London through the contact of potential participants obtained from acquaintances and snowball provided by the researcher contacts. Participants in wealthy areas

of Santiago were contacted in a similar form, that is, through institutions and social networks. Meanwhile, in the deprived neighbourhoods in Santiago, two gatekeepers provided contact details of potential participants. Potential participants were contacted through phone calls, mobile messages and social networks messages, and, if agreed, the interviewer arranged the time and place of the interview (e.g. a coffee store, participants home)¹⁷. Gatekeepers were not present during the interviews.

Sample characteristics

One hundred and forty-eight interviews conducted between August and October 2017 in Santiago de Chile (105 participants, 39 families) and between the periods May - July 2018 and March - April 2019 in London¹⁸ (47 participants, 18 families). At least one child and one carer from each household were interviewed, with both parents and siblings participating in some particular cases. In total, sixty-two children were interviewed in Santiago and twenty-five in London (see Table 4.7). That sample was evenly divided between girls and boys in Santiago and covered the different age ranges of the children. In London, more than half of the children who participated were girls and a third of the sample was between eleven and sixteen years old

Table 4.7. Number of interviewed participants.

London			Santiago	
Children	Primary school (6-10 years old)	Secondary school (11-16 years old)	Primary school (6-12 years old)	Secondary school (13-16 years old)
Boy	6	4	19	13
Girl	12	3	23	7
Total children	25		62	
Carers				
Male	8		4	
Female	14		39	
Total carers	22		43	
Total participants	47		105	

Source: author's own

Due to the high inequality and the strong spatial and social segregation of Santiago, participants were recruited in both wealthy and deprived areas. Twenty-one families that participated in the research lived in the deprived periphery and eighteen resided in the wealthy neighbourhoods of Santiago.

¹⁷ In London, the response from the institutions was low (less than 8% response rate) and only a couple of the institutions contacted (10) agreed to share the invitation to families. A better response was obtained by recruiting participants using snowball sampling.

¹⁸ Two more scattered interviews were conducted in September and October.

In general, the households in affluent areas had more children willing to participate and the carers were mostly women. This is consistent with the existing literature that describes Chilean women as the predominant figure of the household; responsible for the care of the children (Staab and Gerhard, 2010).

Among the carers, the majority were the mothers of the child(ren), yet a few of them, in poorer areas, were close relatives (i.e. aunt, cousin). Three fathers in the affluent areas took part in the interviews, occasionally joining the conversation and frequently interrupting mothers or children developing ideas. In deprived areas, male carers did not participate in the interview; even those who were present in the household at the time of the study. However, in one case both carers participated in the interview.

Of the participants living in deprived areas, none of them owned a private vehicle and all lived close to bus stops; with local stores and some facilities (e.g., health centres, shopping centres) at walking distances (i.e., 15 minutes). Contrastingly, all participants residing in wealthy areas owned at least one car and had one or more adults in the household with a driving licence. All households were located at less than two kilometres away from large facilities. Public transport was, in general, within walking distance.

In London, thirteen of the participating families had one child while five had two or more children. In most of the cases, and like the interviews conducted in Santiago, just one carer was interviewed (ten females and four males). In four families two carers were interviewed, answering cooperatively and negotiating their views and responses.

Due to the methods employed to recruit participants (i.e., snowball sampling), the families from London lived in socially diverse neighbourhoods which ranged from the 7th most deprived neighbourhood in London to one of the least deprived (MHCLG, 2019). As the analysis of the additional questions showed, most of them were medium or high-income families and did not suffer from evident forms of deprivation and poverty (e.g., income, basic needs). Three families were below the London median household income (Corporate Research Unit, 2018). Seven families owned a private vehicle (car and motorcycles), with at least one carer holding a driving licence. All households were located close to public transport facilities (e.g. bus stops, train and underground stations).

On average, the interviews lasted 89 minutes and 81 minutes for the households in Santiago and London, respectively. The children's interviews lasted approximately 30 minutes in both cities. Carers in wealthy areas of

Santiago engaged in longer conversations (60 minutes); compared to those from London (40 minutes) and the deprived areas of Santiago (35 minutes). All participants showed a noticeable interest in activities that involved mapping and the discussion of selected images. Younger children required adult assistance to remember the experience of travelling in the city as well as the stages of the mapped route. Older children were completely autonomous and managed to respond and complete the activities without any help.

4. 3. 2. Quantitative stage

The quantitative stage involved children aged 8 to 16 years old as they experience a substantial change in travel behaviour at those ages (see Section 4.3.1).

Sample size

The minimum sample size was obtained using the rule of thumb approach. The rule of thumb is a simple method for estimating the minimum sample size that uses indirect and empirical experience to determine the required number of participants. Authors had suggested a rule of thumb by considering the number of choice tasks, questionnaires versions or empirical evidence (Johnson and Orme, 1998, 2003; Pearmain *et al.*, 1991; Lancsar and Louviere, 2008). Table 4.8 explains each rule of thumb method used and the recommended sample size.

Table 4.8. Sample size by rule of thumb methods.

Author	Sample size	Calculation details
Johnson and Orme (1998, 2003)	250 for sections D and F1 250 for section F2	The sample size must be larger than $500c/(t \times a)$; with t equal to the number of choice task (4 in sections D and F1, 2 in section F2), a the number of alternatives (2 in sections D, F1 and F2) and c the largest number of levels of the studied attributes (4 in sections D and F1, 2 in section F2).
Pearmain et al. (1991)	100 for sections D, F1 and F2	Empirically, 100 participants provide the basis for modelling the preference of a discrete choice design.
Lancsar and Louviere (2008)	120 for sections D, F1 and F2	The number of questionnaires versions (6 as given by the block design) multiplied by 20.
Ortúzar and Willumsen (2011)	150 for section D, 120 for section F1 and 90 for section F2	30 observations for each cell (attribute)

Source: author's own

The minimum sample size was 200 participants, an intermediate value considering the different rule of thumb methods.

Recruitment strategy

The questionnaire was conducted between March and December 2020 (10 months). Considering the high penetration of the internet in Santiago (excepting poorer areas, SUBTEL, 2021) and London (ONS, 2020), the questionnaire was delivered online, accessible from computers, tablets or smartphones, allowing the participants to answer at their convenience. In line with UCL Ethics Protocols, the online platform *Opinio* (www.objectplanet.com/opinio) recorded participants sensitive information (e.g., contact details), while the online platform Qualtrics (www.qualtrics.com) hosted the body of the questionnaire. To prompt participation, the participants had the chance to win a cinema voucher lottery (or equivalent) at the end of the study. Additionally, the institutions that helped to recruit participants received a report with the relevant findings of the quantitative stage.

The recruiting process included families previously contacted in the qualitative stage and new participants recruited online via relevant institutions and gatekeepers. The final questionnaire, ready to accept responses by March 2020, coincided, unfortunately, with the COVID-19 pandemic. Under those challenging circumstances, the snowball sampling proved to be a successful method, recruiting 20 families (i.e., 20 child and 20 carer participants, 22 in Santiago and 18 in London). These responses provided enough data to estimate the first model, generating the parameter priors required for the efficient design. However, it was not possible to reach more families using this method.

In London, March 2020 marked the announcement of the first lockdown, which limited non-essential travel and enforced the closure of schools (except for children of essential workers). Schools re-opened in June 2020. The researcher asked schools and local authorities to contact carers of children with an invitation to take part in the research study (see Appendix 10.7). However, the pandemic put exceptional pressure on school staff, with institutions being reluctant to share the invitation to the parent body until the pandemic ended. More than 550 schools and local authority officers were contacted in London, and 22 institutions agreed on sharing the invitation in September 2020, after seven months since the beginning of the pandemic and the start of the new term. However, only a handful of families took part in the research (see Table 4.9). Due to the low number of responses, the

recruitment of participants was commissioned to a UK-based survey panel company. The researcher shared the online link to the questionnaire with the panel company and informed it about the required number and characteristics of the participants (e.g., children or young people's age). The panel company was only responsible for contacting participants and sharing the link to the questionnaire; it was not able to modify the questionnaire and did not have any form to access the participants' answers. The company asked for the removal of any incentive from the questionnaire as they had their method to reward participants (i.e., cash rewards for a completed survey).

At the end of the data collection, 226 families in London successfully completed the questionnaire.

Table 4.9. Number of families according to the recruitment strategies.

Families recruited via:	London	Santiago
School	5	56
Survey panel	203	-
Recruitment team	-	126
Previous participant (interviews)	18	22
Total	226	204

Source: author's own

In the case of Santiago, the government announced the first lockdown in response to COVID-19 in March 2020. Amid these circumstances, only four out of more than 270 schools contacted in wealthy and deprived parts of the city invited families to participate in the research. In general, schools refusing to help in the recruitment argued concerns with communicating only essential information with carers. Only 56 families contacted via schools took part in the study (see Table 4.9). A recruitment team was hired to reach more participants, especially in deprived areas with a lower participation rate due to digital barriers. The team contacted gatekeepers and participants via social media platforms (e.g., Facebook, WhatsApp) and telephone calls, virtually assisting those unskilled but interested participants. At the end of the data collection, 126 families contacted through this method answered the questionnaire.

Sample characteristics

In Santiago de Chile 204 families and 408 participants completed a questionnaire and in London 226 families and 452 participants did so. Each

family included one child and one adult carer participant¹⁹, distributed across the sample by age, gender and household location characteristics (wealthy or not wealthy areas in Santiago, Index of Multiple Deprivation in London). Details are shown in Table 4.10 for Santiago's sample and Table 4.11 for London's sample.

In Santiago, 26% of the sample participants (106) were families residing in a wealthy area of the city, while 74% (302) were families residing in less accommodated areas (see Table 4.10). The age and gender of the child participants were evenly spread in the sample. The gender of 85% of carers in the sample was female, 14% were male carers and 1% did not declare their gender. Among the carers, 81% were 31 years old or older and 19% were 18 to 30 years old. Subdividing the sample according to children and carers' gender together, 42% of female carer participants responded with boys and 43% with girls. Male carers responders were slightly weighted towards boys (8%) compared with girls (6%). Carers not declaring their gender responded only with girls (1%).

Table 4.10. Santiago questionnaire sample characteristics.

Santiago sample					
Communes	<i>Wealthy</i>		<i>Not wealthy</i>		
Children	Boys	Girls	Boys	Girls	Other
Primary school (8-12 years old)	9 (4%)	10 (5%)	40 (20%)	41 (20%)	-
Secondary school (13-16 years old)	20 (10%)	14 (7%)	33 (16%)	37 (18%)	-
Total children	204				
Carers	Female	Male	Female	Male	Other
18-30 years old	3 (1.5%)	1 (0.5%)	26 (13%)	6 (3%)	2 (1%)
31+ years old	37 (18%)	12 (6%)	107 (52%)	10 (5%)	-
Total carers	204				

Source: author's own

In the case of London, 51% of the participants (230) lived in one of the least deprived areas of the city and 49% (222) in one of the most deprived areas (see Table 4.11). More boys (58%) completed the questionnaire compared to girls (42%). Most of the child participants were secondary school boys. In addition, most of the carer participants were women (53.6%), with a good representation of men (46%) and a sole individual not declaring their gender

19 Only one child or young person per family was invited to answer the questionnaire because the inclusion of another person with similar characteristics (i.e., household attributes) may have added a new error term in the models (e.g., diversity within sibling), which can be confounded with other variables (e.g., age).

(less than 1%). The majority of the carers were 31 years old or older (80.5%) and only a fifth were aged 18 to 30 (19.5%). Combining children and carers' gender, 25% female carers answered with a boy and 28% with a girl. Male carers answered the questionnaire with more boys (32%) than girls (14%). Two hundred and three participants were contacted by the panel and twenty-three were directly recruited. Half of the participants from the panel and 39% of participants directly recruited lived in one of the most deprived areas in London.

Table 4.11. London questionnaire sample characteristics.

London sample						
Index of Multiple Deprivation	<i>Least deprived deciles</i>			<i>Three most deprived deciles</i>		
	Boys	Girls	Other	Boys	Girls	Other
Primary school (8-12 years old)	29 (13%)	19 (8%)	2 (1%)	24 (11%)	26 (12%)	-
Secondary school (13-16 years old)	43 (19%)	22 (10%)	-	33 (15%)	28 (12%)	-
Total children	226					
	Female	Male	Other	Female	Male	Other
18-30 years old	6 (3%)	14 (6%)	-	15 (6.6%)	9 (4%)	-
31+ years old	52 (23%)	12 (19%)	-	107 (21%)	10 (17%)	1 (0.4%)
Total carers	226					

Source: author's own

Regarding the last walking trip, 51% of the children in Santiago travelled accompanied by an adult; to a shopping destination (29.4%) or to visit a friend or relative (23%), as shown in Table 4.12. The majority of the schools were closed due to the arrival of the COVID-19 pandemic (see Chapter 4) which may be linked to the low number of school trips reported (14.2%). Only 21.1% of the last trips occurred during a lockdown. Likewise, in London, only 17.3% of the children's last walking trip occurred during a lockdown. Furthermore, children mostly travelled to the school (55.8%) and—far behind—to a recreational activity (17.3%), primarily walking accompanied with an adult (46.5%) or unaccompanied (30.1%) as shown in Table 4.12.

Carers reported the reasons for a child being accompanied during their last walking trip. In general, these reasons were the availability of an adult to walk with the child, a child deemed to be too immature to travel alone, or streets in the neighbourhood considered inadequate (see Table 4.13). In Santiago, carers' worries included the people the child may encounter when travelling. Meanwhile, in London, other reasons were the availability of another child,

or the travel destinations too far for the child to walk to. By contrast, the most relevant reasons carers gave for children travelling unaccompanied were the location of the destination, the child's maturity and the knowledge carers had about the area. Additionally, in London, carers took into account the conditions of the streets and the weather on the day.

Table 4.12. Child last walking trip companion and purpose by city.

Last walking trip companion				
Trip purpose	<i>child walked unaccompanied</i>	<i>an adult</i>	<i>another child</i>	<i>another child and an adult</i>
London sample				
School	21.2%	24.3%	7.5%	2.7%
Recreational activity	1.3%	9.3%	3.5%	3.1%
Friend or relative house	3.5%	6.6%	3.1%	0.4%
Shop	2.7%	4.9%	0.9%	0.4%
Another destination	1.3%	1.3%	0.4%	1.3%
Total London	30.1%	46.5%	15.5%	8.0%
Santiago Sample				
School	4.4%	3.9%	2.5%	2.9%
Recreational activity	4.9%	9.8%	3.4%	2.0%
Friend or relative house	7.4%	13.2%	0.5%	2.0%
Shop	9.3%	13.7%	2.9%	3.4%
Another destination	1.5%	10.3%	1.0%	0.5%
Total Santiago	27.5%	51.0%	10.3%	10.8%

Source: author's own

Table 4.13. Main reasons for a child walking (un)accompanied.

Main reasons for walking accompanied									
	Santiago					London			
	<i>child age</i>	<i>Primary school (8-12 years old)</i>		<i>Secondary school (13-16 years old)</i>		<i>Primary school (8-10 years old)</i>		<i>Secondary school (11-16 years old)</i>	
	<i>gender</i>	<i>Boy</i>	<i>Girl</i>	<i>Boy</i>	<i>Girl</i>	<i>Boy</i>	<i>Girl</i>	<i>Boy</i>	<i>Girl</i>
The child is too young or immature		23%	27%	12%	9%	28%	24%	8%	10%
Another child is available to accompany the child		5%	3%	15%	15%	11%	9%	21%	15%
There is an adult available to accompany the child		31%	19%	32%	35%	23%	24%	38%	27%
The destination of the journey is too far away		7%	7%	6%	4%	12%	9%	10%	12%
The neighbourhood's streets are inadequate		15%	20%	6%	9%	12%	13%	5%	7%
I don't like the people that my child may encounter		14%	16%	6%	18%	5%	12%	10%	10%
I don't know the area/neighbourhood/streets in the child's route		0%	1%	3%	0%	0%	5%	0%	0%
Bad weather		0%	0%	0%	2%	8%	1%	3%	5%
Other reasons		5%	6%	21%	9%	1%	3%	6%	15%

Table 4.13. Main reasons for a child walking (un)accompanied (continued).

Main reasons for walking unaccompanied									
	Santiago					London			
	child age	Primary school (8-12 years old)		Secondary school (13-16 years old)		Primary school (8-10 years old)		Secondary school (11-16 years old)	
	gender	Boy	Girl	Boy	Girl	Boy	Girl	Boy	Girl
The child is mature enough		18%	22%	27%	32%	21%	24%	36%	35%
There isn't another child available to accompany the child		0%	11%	1%	0%	21%	0%	0%	6%
There isn't an adult available to accompany the child		0%	11%	4%	4%	0%	0%	1%	4%
The destination of the journey is not far away		36%	44%	28%	39%	21%	24%	23%	16%
The neighbourhood's streets are acceptable		0%	0%	9%	4%	7%	12%	12%	16%
I'm ok with the people that my child may encounter		9%	0%	4%	0%	7%	6%	4%	6%
I know the area/neighbourhood/streets in the child's route		9%	11%	21%	18%	7%	18%	15%	10%
Good weather		9%	0%	4%	0%	14%	18%	8%	8%
Other reasons		18%	0%	1%	4%	0%	0%	1%	0%

Source: author's own.

Refining the dataset

The rating, stated preference, verification and ranking tasks were consolidated in one dataset, labelling and coding each observation independently and according to the analysis method and software. Socio-demographic responses for each observation were coded into dummy variables.

Four hundred and seventy incomplete questionnaires were discarded, and completed questionnaires were revised to correct inconsistencies and errors. As many of the participants recruited in London were part of a commercial panel, to be accepted, responses needed to surpass a total duration of 18 minutes or more (i.e., the time required to read the whole questionnaire). This restriction was lifted for participants directly recruited in London and Santiago, because the incentive was different to that offered by the survey panel.

In addition, carers and children might be tempted to answer the whole questionnaire alone. To check for this, the level of similarity of the carer and child responses was analysed for each pair considering (i) the number of participants with the same response in each task, and (ii) the average number of similar responses within a task (see Table 4.14).

The proportion of the same individual observations are similar in Santiago and London (recruited by the panel and directly recruited); that is, less than

10%. Results with equal responses may have several explanations, including a child being aided by an adult

Table 4.14. Participants' same responses by task.

		Rating scale data	Ranking data	Discrete choice (SCL and LON data)	Discrete choice (GC - link data)	Discrete choice (GC - junction data)
Santiago	Same carer-child response cases	0 / 204	11 / 204	17 / 204	17 / 204	35 / 204
	Average of similar task responses	6.6 / 16	1.6 / 5	2.3 / 4	2.4 / 4	1.3 / 2
London	Same carer-child response cases	0 / 226	12 / 226	11 / 226	10 / 226	27 / 226
	Average of similar task responses	6 / 14	1.7 / 5	2.7 / 4	2.6 / 4	1.4 / 2
London (Panel recruitment)	Same carer-child response cases	0 / 203	12 / 203	10 / 203	9 / 203	25 / 203
	Average of similar task responses	6 / 14	1.7 / 5	2.8 / 4	2.6 / 4	1.4 / 2
London (Direct recruitment)	Same carer-child response cases	0 / 23	0 / 23	1 / 23	1 / 23	2 / 23
	Average of similar task responses	6.3 / 14	1.5 / 5	2.3 / 4	2.3 / 4	1.4 / 2

Source: author's own.

4. 4. Analysis methods

4. 4. 1. Qualitative analysis

Attitudes, gestures and other significant behaviours that occurred during the interviews were written down in field notes. As for the conversations, they were recorded in audio, transcribed in the native language of the participants (English or Spanish) and later imported into the qualitative data analysis software NVivo (version 11.4.3). Using the tools of the software, codes (labels) were assigned to meaningful fragments of the transcripts which, depending on their content, varied from short phrases to long interactions between participants and the researcher and could be labelled under more than one code. In an iterative process of decontextualization and recontextualization of the data (Berends and Johnston, 2005), this coding implied isolating fragments from the transcripts (decontextualization) and re-grouping them in broader categories according to their similarities (recontextualization).

In a discovery-oriented or data-driven analysis that sought to identify ideas, relationships and omissions within the narratives developed by the participants (Gough and Scott, 2000; Braun and Clarke, 2006), codes and categories emerged from the data. These were refined with the addition of more transcripts into the software, the comparison with the data gathered in field notes, the contrast with the pertinent literature and ended with the codes and categories displayed in the qualitative stage (see Chapter 5).

The narratives of the built and the social environment

In general, children, young people and carers were able to verbalise those aspects of the environment that are relevant to them when travelling. Independent of the city or the neighbourhood, they described physical elements of the environment, man-made or natural, animals (stray or domestic), people present or absent in the public space, and explained the reasons why these affected their attitudes, patterns and behaviours. As expected, language differed between adults and young people, who expressed complex narratives, and children, who developed ideas in simpler terms. The pictorial activities and images employed during the interviews served to elicit the conversation with all participants—and were particularly useful for children and young people who used them to give examples.

Considering the differences between Santiago and London, the interviews from both cities were analysed separately, nevertheless, the narratives sometimes concurred. The analysis of the participants' interviews identified four relevant categories for the built environment: (i) landmarks, (ii) experience, (iii) environmental cues for risk and (iv) traffic-related features. Those four categories encompassed twenty relevant features of the built environment for London and sixteen for Santiago (Table 4.15). In the case of the social environment, four categories were identified: (i) activities and behaviours, (ii) acquaintances and ties, (iii) presence of people in the streets, and (iv) their physical characteristics. Fifteen features of the social environment were identified in London and Santiago's transcripts. Lastly, animals in the public space were also identified in the participants' narratives. The categories will be explored in detail for each city in Chapter 5.

4. 4. 2. Quantitative analysis

The collected data from the questionnaire comprises: (i) **rating scale data** from the evaluation of specific attributes of a street environment, (ii) **stated preferences data** from the comparison of two fictional streets, (iii)

Table 4.15. Identified categories and codes.

Aggregated code		Code	Code found in						
			London			Santiago			
			For:	Child	Young people	Carer	Child	Young person	Carer
Physical environment	(A) Landmarks	A.1	Facilities (as landmarks)	•	•	•	•	•	•
		A.2	Familiar landmarks	•	•	•	•	•	•
		A.3	Urban and natural amenities	•	•	•	•	•	•
		A.4	Landscape harmony	•	•	•	•		•
		A.5	Spatial complexity		•	•		•	•
		A.6	Topographic landmarks	•		•			
	(B) Children's experience	B.1	Enjoyment of physical and natural features	•	•	•	•	•	•
		B.2	Admiration of facilities and facades	•	•	•	•		
		B.3	Level of maintenance	•	•	•	•	•	•
		B.4	Physical topographical challenges	•		•			
		B.5	Public transport services	•	•	•			
	(C) Environmental cues for risk	C.1	Facades	•	•	•	•	•	•
		C.2	Facilities	•	•	•	•	•	•
		C.3	Urban amenities	•	•	•	•	•	•
		C.4	Maintenance, deterioration and neglect	•	•	•	•	•	•
		C.5	Type of environment		•	•			
		C.6	Street section size			•			
		C.7	Security					•	•
	(D) Traffic-related features	D.1	Vehicles (externalities, behaviour)	•	•	•	•	•	•
		D.2	Vehicles lane / footpath width	•		•		•	•
		D.3	Traffic calming measures			•		•	•
(E) Acquaintances and ties	E.1	Closer relationship	•	•	•	•	•	•	
	E.2	Occasional or superficial relations	•		•	•	•	•	
	E.3	Acknowledged actors	•	•	•	•	•	•	
	E.4	Stranger	•	•	•	•	•	•	
Social environment	(F) Activities and behaviours	F.1	Recreational activities	•	•	•	•	•	•
		F.2	Routinised activities	•	•	•	•	•	•
		F.3	Sub-criminal activities	•	•	•	•	•	•
		F.4	Vigilance and protection					•	•
		F.5	Criminal/illegal activities					•	•
		F.6	"Minding their business" – intrusive		•	•		•	•
		F.7	Threatening	•	•	•	•	•	•
		F.8	Aggressive or invasive - good manners	•	•	•	•		
(G) Physical characteristics	G.1	Physical appearance	•			•	•	•	
	G.2	Clothes	•			•	•	•	
	G.3	Age and gender	•	•	•	•	•	•	
(H) Presences in the streets	H.1	Density of people	•		•				
	H.2	Privatising the public space		•	•				
Other	(I) Animals	I.1	Animals	•	•		•	•	•

Note: The existence of a code in London or Santiago is marked with a •.

Sample size: 148 participants.

Source: author's own

verification data from combining two sets of chosen stated preference alternatives as part of a walking route, and (iv) **ranking data** from the ordered importance of the attributes of a street environment for a walking trip. The researcher analysed each type of data with an appropriate method as some of the studied attributes differ between Santiago and London. The results were interpreted independently.

The **rating scale dataset** was analysed with the assistance of the software *SPSS* (version 27). The software calculated featured statistics (mode, median, interquartile range) and graphed the results (frequency, box-plot) for each studied attribute. To identify differences for distinctive groups of participants (e.g., male vs female), the analyst executed non-parametric tests of hypothesis (Kruskal-Wallis, Pearson χ^2).

Regarding the **stated preference data**, route choice models were estimated using the software *R* (version 4.0) with the *Apollo* package (version 0.2.4, Hess and Palma, 2019). The software permitted the estimation of basic multinomial logit models (MNL, McFadden, 1974; Ben-Akiva and Lerman, 1985), as well as ad-hoc mixed logit models (MMNL) with random coefficients and systematic taste variations (Ortúzar and Willumsen, 2011; Waintrub *et al.*, 2016). Similarly to the rating analysis, the estimation and interpretation of route choice models were done independently for Santiago, London and the Generic City, given the examined set of attributes (see section 4.2.2). The estimated models omitted interaction effects between attributes (e.g., a street with trees and teenagers) as it would have resulted in a different experimental design requiring a substantial number of choice tasks and a larger sample size.

Each model has the general structure:

$$\begin{aligned}
 V^{StA} &= ASC^{StA} + \sum_k \left(\theta_k + \sum_m \theta_{km} x_{mq} \right) X_{kq}^{StA} \\
 V^{StB} &= ASC^{StB} + \sum_k \left(\theta_k + \sum_m \theta_{km} x_{mq} \right) X_{kq}^{StB} \\
 V^{Neither} &= ASC^{Neither}
 \end{aligned} \tag{25}$$

Where V is the utility function of the preference for a child to walk unaccompanied down Street A (StA), Street B (StB) or *Neither* of those streets; θ_k is the estimated marginal utility of attribute k , while θ_{km} is the marginal utility incorporating socio-demographic characteristics m (e.g., gender); X_{kq} is the observable k th attribute (e.g., well-kept footpath, dirty footpath)

for individual q while x_{mq} is the individual sociodemographic characteristic; and $ASC^{Neither}$, ASC^{StA} and ASC^{StB} are the Alternative Specific Constant for alternative Neither, StA and StB, respectively. It is expected that the best models will result from ASC^{StA} and ASC^{StB} equal to zero as these are specific constants for generic alternatives (Ortúzar and Willumsen, 2011).

The best-estimated version of a model outperformed others by the following criteria:

- » The estimated signs are consistent with the theory. For instance, *well-kept footpaths* estimates should be positive as these may favour a walking trip and preferred to *dirty footpaths*.
- » The model is a better fit for the collected data. In practice, the model is superior to other versions from the log-likelihood value and the log-likelihood ratio test (LR).

In the case of the **verification task** data, the analyst used Excel version 16.52 capability to compute the percentage of participants that would travel (or would allow a trip) on a previously preferred street link and junction (i.e., route) from the stated preference sets. The results were divided by the participant sociodemographic characteristics to identify patterns in the responses. Using the models obtained in the previous stage, the analyst estimated the probabilities of a participant choosing the offered route. The different probabilities for subgroups of participants are later analysed using the Mann-Whitney U test with the assistance of the software SPSS (version 27).

Finally, the analysis of the **ranking scale data** used the software R (version 4.0) and the Apollo package (version 0.2.4, Hess and Palma, 2019) to estimate discrete choice models with exploded logit structures (Ortúzar and Willumsen, 2011). Those models include *ad-hoc* mixed logit model structures (MMNL), random coefficients, and relevant systematic taste variations. Interpreted independently for the cases of Santiago and London, the utility functions are represented in the equations:

$$\begin{aligned}
 V_1 &= ASC_1 + \sum_l \theta_{1m} x_{mq} \\
 &\dots \\
 V_K &= ASC_K + \sum_l \theta_{Km} x_{mq}
 \end{aligned} \tag{26}$$

Where V is the utility function for attribute $k=\{1,\dots,K\}$; ASC is the Alternative Specific Constant for attribute k ; θ_{km} is the estimated marginal utility of attribute k incorporating socio-demographic characteristic m (e.g., gender), and x_m is the sociodemographic characteristic for individual q .

4. 5. Ethics and protocols

In research studies, the child population is considered a vulnerable group that needs to be protected and safeguarded from physical, psychological and emotional harm (Graham *et al.*, 2013), requiring any research study to first question the need to include children as participants. If children are fundamental subjects in a research study, scholars must identify potential risks of participating, designing measures and protocols to deal with those issues (Anderson and Morrow, 2012; Carroll *et al.*, 2021). This research study was reviewed and approved by the UCL Research Ethics Committee. This section describes the ethical issues raised by the committee and others described in the UNICEF compendium Ethical Research Involving Children (Graham *et al.*, 2013). In particular, the topics addressed include planning and preparation of the study, research design and methods, data collection and analysis, writing and dissemination of the main findings.

The research explores the perspectives of children aged 6 to 16 years old to understand the barriers to travelling unaccompanied. From the review of the relevant literature (see Chapter 2), the researcher identified a gap in knowledge as child views on travelling in urban environments is usually absent. The absence of children's perspective in research was also identified in other subject area (Alderson, 2013), with a growing number of scholars advocating the inclusion of more children in research studies (Tranter and Pawson, 2001; Shaw *et al.*, 2012; Mackett, 2013; Mitra, 2013; Horton *et al.*, 2014; Alderson, 2016; Murray and Cortés-Morales, 2019). To redress that gap, the research involved children as participants in both data collections stages (quantitative and qualitative) as key informants.

Well-known child development theories such as Piaget (1929; 1952), Vygotsky (1987), and subsequent research studies (Tudge and Winterhoff, 1993; Shute and Slee, 2015) suggest that children can imagine, comprehend and describe issues affecting their life from as young as five years old. At that age, children can interpret, elaborate and communicate simple ideas about complex subjects.

Following the experiences of Horton *et al.* (2014), Saraví (2014) and others (Jensen *et al.*, 2015; Solberg, 2015; Mayeza, 2017; Elshater, 2018; Honkanen

et al., 2018), the qualitative method used in this research was an interview adapted for children of different ages. It included visual aids, white paper sheets to draw and sketch maps and black and white photos of streets. Due to the nature of the inquiry (i.e., behaviour in public spaces), it was not expected to find information that may put child participants at risk.

The design of the interview aimed to provide physical and emotional safety to participants, giving children enough space and freedom to share their views without pressure. School teachers reviewed the interview language and activities, suggesting changes in the wording of the questions and teaching the interviewer how to read and manage children.

The second method, using quantitative techniques as those used by Mackett *et al.* (2007), Kamargianni and Polydoropoulou (2013), and others (Singh and Vasudevan, 2018; Lucken *et al.*, 2018), consisted of an online questionnaire adapted for children. It included tasks of different nature; scale ratings, stated preferences and rank questions. The questionnaire was tested with children and adapted to their level of comprehension. Visual aids in the questionnaire included computer-generated images of a street environment with distinctive colours for each characteristic of the built environment and a text box describing social aspects such as strangers' activities. The questionnaire was adjusted for children with different levels of development following the recommendations of Aydin *et al.* (2016) and the advice of schoolteachers in Santiago and London. If a child still has difficulties with the questionnaire task, carers were informed on how to assist.

Carers had multiple roles in the study; as gatekeepers of the family participants, as participants and as a person that the child participant could look for support. Carers decided the location and time of the interview, as was convenient for them and the children. The interviews usually took place at the family household. Just in one interview the location was another place (a coffee shop). Most carers scheduled the interview for a weekday afternoon, after the child school period. A few interviews took place on the weekend. Carers were present during the whole interview, giving practical and emotional support to children. As the interviewer was a stranger to the family, carers present during the conversation helped to reduce any stress and anxiety experienced by children. Similarly, in the online questionnaire, carers were requested to stay with a child that could need help to comprehend the questions and images.

Benefits

The participants perceived no direct benefits from the research study. However, the difficulties to recruit participants for the online questionnaire required the proposal of an incentive. Those recruited via snowball sampling and the institutions could sign up to a lottery offering six £20 cinema vouchers; whereas participants from the panel received a paid compensation for their time from the recruitment agency²⁰. Furthermore, the panel company is a member of the British Polling Council (BPC) that promotes the “highest professional standards” in terms of confidentiality, disclosure of the sampling procedures, among others. The researcher did not have access to the ethical protocols used by the company. The researcher also acknowledges that different recruitment strategies could be biased, yet the low number of participants recruited from traditional channels amid the COVID19 pandemic required extraordinary efforts.

Institutions that helped with the recruitment and participants received a brief report with the main research findings and links to published material. This document included the contact details of the researcher for further communication.

Informed consent

Before the interview and the introduction of the questionnaire, the researcher explained the implications of participating in the research study and requested informed consent. Those giving consent did it voluntarily—and were informed that they were not obligated to answer the questions and have the right to withdraw from the study. If a carer or child refused to give consent, the interview meeting or online questionnaire ended immediately. The interviewer requested carers, the legal guardians of children, to provide their consent on behalf of the children. If any participant was unable to give consent due to illiteracy, the consent was verbally requested. This verbal consent was recorded and then transcribed as an integral part of the interview. Signed consent forms were stored in a locked filing cabinet at University College London. In the case of the questionnaire, consents were agreed digitally on an online platform. Consents are stored on the UCL online platform and in the researcher’s encrypted personal computer.

Confidentiality could be requested at any moment during the interview. These requests were respected, unless a risky or compromising situation

²⁰ Incentives were not disclosed by the recruitment agency. However, incentives could range between £0.25 to £10 depending on the questionnaire duration and complexity as posted in <https://www.panelbase.net/index>.

emerged. In the case of that situation happening, the researcher and his supervisors evaluated the potential consequences that the disclosure of the information could have on the participants and the researcher himself. If any risky circumstance related to confidentiality arose, the protocol indicated that the interview should be suspended. The conditions described above were stated as an integral part of the introduction of the interview and the consent.

Withdrawal

Participants were informed about their right to withdraw their responses from the study at any time before the analysis of the data. Withdrawal was impracticable after that stage as conducting new interviews required the researcher to travel to Chile, and excluding anonymised data from the aggregated analyses is practically impossible. All sensitive data were deleted at the end of the research project.

Data management

Handling participant's data may raise potential ethical issues. The researcher followed the General Data Protection Regulation (by its acronym GDPR) to comply with the data protection legislation in the UK and Chile (law No. 19.628, Ministerio Secretaría General de la Presidencia, 1999). As there are no regulations in Chile that oversee non-medical participants data protection rights, the research followed the stricter UK regulation. To protect participants personal data, recordings, transcripts and responses were anonymised using only general descriptors (e.g., gender, age, relationship with the child). These were used at the analysis stage and in published material. Additionally, contact details such as names were treated with confidentiality and kept separated from the responses.

The interviews data was analysed in the UK; hence, data collected in Santiago had to be transferred from outside the GDPR regulated region. To avoid information being lost or leaked, the data was encrypted and stored only in encrypted devices. Once in the UK, encrypted data was stored in the University College London storage system and the personal laptop of the researcher. To avoid distortions during data collection and analysis, these stages were carried out in the same language in which the interviews and questionnaires were conducted. These were conducted in English in London and Spanish in Santiago. Translators or interpreters were not necessary as the researcher is a native Spanish speaker. Interviews were recorded and later transcribed and, when necessary, partially translated by using functional translations which prioritise the meaning of the sentences.

The analysed data were (or will be) published in a dissertation, reports, books and academic articles. Findings from the interviews included quotes to exemplify the narratives of child and adult participants. Quotes were pseudo-anonymised, thus being unlikely to link or track any participant to their responses. Questionnaire data were analysed aggregating all responses, being impossible to expose participants' data.

Researcher training

The practice of ethically responsible research involves acknowledging issues involving the researcher capacities and safety. With a transport engineering background, the researcher reviewed the available literature about researching the child population and attended a UCL course about "Working ethically with children and young people as research participants". Furthermore, the researcher met teachers in London and Santiago to learn how to manage children in different situations.

Researcher safety and wellbeing

Each time the researcher needed to travel to those areas, he took extra precautions, exploring the public transport services and notifying a next of kin when and where the interview was being conducted.

As with any social research, the researcher monitored his emotional and physical toll and the need for support. The emotional support was provided by his network (i.e., partner, relatives and friends), taking care of respecting confidential matters of participants. Any issue that arose in the study was discussed with the supervisory team and handled appropriately.

Chapter 5. Findings - Qualitative stage

This chapter reports the findings of one hundred and forty-eight interviews that aimed to explore the conditions in which children's unaccompanied trips occur, and identify the features of the physical environment and the social aspect that influence those trips (objectives 2 and 3). The semi-structured interviews and the topics that guided the conversation are described in Chapter 4.1. Meanwhile, the thematic analysis of the interviews was carried out using the software NVivo (version 11.4.3) and is covered in this chapter.

In detail, 18 children, 7 young people and 22 carers were interviewed in London, and 42 children, 20 young people and 43 carers in Santiago. The total recording time of the interviews in London was more than 24 hours (average of 81 minutes per household), and more than 58 hours in Santiago (average 89 minutes per household).

5. 1. Santiago

5. 1. 1. The schedule: A child's typical day

Children and young people living in deprived¹ and affluent neighbourhoods of Santiago had similar activities in a typical weekday. The day began with a trip from home to school, usually travelling accompanied by an adult or friends, which is followed by the return journey a few hours later. In this returning trip, children and young people had less time pressure, tended to enjoy more independence (especially young people) and many complete it unaccompanied or accompanied just by peers.

In wealthy areas, and due to the locations of the households and the carer convenience, most of the children completed the school trip in private cars. Some children were accompanied by a neighbour, another parent from the "school run group"² or travelled in school vans. Young people that lived close to schools tended to use bicycles or walked to their destinations

1 The participants were recruited in two deprived neighbourhoods located near each other that have significant differences (e.g., level of deprivation). Those differences, however, are not explored in detail—and the neighbourhoods are treated without distinction throughout this chapter to highlight the narratives that intersect deprived areas and the shared experiences of their residents.

2 From the Spanish word "*turnos*", it is an arrangement between a group of parents to have one adult per day in charge of picking up a group of children and dropping them off at their respective houses.

unaccompanied or with another child, sometimes combining this trip with other activities such as going to the park, visiting a local shop or a friend's house.

A similar pattern was reported by those participants living in deprived neighbourhoods. An adult companion, which included close relatives (e.g. grandparents, aunts), friends or neighbours escorted children when walking to and from the schools. Young people in these areas also performed trips to and from school either unaccompanied or accompanied by a friend; mostly walking or using public transport services.

Once home, most children and young people perform at least one more round trip for recreational purposes (e.g. club, football pitch, park), to shop, or visit relatives or friends. They tended to travel accompanied to see friends and relatives and alone when going to shops. Children and young people in wealthy areas indicated that they enjoyed non-home indoor activities such as visiting the shopping centre or a friend's house, reaching those places in cars (children), walking or cycling unaccompanied or with friends (young people). Lacking in options, their peers in deprived areas walked—accompanied in the case of children, unaccompanied in the case of young people—to do outdoor activities, such as recreation (e.g. parks, football court). Only a few children and young people travelled a third time during the day. They lived in the wealthy areas of Santiago and completed these additional trips in cars.

During the weekend, children and young people's activities in affluent neighbourhoods involved a home-based round trip with the purposes of recreation, visit relatives or friends, shopping, worship or a combination of them. Usually, the family travelled together in cars. Young people who enjoy some independence during weekdays travel also with their families during the weekend. In those cases in which the young people had a different schedule, he or she completed their trips walking or cycling unaccompanied. Contrastingly, children and young people in deprived neighbourhoods travelled unaccompanied or accompanied by peers, completing several home-based round trips. They indicated that they leave their houses for recreation, to shop or visit a friend or a relative house. They often ride public transport to reach places that are not within walkable distances.

During the interviews, after examining the schedule of activities and trips, children were asked to select their 'favourite trips' and describe them in detail. In general, children's favourite trips were those to and from school and those that involved recreational activities. A few of them also mentioned the journey to visit their friends (Table 5.1). Furthermore, and in clear gendered patterns, older female children tended to prefer those journeys in which they

were accompanied by carers and friends. Meanwhile, older male children preferred unaccompanied trips.

Table 5.1. Children's "favourite trip" per purpose, company, mode of transport, gender and age in Santiago.

Age	Gender	Trip origin	Trip destination	Mode of transport	Trip companion
6	Girl	Home	Park	Private vehicle	an adult
6	Girl	Home	Park	Private vehicle or cycling	an adult
6	Boy	Home	School	Walking	an adult
6	Boy	Home	School	Walking	another child
6	Boy	Home	Football pit	Cycling	unaccompanied or another child
6	Boy	Home	Park	Walking	an adult
6	Boy	Home	Theme park	Private vehicle	an adult
7	Girl	Home	Park	Walking	an adult
7	Boy	Home	Visiting relatives	Walking	an adult
8	Girl	Home	School	Private vehicle	an adult
8	Girl	School	Visiting friends	Walking	an adult
8	Boy	Home	Home	Walking	an adult
9	Girl	Home	Cinema	Walking	an adult
9	Girl	Home	Park	Walking	another child
9	Girl	Home	Visiting relatives	Walking	another child
9	Boy	Home	School	Walking	an adult
9	Boy	Home	Around the neighbourhood	Cycling	an adult
9	Boy	Home	Football pit	Walking	another child
9	Boy	Home	Supermarket	Walking	another child
9	Boy	Home	Visiting relatives	Private vehicle	an adult
9	Boy	Home	Visiting relatives	Walking	another child
10	Girl	Home	School	Private vehicle	an adult
10	Girl	Home	Shopping mall	Walking	an adult
10	Girl	Home	Supermarket	Private vehicle	an adult
10	Boy	Home	Visiting relatives	Walking	unaccompanied
11	Girl	Home	School	Private vehicle	an adult
11	Girl	Home	Football pit	Walking	an adult
11	Girl	Home	Park	Walking	an adult
11	Girl	Home	Sports	Walking	an adult
11	Girl	Home	Visiting relatives	Walking	an adult
11	Boy	School	Home	Walking	unaccompanied
11	Boy	Home	Supermarket	Walking	another child
12	Girl	Shopping	Home	Walking	an adult
12	Girl	Home	School	Private vehicle	an adult
12	Girl	Home	School	Walking	another child
12	Girl	Home	School	Walking	an adult
12	Girl	Home	Park	Walking	an adult
12	Girl	Home	Visiting relatives	Walking	unaccompanied or an adult
12	Boy	School	Home	Walking	unaccompanied or another child
12	Boy	Home	Park	Cycling	unaccompanied
12	Boy	Home	Park	Walking	an adult
13	Girl	Home	Sports	Walking	unaccompanied
13	Boy	Home	School	Walking	unaccompanied
13	Boy	Home	Park	Cycling	another child
13	Boy	Home	Visiting friends	Cycling	unaccompanied
14	Girl	Shopping	Home	Walking	unaccompanied and another child
14	Girl	Home	School	Walking	unaccompanied
14	Boy	School	Home	Private vehicle	an adult
14	Boy	School	Home	Walking	unaccompanied
14	Boy	Home	School	Private vehicle	an adult
14	Boy	Home	School	Private vehicle	an adult

Table 5.1. Children's "favourite trip" per purpose, company, mode of transport, gender and age in Santiago (continued).

Age	Gender	Trip origin	Trip destination	Mode of transport	Trip companion
14	Boy	Home	Football pit	Walking	unaccompanied
14	Boy	Home	Shopping	Walking and public transport	an adult
15	Girl	Home	Park	Walking	another child
15	Girl	Home	Park	Walking	an adult
15	Girl	Home	Sports	Walking	unaccompanied
15	Boy	Home	Alley	Walking	unaccompanied
15	Boy	Home	Park	Cycling	unaccompanied
16	Girl	Home	Park	Walking	another child
16	Boy	Home	School	Walking	unaccompanied
16	Boy	Home	Shopping mall	Walking and public transport	an adultt

Sample size: 61 participants.

Source: author's own

5. 1. 2. Children's mobility.

Adults, children and young people indicated that moving across the city is a dynamic practice, it evolves as the child learns how to cope with the public realm, and is shaped by a number of tacit agreements (e.g., walking all the time on the footpath). They argued that travelling happens in contested places that require a number of skills to negotiate the available space (see Christensen *et al.*, 2018). This wealthy carer, for instance, indicated that his/her children should cycle on the road if the footpath is unavailable

Interviewer [I]: When the children walk, do you have any rules?

Carer 1 [C1]: Don't walk on the road... they have to walk on the footpath. If they cycle, wear a helmet.

I: When they cycle, do they go on the road or the footpath?

Carer 2 [C2]: On the footpath

C1: Yes, mostly the footpath. [...] If other people are on the footpath, I told [the children] to go on the road... or if a car is parked [on the footpath].

(Carers of a 6-year-old boy, and a 9 and 12 years old girls. Wealthy area)

The sense of travelling through contested spaces is also shared by children living in well-off areas:

Interviewer [I]: Do you like this place? [showing an image of a main street]

Boy [B]: Yes

I: Why?

B: Because is like... because the footpath is wide, big enough... so many people can use it and not only two people and a cyclist... so they don't bump into each other and getting mad because there is enough space.

(Boy, 12 years old. Wealthy area)

In deprived areas, the spaces may be also places taken by antisocial activities:

Interviewer [I]: Why can't the boy go south of the main street?

Carer 1 [C1]: Because he [only] goes to the multipurpose court and to play to his friend's [house].

I: Why can't he go up of [name of street]?

C: Because [the boy and his friends] look for main roads... because people can be gathering in the alleys. Then they, for safety, always look for main and wide roads.

I: Which people gather in the alleys?

C: People getting high or drinking and standing in the street corners... and many vehicles [use those roads]...so they prefer busier streets.

(Carer of a 14 years old boy. Deprived area)

Children in deprived areas learn to recognise dangers in the streets and develop strategies to cope with them (e.g., the best moments to travel):

Interviewer [I]: Is there anything you don't like of this place [in the image]?

Girl [G]: Yes, it looks dangerous.

I: Why?

G: Because, for example, you can see people here, so I feel like everything is going to be alright but, at the same time, anything can happen, you can get hurt [...]

I: What can happen?

G: People can drive too fast and run over you... or a gunfight can happen, and you have to hide inside a house. You have to be careful when going outside.

I: Would you walk alone on that street?

G: Yes, but in the morning, during daylight.

I: Why?

G: Because in the mornings it is lighter, and more people [are present], so if something happens there is people [around] to aid me.

(Girl, 12 years old. Deprived area)

Adults, children and young people acknowledged that those tacit agreements were particularly relevant in those spaces where vehicles and people coincide. Reflecting on street crossings, the carers indicated that they, as drivers, expected predictable behaviours from those going on foot, and, as pedestrians, expected to have priority when the crossing was well-defined (e.g., signalised or zebra crossing). For avenues and wide roads, the majority of the participants indicated that pedestrians should use only signalised or zebra crossings, and a few pointed out that they crossed anywhere on the road. In narrow streets with low traffic volumes, they indicated that it was fine to cross at any point along the road, yet taking the right precautions when doing so (e.g., look both directions, cross quickly).

The carers pointed out that they taught children several norms of behaviour. How to behave when walking on footpaths beside moving cars. The speed and distance they can go when cycling or using a scooter on the footpath, alone or with an adult. Where they have to stop and wait when crossing streets and whether and when they are allowed to play along the street. The carers transmit those norms to children, teach them about the safe and dangerous behaviours, and provide them with the skills that are needed to travel alone.

Those norms are accompanied by recommendations to respect the personal space and delimit interactions with those present in the public realm, coinciding with the findings of Christensen *et al.* (2018) and Witten and Field (2020) about children learning to negotiate space, assess risk and make decisions. Children learn about courtesy and self-control when moving through the public realm, to avoid collisions with people standing on the footpath and give enough room for pedestrians to move freely. Moreover, carers pointed out that children should learn how to interact with the broad range of people they may encounter when travelling; further transmitting fears of strangers which often rest on stereotypes (see section 5.2.3). Children and young people absorbed those fears as they grow up, increasing the concerns towards others and the tensions with those that look different:

Boy [B]: [When I walk] I look both sides [of the street], I mean what my mom taught me... to see both sides of the streets when crossing a street [...] or to see if a stranger is in the park and doing something. [I have to] watch what that person is doing.

Interviewer: Who are those strangers?

B: They can be neighbours or anyone... I don't know.

(Boy, 12 years old. Wealthy area)

For children and young children, however, the spaces through which they travel seem less threatening. Children showed that the urban spaces are highly attractive to them and highlighted, in the various methods that were employed to gather data, several features and singularities that enrich their everyday experiences. For young people, the urban space represented an opportunity to meet and interact with friends; away from adult constraints and supervision. From their point of view, having more freedom allowed them to be “more like themselves”, as also suggested by other authors (Gough and Franch, 2005; Milne, 2009).

In the growing up process, mobility practises, either unaccompanied or accompanied, open endless opportunities for children to acquire the needed skills to access the public realm, negotiate the space with others and, finally, gain independence. As the literature and the data collected suggests (Hillman *et al.*, 1993; Shaw *et al.*, 2012; Christensen *et al.* 2018), that process of learning new skills and gaining independence is somewhat framed by the carers through the permissions (or licences) they give to their children and young people. Whether travelling unaccompanied or accompanied, walking, cycling, in public transport or other means of transport, permissions limit the places and the time of the day in which travel may occur. The analysis shows that the authority in charge is most of the times the female (as observed by other scholars, see Puga, 2006; Staab and Gerhard, 2010; Murray and Cortés-Morales, 2019) figure of the household who, in a gendered role, is characterised as the person who knows better the stage of development and capabilities of the child.

Although granting privileges can lighten carers' schedules and have positive impacts on their budgets (see Waygood *et al.*, 2017), carer participants pointed out that giving permissions to travel alone often increased their mental burden, because they believe that the children inevitably will be in a risky situation at some point in the trip. Those apprehensions may become one of the main reasons to deny permissions, restrict children's mobility and, eventually, delay their development.

Children and young people respect the limits (often a mixture of a given distance from the household and the safe places located within it) where their carers authorise them to travel unaccompanied. On average, the area drawn by carers covers 0.1 square kilometres for children (6-12 years old) and 9 square kilometres for young people (13-16 years old). The reduced space available for children in Santiago echoes Puga's (2006) arguments that suggest that children are under constant adult supervision and are allowed to roam close to their homes. Children, and especially young people,

try to expand those boundaries as part of a process of self-exploration and, sometimes, break the rules by walking or cycling further than permitted. As the literature has acknowledged (Valentine, 1997a), children sometimes test their physical and mental abilities and confront self-imposed restrictions (e.g., fear of the unknown) that reduce their ranges of action to areas that are smaller than those they believe could travel. In this process of challenging limits, the journeys the children and young people complete play a key role. The data suggest that travelling unaccompanied to nearby yet novel places strengthened child's confidence and increased carers' trust in their abilities

The conditions of permissions, such as the time of the day and the reachable places, tended to vary between children and young people living in wealthy and deprived areas. Compared to the areas available for children and young people living in disadvantaged neighbourhoods, those living in well-off neighbourhoods had large territories where they are allowed to walk or cycle unaccompanied (6.9 square kilometres on average), or accompanied just by friends. Carers had a favourable perception of their neighbourhoods and those located around, interpreting the physical homogeneity of the houses as a sign of people sharing similar values. Nevertheless, permissions to use public transport licenses are gained at older ages. Public transport is seen as risky because potentially dangerous individuals can be hidden among its diversity of users.

In deprived areas, carers feared their neighbourhoods, thus constraining children and young people unaccompanied trips into small areas (0.05 square kilometres on average) with defined limits (e.g., roads, street junctions), marking places (e.g. park) that should be avoided. Carers' apprehensions covered a variety of physical elements in the environment that could indicate the presence of wrongdoers. The young people living in the disadvantaged neighbourhoods are allowed to ride the public transport to reach their schools (mostly secondary level), sports facilities (e.g. football court) or other places to engage in beneficial activities (e.g. volunteering in firefighter stations³) earlier compared to peer in wealthy areas.

5. 1. 3. The social environment

Children, young people and carers living in deprived neighbourhoods described a profound process of social decay, an increasing strangeness towards others and a constant weakening of the local community. Reflecting on the changes observed in the public life, many explained that strong ties, positive strangers and other individuals who support children and young

³ Firefighters is an unpaid job in Chile, supported by volunteers.

people are disappearing from the public space and are being slowly replaced by men and hostile strangers with unclear intentions and purposes:

Interviewer : When [your daughter] goes to the park, does she go unaccompanied?

Carer: Not unaccompanied. She always goes with her brother and the dog, but no, she never goes unaccompanied. Well, it's because of my own insecurities. Long ago the neighbourhood was calm, I used to play outside alone. [You could] see more children [around]. Now you don't see children playing outside. What you see are more men. I care more because she is girl and because there are no girls of her age with whom she can stay outside.

(Carer of a 11 years old girl. Deprived area)

The “invasion” of drugs in the neighbourhoods is described by carers as the reason for the many forms of violence to which children and young people are exposed. With real or perceived occurrence in their neighbourhoods, carers depict the consumption of strong stimulants (mostly cocaine paste), prostitution, street fights, shootings and stray bullets, and other conflicts related to drugs as the current normality. Meanwhile, drug addicts suffering comedowns (“zombies” in the local jargon), wrongdoers looking for opportunities to mug someone or rob houses and stationary persons (“soldiers”, “gargoyles” or “dogs”) intimidating others are individuals present either in key places of the neighbourhoods or in the frontiers between territories in conflict; as also observed by Figueroa *et al.*, (2019) in equivalent neighbourhoods in Santiago. Those individuals, who seem to be mostly men, who avoid eye contact and pretend to be distracted, dress in loose clothes or use hoodies to cover their faces, are feared.

Families do their best to avoid territories they presume to be invaded, either by accompanying children at all times, making detours or denying unaccompanied trips to young people. Otherwise, through no fault of their own, children and young people may be at risk of being harmed, kidnapped or harassed by those dangerous individuals, be accidentally involved in unexpected fights between groups in conflict, or be in contact with the “wrong path” of drugs and robbery:

Interviewer [I]: Do you meet with strangers [in the street]?

Boy [B]: Sometimes, [but] I have a bad feeling about them.

I: How are these strangers that give you a bad feeling

B: Well... if I came close to them, they would kidnap me [...] because I think they could be “child robbers”.

I: Why do you think they could be a child robber?

B: I don't know, sometimes... they look at me without saying "hi". I move away [from them] every time because they scare me.

(Boy, 8 years old. Deprived area)

In affluent neighbourhoods, children, young people and carers described a profound distrust towards the public realm, visible in a recurrent attitude to "profile" others and in a constant recollection of isolated bad experiences in their networks. They feel somehow trapped in attractive neighbourhoods where anyone not residing or working in them is seen as a potential criminal. As most of the residents have cars, carers expressed concerns about the strangers who wait at bus stops. Similar apprehensions were raised when describing those individuals who lingered in parks or other places of public access, as they believe that the public space is not a place for "others" except residents:

Interviewer [I]: Is there anything that worries you or that you consider relevant when the boy walks alone?

Carer [C]: No, [the streets] are safe [...] because there is no place like...well, there is many constructions sites [...] with many construction workers.

I: Is that good or bad?

C: It depends on... eventually it can be good... not so safe if the street is residential... if many constructions workers are there.

I: Why it isn't so safe?

C: Because there are many people from outside the neighbourhood, strangers [...] They are people that work in construction, who are not bad, but maybe if we let [the boy] walk everyday it wouldn't be very safe...well, nothing is so safe and nothing is very unsafe I think.

(Carer of a 12 years old girl and a 14 years old boy. Wealthy area)

Families living in affluent neighbourhoods heavily rely on indirect and direct surveillance services. Individuals who work for the family, like nannies, or belong to the body of security of the gated community (e.g., guards) are part of a battery of individuals who are paid to provide safety to the spaces in the neighbourhoods. Such trends are similar to those observed in Latin American countries like Mexico (Saraví, 2014) and Brazil (Gough and Francht 2005). Moreover, the police and security patrols are expected to be available at all times to answer emergencies. Meanwhile, there is a growing tendency to fortify houses with electric fences and watch the public space with cameras. Fear of crime is high in affluent neighbourhoods and so is the physical –and social– distance between them and the rest of the city.

Participants from wealthy areas seem to move inside a “bubble” of similar neighbourhoods; gravitating around services and facilities symbolically designed to include the rich and exclude outsiders and the many workers who keep the wealthy areas functioning. Those participants living in the deprived neighbourhoods raised this practice of exclusion many times during the interviews; they were aware of the existence of “another Santiago” where they do not belong, and neither are welcomed. This is evident in the comment of a participant from a deprived neighbourhood commenting on an image of a wealthy area:

Interviewer : Do you like this place? (showing an image of an affluent neighbourhood)

Carer: Who wouldn't like to live there and have that pickup truck (pointing the parked vehicle)? [...] If someone goes “up there”, one is told immediately “what is this pinganilla (unimportant person) doing here?” [...] You (referring to the interviewer) go down to our world and you... you [see] a different world. It is a different reality. And your reality is different.
I don't know where you live, but it is evident that you aren't from here, then...is a different world. It is not the same, they (the people in wealthy areas) live in a different world.

(Carer of a 10 years old boy. Deprived area)

Although participants' narratives in wealthy and deprived areas revolved around a high perception of insecurity, the two faces of “Santiago” appeared in several forms when participants described the features of the social environment of their neighbourhoods and the impacts of them on the mobility of their children and young people.

Acquaintances and ties

Among the many people who inhabited the public realm, carers liked those who enhanced, assisted and make the route more entertaining, and worried about the presence of people that jeopardise the safest occurrence of an unaccompanied trip. As carers, children and young people do not know beforehand the intentions of those present in the public realm, they profile them according to their visible characteristics (e.g., physical appearance) and their behaviour (e.g., their activities and attitudes). They have fabricated a number of assumptions based them on personal experiences, local rumours (as also observed by Valentina, 1997a), news reports (as also observed by Foster *et al.*, 2014), among other undefined sources, often profiling as dangerous those that do not fit into their expectations.

Coinciding with traditional findings in the literature (Tonucci, 2016), carers considered that the presence of children in public space is a sign of safety; children playing street games or sports encourage other children to enjoy the public space too. Similarly, like Preza *et al.* (2001) and others suggest (Brown *et al.*, 2008; Crawford *et al.*, 2017; Smith *et al.*, 2019), the presence of well-known individuals in public space, analogous to the strong ties concept (Granovetter, 1973; Paulos and Goodman, 2003), is a factor which eases unaccompanied trips.

In a context in which the family is seen as the primary support of children and young people, the presence of a close relative secures the space for children regardless of those who could be nearby. In addition, participants indicated that people who are recurrent visitors of the spaces somewhat support children's mobility. For children and young people in deprived neighbourhoods, these people included shopkeepers, customers, passers-by and people in parks which, with occasional and superficial interactions, may become recognisable actors in children's journeys. As other authors suggest (Waygoo *et al.*, 2017; Bourke, 2017), those interactions strengthen children and young people's social skills and help them develop a sense of place and belonging. For participants in affluent neighbourhoods, those recurrent actors included children, young people and adults in the public realm, available to play or protect the area, and guards of the gated communities that have worked long enough to become known faces:

Interviewer [I]: Do you encounter anybody else when you walk?

Boy [B]: The guards.

I: How are those guards?

B: Nice people.

I: Do you have an opinion of them?

B: They are trustworthy.

I: Why?

B: Because we always see them, you can trust them.
You know that nothing [bad] will happen.

I: Do you feel safe when they are around?

B: Yes.

I: Why?

B: Because if they are not around [somebody] can
steal and all that.

(Boy, 15 years old. Wealthy area)

People's physical characteristics

In the absence of any relationship or any other aspect that could provide certainty, carers, children and young people evaluated the intentions of strangers by other means, judging people's activities, their expressions, attitudes and behaviours and their physical appearance.

In wealthy areas, carers' expectations were framed by a rooted belief that they live in homogenous areas, classifying as "deviant" those who do not fit into their stereotype of a wealthy person (e.g., mostly light-skinned, without body modifications, wearing smart but casual clothes). Consequently, the risk is epitomised by those who have visible body modifications (e.g., tattoos, piercings, dyed hair with unusual colours) or different skin tone (e.g., dark or brown skin). In contrast, those who appear to be locals by wearing school uniforms, formal or sports outfits provide safety for children and young people. Local workers wearing uniforms (e.g., nanny, guard) or taking care of natural elements (e.g., gardener) also have a positive effect in securing the space for children.

Carers from deprived areas believed to be surrounded by drugs and typify as potentially dangerous those who do not behave like a "hard-working person", that is, a person who stays in their homes most of the day and leaves the neighbourhood to work and return in the afternoon. The "deviant" in deprived neighbourhoods is less related to the physical appearance and more linked with suspicious behaviours like lingering in the public space without a clear purpose. In detail, children, young people and carers indicated that those who wear expensive shoes from a popular brand, sportive trousers, tops and T-shirts, big earrings and caps may represent a threat. They link those trends and options to the "culture of the street" that have been cultivated by drug traffickers and consumers. The presence of individuals wearing those clothes is seen as a sign that conflicts (e.g., street fights, shootings) could emerge at any time and the children and young people walking unaccompanied could be at, even (mortal) risk. The fear of being involved in a mortal incident is often grounded in previous experiences and situations that, rare before, have become part of the normality of the neighbourhoods:

Interviewer [I]: Which people frightens you?

Boy [B]: Mostly *flaites* (local badly behaved youngsters), they always frighten me [...] I never feel comfortable when they are around because this year they tried to steal my mobile... the *flaites*. I don't like being near them.

I: How are those *flaites*?

B: There are different types, but the classic one wears popular brands with chain collars down to the belly-button, baseball caps and sag trousers, always... and they speak with a locked jaw, they can't pronounce [words] properly...these are the ones I know.

(Boy, 16 years old. Deprived area)

In both social contexts, age and gender also was pointed out as a factor that can provide some certainty. Children and carers found beacons of safety and support in old women or families with children. It is believed that an area safe for those people is also safe for children, or that they may give support or aid to children in case of a dangerous event.

5. 1. 4. The built environment

Landmarks: the singularities of the built environment

Like the findings of Matthews (1992), young people depicted the environment in which they travel unaccompanied or accompanied mostly from aerial perspectives (Figure 5.1 - B), situating themselves within a bigger system of streets and avenues. Children demonstrated a more eccentric view (Figure 5.1 - A), with lines representing movement within a broader system of singularities and landmarks.

The sketch of the boy in Figure 5.1 – A shows the significant elements on the route, roughly covering the whole page. The physical features, represented in 2D, are of similar size and points to the landmarks of interest; houses (i.e., origin and the destination of the trip), a church, a multipurpose court, two cars, and a tree. The boy omits all streets except those connecting the point of interest, suggesting that he is aware only of a tiny part of the street network. The drawing of the girl in Figure 5.1 – B depicts a wider area connecting her house with the school. Using an aerial perspective, she drew—and simplified the neighbourhood to—relevant landmarks in a small area. A continuous line represents the route, which turns or goes straight accordingly to the travelled path; like diagonally through the park (large rectangle on the image). This representation suggests movement on a street grid that, while not represented on the page, exist in her imagination. The contrast between the two drawings may indicate development in the understanding of the routes occurring in a connected street network, surrounded by defined and distinguishable physical elements.

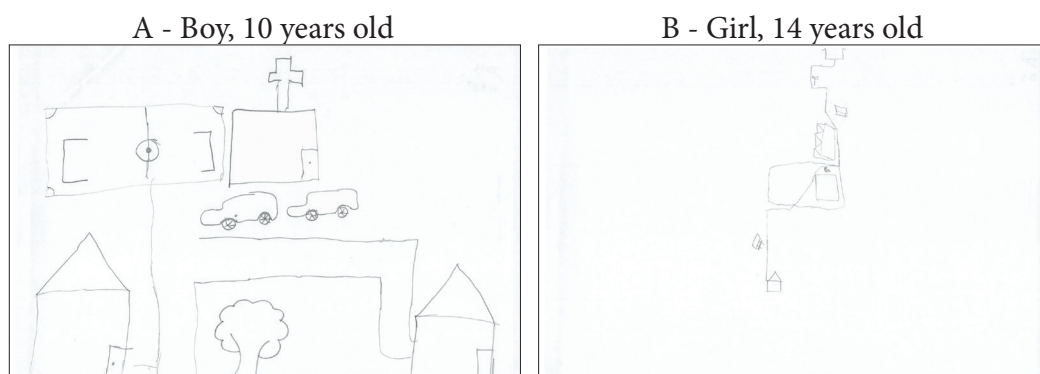


Figure 5.1. Map representations of an older and a younger children in Santiago.

Source: author's own

The children and young people drew and discussed a variety of landmarks that helped them navigate the environment and reflected their environmental knowledge and geographical orientation (Table 5.2). From small objects to large scale infrastructure, these included elements that provide novelty to an area as noticeable urban furniture (e.g., fire hydrant, benches), transport amenities (e.g., bus stops), recreational amenities (e.g., playgrounds, parks) and facilities (e.g., local stores, schools, hospitals) that served as a reference in highly homogeneous neighbourhoods. Furthermore, larger systems, such as the road network, served as distinctive references for young people appreciating the complexity of the grid formed by a mixture of avenues, streets and salient elements (e.g., roundabouts), while the urban landscape had a similar function by interpreting an area from its constructions (e.g., clusters of tall buildings) combined with other features such as natural elements and urban furniture for children. Carers somehow reflected on the positive impacts of having diversity within their neighbourhoods or in reachable areas as the literature acknowledges (Kerr *et al.*, 2006; Brown *et al.*, 2008; Carver *et al.*, 2014).

Table 5.2. Landmarks identified from the routes sketched by children in Santiago.

Object	Children drawing the object	Times drew in total	Mean apperance per map
Houses	31	107	1.84
Trees	24	86	1.48
People	23	58	1.00
Playground	24	53	0.91
Home	50	50	0.86
Animals	11	47	0.81
Plants	10	28	0.48
Other objects	12	26	0.45
Motorised vehicles	17	24	0.41
School	23	23	0.40
Park	21	23	0.40

Table 5.2. Landmarks identified from the routes
sketched by children in Santiago (continued).

Object	Children drawing the object	Times drew in total	Mean apperance per map
Urban amenities	13	23	0.40
Sky, clouds and sun	16	22	0.38
Road	15	21	0.36
Hill and mountains	5	14	0.24
Shops	12	13	0.22
Football court	12	12	0.21
Fences	5	11	0.19
Supermarket	8	8	0.14
Bus stop	6	8	0.14
Streetlight	5	7	0.12
Services	6	6	0.10
Gates	5	6	0.10
Bicycle	2	4	0.07
Shopping mall	3	3	0.05
Church	3	3	0.05
Front gardens	1	3	0.05
Stadium	2	2	0.03
Street sign	2	2	0.03
River	1	1	0.02

Sample size: 61 participants.

Source: author's own

Children and young people in better-off neighbourhoods indicated that their travels happen in homogenous suburban landscapes; a succession of gated communities and walls, impermeable fences or tall bushes that hide houses and limit the natural surveillance of the public space. Such accounts coincide with the findings of different authors, like Saraví (2014), who studied Mexico City, and Krishnamurthy and colleagues (2018), who explore the experiences of Dutch children under the age of 12 in the city of Eindhoven. They depicted singular landmarks, focusing on the features that are visible from the distance (e.g., large facilities), elements aesthetically pleasing (e.g., parks, greenery) located in their neighbourhood or outside it (Table 5.2) and features relevant for navigation, which can serve as a guide along the route (e.g., junctions, roundabouts), a destination for recreational purposes (e.g., park, cinema), a secure area for children to play freely (e.g., fences, guard post).

As indicated by children and young people, unaccompanied trips in affluent areas happened in well-provided and well-maintained environments, within or from their gated communities to other private spaces (e.g., school, shopping

mall), and similar to the experiences of Dutch children under the age of 12 in the city of Eindhoven (Krishnamurthy *et al.*, 2018). When travelling through main avenues, they described well-maintained footpaths and roads, abundant natural elements (i.e., grass, trees) and absence of potholes. Those avenues were populated with signalised crossings, mostly located at the street corners. Children pointed out that smaller streets often have well-kept zebra crossings and traffic calming measures (e.g., speed humps). Young people depicted in more detail those street environments, describing the road system and the road infrastructure that defines a route (e.g. traffic lights, road crossings, roundabouts), and the more complex stages of an unaccompanied trip, such as crossings where they must negotiate the space with vehicles.

In contrast, children and young people travelling accompanied or unaccompanied in the deprived areas described few large facilities (usually located outside their neighbourhoods), focusing on a few features (i.e., urban furniture, transport amenities, recreational facilities) and local stores attached to the houses of their neighbours that stand out in the plain urban setting (Table 5.2). Like their peers from wealthy places, children and young people described the presence of impermeable fences and walls, yet rarely mentioned natural elements. Behind the walls and opaque fences, children mentioned self-constructed houses of one or two floors. Children tended to highlight specific buildings and amenities that seemed to be relevant for their orientation. Those buildings included destinations for journeys (e.g., school, friend's house), a stopover in a long journey (e.g., shops), secure areas for children to roam free (e.g., squares outside facilities), a "safe point" in a dangerous place or in case of emergency (e.g., relative or friend's houses) and so forth. Young people travelling unaccompanied characterised their neighbourhood by pointing out places they could use for entertainment (e.g., arcade, football pitch), shopping and for accessing the wider city (e.g., bus stops). Children drew and mentioned playgrounds, squares or parks, multipurpose courts and other urban amenities. If available, these are seen as opportunities to stay in the public space and engage in recreational activities, as illustrated below:

Interviewer [I]: Do you like this place? (showing an image of a place with urban amenities)

Girl [G]: Yes.

I: Why?

G: Because, one can say, is a space that I can enjoy and have social life.

I: Why?

-
- G: Because it is a space... for example here you can see the existence of playgrounds, the [multipurpose] court [where] I can run and play.
- I: Why is that important?
- G: Because [...] it is a fundamental right that children enjoy. One cannot be in the school lessons the whole day or studying. We need to clear our heads up.

(Girl, 12 years old girl. Deprived area)

Children and young people argued that many of their trips happen in big avenues, with enough space allocated for motorised vehicles or public transport, but little for pedestrians. Children and young people depicted a hostile environment, with narrow footpaths with little or absent greenery. Other works have indicated that the limited space dedicated to pedestrians is an issue rooted in norms that favour the movement of cars and neglect active forms of travelling (Herrmann-Lunecke *et al.*, 2021). Smaller streets were described as having enough space for the movement of motorised vehicles, usually to the detriment of pedestrian infrastructure, and without demarcated crossings. Footpaths were characterised as poorly maintained, dirty and full of debris; meanwhile, the roads were also described as highly deteriorated elements, with potholes and damaged traffic calming infrastructure.

Children's experience: the sensorial elements of the built environment

Bourke (2017) reveal a sensory experience of children's trips in the form of sounds, smells, and observable and touchable features. The analysis suggested that the sensory experience of children and young people was linked to smells (e.g., air pollution), sounds (e.g., traffic noise) and the textures of the natural elements (e.g., bushes, flowers) available on the footpath. Elements visible from the public space also influence the sensory experience of children and young people. Those include natural elements (e.g. trees, bushes, flowers), urban furniture (e.g. streetlights, bollards, benches, playgrounds) and permeable facades (i.e. visible private property from the outside). Such findings are consistent with the conclusions reached by Bourke (2017) who suggest that children's sensory experience is, to different degrees, affected by sounds, smells, and observable and touchable features. Children and young people also felt upset when travelling and alluded to the importance of the maintenance of the physical environment as the elements listed above cannot be found in places suffering deterioration and neglect.

In deprived areas, the presence of rubbish, debris, vandalised urban furniture and other aspects of neglect were described as visually disturbing elements associated with bad smells. These aspects are also seen by young people as a “wicked circle” which prevents them from accessing better environments and features they like (e.g., trees cannot grow among rubbish) and a “normal” aspect of the places where they live. This is evident in the following quote:

Interviewer [I]: Do you like this place? (showing an image of her neighbourhood)

Girl [G]: It's where I live, I have to like it.

I: Why?

G: I mean... I would decorate it in another way, but it is beautiful.

I: How would you decorate it?

G: To be sincere the grass is ugly, not maintained. It's like [nobody] cares for it.

I: Why is the grass ugly? Is it not maintained?

G: Because there is no [grass] there. Sometimes [the lawn] is beautiful. Then you have a green area where you can sit and spend time...or something like that. It is better to have something.

(Girl, 15 years old. Deprived area)

Even more, children and young people in deprived areas expected to find neglected spaces and expressed similar concerns about having few opportunities to enjoy better places. These places are far from home or not available at all times (e.g., closed parks during the afternoon). Children and young people attributed this neglect to individuals or families who care little for the public space in front of their houses, or the community and the wellbeing of others.

Contrastingly, in affluent areas, well-kept footpaths, urban furniture and greenery composed of rows of tall trees, neat grass and bushes along the verges and gardens were described by children and young people as beautiful and also pleasing to the touch. For young people, the good quality of these features is the “standard condition” of the places where they play and travel unaccompanied every day. However, they also suggested that parks and gardens can be used by “others” taking a nap or drinking alcohol, which can prevent them from obtaining the greatest pleasure from the features of the environment. They had normalised “immaculate landscapes” and showed concern about aesthetic decisions (e.g., type of facades) and situations (e.g., lack of maintenance) that could be detrimental to their joyful normal experience. As this quote shows:

Interviewer [I]: Do you like this place? (showing an image of a deprived neighbourhood)

Boy [B]: Not much because it has papers and litter on the street, [...] is not like the neighbourhoods up here, I mean I think that is because the people don't respect the cleanliness of that place and don't have enough money to buy a car like we have [...]

I: Why is the cleanliness important?

B: Because it looks nice.

I: Why is important [for a place] to look nice?

B: Because if [a place] is clean and looks nice is like "oh, I would like to be here because is a nice place where my son can play without finding litter or rats"...

(Boy, 12 years old. Wealthy area)

Similarly, the carers commented that pleasant experiences on an accompanied or unaccompanied trip may be reduced by debris from local constructions, utility poles or inappropriate selection of trees (e.g., palm trees) that menace the positive visual aesthetic appreciation of their neighbourhood.

The young people residing in wealthy areas expressed the tension of a potentially gratifying experience of walking or cycling unaccompanied being adversely affected by the externalities caused by traffic. They described that the experience of moving on footpaths beside main roads and avenues may be greatly affected by noise and pollution from vehicles; issues exacerbated on congested roads. These accounts are consistent with the findings of Evenson *et al.* (2006), who indicate that walking or cycling trips are less likely to occur in places with exhaust fumes and bad smells, and Bourke (2017), who points out that the noise of a local tram could be irritating. To avoid these nuisances, young people make decisions about their route when travelling unaccompanied, preferred smaller roads with occasional traffic, with more scattered greenery to enrich trips.

Environmental cues for risk

Notable elements in the environment were often described as cues to infer the social qualities of a space. Local facilities, from small shops to street markets, schools, universities, shopping centres and health centres, enriched their public life and indirectly provided a "safer" space for children and young people travelling unaccompanied. In children, young persons and carers' arguments, the presence of facilities induced movement, attracted neighbours (in the case of shops) or "not dangerous" strangers (in the case of larger facilities) to the public space and put eyes on the street. Similar to the

“natural surveillance” suggested by Jacobs (1961), Gehl (1987) and others (Appleyard *et al.*, 1981; Whyte, 1988), more eyes may control wrongdoers and inhibit harmful actions towards children.

The participants in affluent and deprived areas had similar interpretations of facades as a dual and contradictory feature. For children and young people staying inside, tall fences and walls were preferred as they can create a highly controlled space, preventing potential aggressors from entering. However, for children and young people travelling unaccompanied on the streets, carers preferred low fences and walls. Permeable facades allow surveillance of the public spaces from the private property and are signs of families or communities that do not feel threatened by wrongdoers. Carers argued that over-protection is a reaction to the threats present in the streets; a sign of families that have abandoned the public space, or access it under conditions that increase their safety (e.g., guards). Spaces surrounded by fortified houses are no places for children to roam free:

Interviewer [I]: Do you like this place? (showing an image of an affluent neighbourhood)

Carer [C]: Yes, it looks like a relatively calm street... it is not covered in fences. When you put more security in your house is because the neighbourhood is not good.

I: Then, is this neighbourhood calm because it is not so “fenced”?

C: Well, when someone secures his/her house, they first built a gate [at the end of the front garden] and cover it with a roof to close even more the space [...].

I: Would you let your girl walk unaccompanied through that place?

C: Yes... maybe.

(Carer of a 11 years old girl. Deprived area)

Carers had similar interpretations about the places used by parked vehicles, suggesting that those parked on the street or inside private properties with low fences only occurred in safe neighbourhoods, with few or no cases of theft.

The participants considered the lack of amenities, deterioration, neglect, vandalised places as signs of weak communities and neighbourhoods which were left behind, and provoked sadness and despair as also noted by others such as Bostock (2001), Benediktsson (2018) and Figueroa *et al.* (2019). This understanding has further implications for those living in deprived areas, as the low level of maintenance of public space was seen as a direct

consequence of the confinement of families and communities in the private property. Communities that left the public space in the hands of wrongdoers (e.g., drug traffickers, consumers) and would not offer support to a child in danger and places where there is a high chance of being involved in an incident (e.g., shootings, attacks from drug addicts). Like this participant asserts after seen the image of a deprived neighbourhood close to her home:

Interviewer [I]: Do you like this place? (showing an image of a deprived neighbourhood)

Carer [C]: This street corner is close to our house... it is ugly, it was always dirty...if we don't clean, nobody does...and since we start working, it is always crowded with people consuming drugs. At this hour, for example, there is always people consuming drugs, young people...and here [nobody] takes care of the grass and trees

I: Why do nobody take care [of the greenery]?

C: Because nobody cares about this piece [of the neighbourhood], because [the neighbours] have an auto and an old woman live in that house [...]

I: You are the only ones that take care of that place?

C: Yes, fighting [strangers] and all that.

(Carer of an 8 years old girl. Deprived area)

Children, young people and carers in wealthy neighbourhoods had similar interpretations about the level of maintenance of the places. They tied the neglect and the lack of maintenance of the spaces with socially deteriorated neighbourhoods. Unaccompanied and accompanied trips in their neighbourhoods occurred in well-kept and constantly maintained spaces. If noticeable signs of deterioration and neglect existed (e.g., rubbish), those were described as the wrongdoings of young people, young adults and outsiders with behaviour and activities (e.g., alcohol consumption) that conflict with what they expect in the public spaces.

Young people and carers from wealthy areas identified further signs of risk in the most "public" features of the environment like those open to the public (e.g., parks) or those that connect the neighbourhood with the wider city (e.g., bus stops). These attract a variety of people into the neighbourhoods who, with different socio-cultural backgrounds, may not know the social norms while jeopardising the area by "bringing" urban violence with them. Like this girl comments about walking back home:

Girl [G]: For example sometimes...[the walk back home] may be insecure as when I go by...like walking by the bus stop... some people may be there, you know? I feel very unsafe.

Interviewer [I]: What kind of people make you feel unsafe?

G: Men that, I don't know, generally them [...] generally men ... women don't make me feel [like that]...I believe I can defend myself from a woman but not a man.

I: That [perception] is along the whole route or only close to the bus stop?

G: No, only close to the bus stop...

(Girl, 14 years old. Wealthy area)

Traffic-related features: the spaces of children and cars

The carers indicated that a large part of the space of the streets where children and young people travel unaccompanied is dedicated to motorised traffic. They argued that streets of their neighbourhoods are primarily designed for the fast movement of vehicles in detriment of the spaces required for slower mobilities (e.g. footpath, cycle lanes). As widely recognised in the literature (Mitra, 2013; Smith *et al.*, 2019), these car-centric conditions increase carers', children's and young people's concerns and fears of road accidents. Fears were more prominent on main roads, as fast cars move beside large vehicles like buses and lorries, similar to the barriers (high traffic and high speed) for active trips identified by Palma *et al.* (2020). In particular, children in deprived areas struggled between choosing to travel accompanied or unaccompanied on scary main roads and local roads which usually consisted of a paved surface shared between motorised transport, pedestrians, cyclists and children playing. These concerns are illustrated by the carer of a child of ten years old:

Interviewer [I]: When the child walks unaccompanied or with someone, what are your worries about the streets?

Carer [C]: You have to walk on the road because footpaths are small, or the dwellers extend their gardens [to accommodate cars] and things like that. He can walk on the footpath, [but] he must walk on the pavement to go to the school and the multipurpose court. To [go] to the [local social centre] is the same.

I: Why can you use the roads and not the footpath? Fewer cars going through there?

C: No, cars go through the street, and you have to be careful, you have to be aware. In fact, [name of child] cannot come home unaccompanied. Sometimes cars run [fast], the motorcycles do not respect [pedestrians].

(Carer of a 10 years old boy. Deprived area)

Carers and young people were afraid of the phenomenon of stray cars which they linked to the networks of drug trafficking that have gained power in recent years. Cars running fast, respecting little those present in the streets, losing control and deflecting onto footpaths, have increased carers' fears and has reduced further the area within which children can roam freely.

Moreover, children and carers in deprived neighbourhoods pointed out that parked vehicles often invade pedestrian spaces. Children "navigate" among cars, if they have enough space on often narrow sidewalks. If the route is blocked or the space is insufficient, they are forced to occupy the roads and negotiate a space that is unsafe and not designed for that purpose:

Carer [C]: One has to walk on the road because the footpaths are too narrow, or the people (homeowners) occupied the footpath [with extensions of the house like] gates and [other] things. You can't walk on the footpath, you have to walk on the road when travelling to the school and to the multipurpose court...or to the neighbourhood assembly building [...]

Interviewer [I]: Why can you use the road? Are there fewer cars?

C: No, many cars use this road, and you have to be careful. You have to be watching [any approaching car]. In fact, my son can't walk back home alone.

(Carer of a 10 years old boy. Deprived area)

This issue was also observed by a boy in a different deprived area:

Interviewer [I]: Do you like this place? (showing an image of a deprived neighbourhood)

Boy [B]: To some degree

I: Why?

B: Because here you can see a car and that is the space for pedestrians...[the car] should be inside the house or not there at all...

(Boy, 11 years old. Deprived area)

In wealthy areas, carers also mentioned "stray cars", describing them as vehicles moving fast or erratically (e.g., reversing in a one-way road), yet making no references to drug trafficking. They described that a street network of wide, long and mainly straight roads, favours reckless driving and instead preferred narrower streets where they think their children and young people would face fewer risks when travelling unaccompanied. The carers also expressed concerns of curved roads, those with limited visibility for drivers. However, they pointed out that those risks can be counteracted by traffic calming measures (e.g., speed bumps), as also pointed out by Panter *et al.* (2010a).

5. 2. London

5. 2. 1. The schedule: A child's typical day

In a typical week, child and young person participants described similar travel patterns for the school trip. These occurred in the morning and are, for most of the children, accompanied journeys. Joined by their carers or siblings, children usually walk or cycle, travelling in a private vehicle or by public transport for schools located at a further distance (between 2 and 14 kilometres). Using similar travel modes, young people generally complete trips unaccompanied or accompanied by friends. However, a few of them are accompanied by an adult for a section of the journey. To reach secondary schools, located in distant places, they usually combine a couple of travel modes on their routes, that is, a walking section and another part completed either on public transport (as also observed by Goodman *et al.*, 2014) or by chauffeured trips.

After classes, children's journeys consist of a trip from school to their home or another place, or a trip with multiple purposes that link several activities (e.g., shopping). Adults usually escort younger children when walking or cycling, replicating the travel mode used from home to school. After reaching home, some children start new journeys to visit the doctor or to carry out other activities (e.g., swimming, dance classes). Others link the trip from school to home to visit to a local park or a shop on the route. In all those trips, children are accompanied by an adult for the trip back home, particularly when the journey occurs in the hours in which natural light is scant. On the other hand, young people travel from school to home walking or using public transport unaccompanied or accompanied by friends. They often perform another trip after reaching home, this time to an afternoon activity (e.g., scouts, sports club) or to meet friends at a park. Depending on the location of the afternoon activity, young people (walking, cycling or taking a bus) travel unaccompanied or accompanied by an adult.

Children and young people's weekend activities usually are a single home-based round trip for recreation and shopping purposes. When travelling accompanied by carers and siblings, children participants usually visit museums, parks, churches or new neighbourhoods in the city. They walk and cycle a section of the trip or ride public transport (buses or the underground) to reach places located at significantly further distances from home. Children who play in a school team (e.g., soccer) or take artistic lessons (e.g., piano) are, most of the times, accompanied by the carers to the place of the activity, generally located at walking or cycling distance from home. In contrast, young people enjoyed more independence compared to their younger

peers. They walk and ride public transport services unaccompanied or with friends around local destinations, like shopping districts, parks or to other commitments (e.g., sports tournament, scout camp), with rare supervision of carers in their journeys.

Similar to participants from Santiago, children and young people from London selected their “favourite trip” (Table 5.3) mentioning if they travelled unaccompanied or if an adult or friend accompanied them. They were asked to describe the origin and destination, the travel mode, and the features that caught their attention on the route when completing the favourite trip. Most of their favourite trips are the weekday trip to/from school or to a recreational activity which children and young people described as “exciting”. A few of them walk or cycle along the whole route of their favourite trips, whereas the majority combined more than one mode, walking a section of the trip and riding public transport services to complete the trip. A few participants travelled accompanied by the carers in a private vehicle for the whole route. In those cases, the carers highlight the convenience of using cars to cover long distances. All children completed their favourite journeys escorted by an adult, while young people travelled unaccompanied or shared a section or the whole route with a friend.

Table 5.3. Children’s ‘favourite trip’ per purpose, company, mode of transport, gender and age in London.

Age	Gender	Trip origin	Trip destination	Mode of transport	Trip companion
6	Girl	Home	Swimming pool	Walking and public transport	an adult
6	Girl	Home	Swimming pool	Walking and public transport	an adult
6	Girl	Home	Day care	Cycling	an adult
6	Girl	Home	Church	Cycling	an adult
6	Boy	Home	Park	Cycling or private vehicle	an adult
7	Girl	Home	Playground	Walking	an adult
7	Girl	Home	Tourist attraction	Public transport	an adult
7	Boy	Home	Swimming pool	Walking	an adult
7	Boy	Home	Football pit	Walking	an adult
8	Girl	School	Home	Walking	an adult and a child
8	Boy	Home	Swimming pool	Cycling	an adult
9	Girl	School	School	Cycling	an adult
9	Girl	Home	School	Walking or scooter	an adult
9	Girl	Home	School	Walking or scooter	an adult
9	Girl	Home	School	Private vehicle	an adult
9	Boy	Home	Park	Cycling	an adult
9	Boy	Home	Home	Cycling	unaccompanied
10	Girl	Home	Home	Walking	unaccompanied
11	Girl	Home	Park	Walking	another child
11	Girl	Home	School	Walking or scooter	an adult
11	Boy	Friend's home	School	Walking and public transport	another child
12	Boy	Home	School	Walking	unaccompanied
14	Girl	Home	Shopping area	Walking and public transport	unaccompanied
15	Boy	Home	School	Walking and public transport	an adult
15	Boy	Home	School	Walking	another child

Sample size: 25 participants.

Source: author's own

5. 2. 2. Children's mobility

For children in London, travelling is, in different ways, shaped by the weather, the distance to the destination and the time of day. Participants indicate that rainy or cold days make walking and cycling a difficult activity. Cold days make children uncomfortable; whereas during rainy days, the conditions of the surfaces change (e.g., slippery paths) and there is a risk of becoming wet and, ultimately, sick. They also mention the location of the destination as an element that may condition a journey, with further distances requiring children and young people to cover longer lengths. Furthermore, the participants prefer to travel during daylight hours because, as many other authors have suggested (Jarret, 1997; Bwire, 2011; Saraví, 2014; Chaudhury *et al.*, 2019), the night-time is linked to more uncertainties and risks.

Further constraints on children and young people's mobility involve the physical elements of the streets, from paths bordering roads with traffic, facades with storefronts, houses and walls, to the virtually boundless spaces of parks with greenery, playgrounds and urban furniture. Travelling accompanied or unaccompanied occurs in contrasting places, like quiet residential areas characterised by scarcely populated streets, or busy streets crowded with people, activities and vehicles. It happens in specific and recognisable areas with distinctive features or homogeneous neighbourhoods lacking notable sights. Children and young people in the city need to master a number of skills to be able to travel in such a diversity of places, as other authors suggested decades ago in the UK (Valentine, 1997a, 1997b; Milne, 2009).

Children and young people describe the streets as endless spaces for recreation and pleasure. They carefully observe the attractive features that are present in the places they cross (e.g., trees, ornamented facades, store windows). Children also play games and create competitions (e.g., running) if they travel accompanied. Some authors argue that the idea of safety in numbers can reduce carers' concerns and restrictions regarding children's play on the route (Holt *et al.*, 2015). This, along with spaces that are not necessarily limited, bounded and specifically designed for games, can encourage running competitions, imaginative activities and other games that enrich children's travels (Tonucci, 2005; Witten and Field 2020).

Children and young people interact with the acquaintances (e.g., chat, play) they encounter along their accompanied or unaccompanied routes and observe the manners and behaviours of the strangers that are present in the streets they use. However, their relations with the environment occur under

the apprehensions and the restrictions imposed by carers (Valentine, 1997a; Horton *et al.*, 2014).

Children growing up are taught the acceptable behaviours and the judicious interpretations of the public realm. As they become older, their ideas and actions of the respectful manners and the potential dangers of the streets (e.g., stranger danger, traffic danger) converge with those developed by the carers. In particular, through this constant teaching process, carers instruct children on how to share the footpath with others, managing their speed while riding a scooter, walking or running, adjusting their actions to changing environments and restricting any game that could disturb a stranger. These findings are consistent with the work of Witten and Field (2020) that suggest that children learn to assess risks and make decisions when exploring the cities. Children's education also involves guides on how to recognise a potential conflict with strangers on the route (i.e., stranger danger⁴) and safely avoid or resolve it. Instructions beforehand include actions such as avoiding eye contact, not talking with strangers, modifying their route (e.g., crossing to the opposite footpath) or riding a bus to bypass an unsafe section of the street. If a conflict is inevitable, carers' strategies transmitted to children include leaving a particular area, seeking help from others who could be trustworthy (e.g., people in uniform, senior women), or immediately reaching them using a mobile phone.

From a carers' point of view, children, primarily the younger ones, are unpredictable and inexperienced travellers, who recklessly rush or play on the footpaths without an adequate judgment of the risks (e.g., moving vehicles). The instructions given to children also seek to transmit the risks of travelling near moving vehicles and not trespassing into car lanes. During the interviews, carers indicated that they train children to restrict their actions to the borders of the footpath. At road junctions, the instructions refer to stopping and waiting for the green traffic light or a carer before crossing the street.

Carers test children and young people's learnings in a number of situations⁵. In a gradual process of gaining independence, children and young people are allowed to go unaccompanied to the school or to a local store or landmark. If they demonstrate that they know what to do to manage the risks found in the public realm, carers may grant more permissions for different trips in which children may travel alone or be accompanied by friends or peers:

4 The awareness and fear of risks posed by strangers who may molest, harm or abduct the child (Valentine, 1997; Moran *et al.*, 1997; Suess *et al.*, 2020)

5 Teachers also instruct children with practical training (e.g. walking around the school, cycling lessons), teaching norms and adequate behaviours on the streets as part of school lessons.

Carer 1 [C1]: So, as [older daughter name]'s gotten older, she has requested more independence, and she wants to be trusted. I think you let her go off and do these small trips by herself way earlier than I would have, because I was more like... but you had a lot of trust in her, and over time she has proven that that's absolutely fine. She's an extremely mature and sensible kid, and she also has a hint of her own internal fear that keeps her smart, and sensible, and safe. [...] So, for example, in the summer time, when it's daylight out, she's quite happy to go to the shop, but in the autumn time when it gets darker out, she does not want to...

Carer 2: She's less keen to do it by herself.

C1: So, she has her own internal sense of when she wants to do these things and not. Now, the twins, on the other hand, are only six... Up until they were about three, we would be out there with them. It's only over the last couple of years that we've let them navigate the square themselves with their friends. I think it's more [than] just an age thing, and the fact that they don't know the neighbourhood maybe as well as [older daughter name] yet. They definitely can make sense of it. I'm sure, if they were on their own, they would be able to get here. But I think that they're not confident in their own navigating skills yet.

(Carers of two 6 and one 9 years old girls)

Permissions were mentioned frequently in the carers' answers. They conceptualise these as authorisations for journeys with particular conditions (e.g., time of the day, company, travel mode) within legal and social norms, physical and relative limits, among other contingent circumstances. Regarding legal norms, participants indicate that children left alone could be considered an offence according to the UK legislation. Nonetheless, the law considers this to be an offence only if a carer leaves a child alone in risky places (UK Government, 2020), without specifying the age and period of time that a child can be on their own; they must use their judgment before taking the decision to leave them alone. Most adult participants judge that their child of twelve, or close to that age, had the maturity to be left alone at home and to travel unaccompanied to other places, corresponding to the NSPCC⁶ (2020) suggestions about the age that a child is able to look after themselves. The carers refer to equivalent norms from primary schools that limited or prohibited a child from travelling unaccompanied to the educational institution, considering this journey to be risky for young and inexperienced

6 National Society for the Prevention of Cruelty to Children.

children. This restriction may be lifted if a young child has older siblings in the same institution who can accompany them.

Regarding the physical limits of permissions, participants define them as the distance (or area) that a child or young person is authorised to travel unaccompanied or accompanied by another a friend, delimited by a built or a natural feature in the area (e.g., landmarks, avenues), contingent to the existing features available in the area. For instance, participants point to artificial landforms (e.g., canals), mobility-related features (e.g., roads, bridges, train and underground stations), facilities (e.g., shops, church) and parks as the current features that delimit children's permitted area. On average, the available area to travel unaccompanied covers 0.04 square kilometres for children (6-10 years old) and 0.8 square kilometres for young people (11-16 years old) as obtained from the maps drawn by carers.

In addition to physical limits, carers suggest relative borders that may restrict further the areas in which children and young people are allowed to travel alone. These are related to the ability of a child or young person to guess their position and the location of their home at all times. According to carers, children acquire these skills by travelling frequently throughout the neighbourhood and to distant places with adults who help them to identify distinctive elements and local safe spots (e.g., friend's house). Furthermore, some carers rely on technology as a support tool. They use software like Google Street to instruct young people on how to navigate around a particular place in the city. Others equip young travellers with mobile phones that can be used to notify carers when reaching the destination or in case of distress. Devices with features that can distract children or make them a target for mugging are described as prohibited.

As expected, the physical boundary can also be expanded if the child or young person is travelling accompanied with relatives or another child. Carers were more willing to give more independence to a young person travelling with friends or another adult as, in their view, a larger group reduces the chances of something bad happening.

Some scholars have found that many children and young people challenge adult judgements by demonstrating that they have the required maturity and skills to complete an unaccompanied journey, or by travelling beyond the limits of their permissions (Valentine, 1997; Crawford *et al.*, 2017). Those studies are contested (see Horton *et al.*, 2014), as also found in this research where child and young person participants seem to accept the permissions

given by carers without trespassing given boundaries⁷. The analysis does not show evidence of children actively demanding more licences to travel alone, further or in a different trip mode. Child and young person participants expect that more permissions to travel unaccompanied would be granted by carers as needed, as they grow up and acquire the needed skills.

5. 2. 3. The social environment

The participants indicate that carers and teachers taught children how to recognise a potentially threatening stranger and avoid a distressing situation. The analysis suggests that children and young people are trained to deduce the risk that a stranger might represent using “shortcuts” such as observable characteristic (e.g., age range, gender), actions (e.g., walking, screaming) and attitudes (e.g., kind, glum). In a constant process of transmission of apprehensions from adults to children, the mentioned shortcuts tend to coincide more between carers and young people. Those shortcuts are illustrated by this girl:

Interviewer [I]: Why can't you go inside a store?

Girl [G]: Because someone could try to do something to me.

I: Who are they?

G: They can be... I don't know ... when I see them [I know], but I can't describe them.

I: What do you watch in a person that could do something to you?

G: I focus on how they stand, what do they wear.

I: What do they wear?

G: For example, if we are going to the school, people go to work and buy something in the store, so there aren't many people. But if someone walks peculiarly, uses shorts or is without warm clothes, I wouldn't talk to them.

I: Why?

G: Because mornings are cold, and it would mean that they were outside for a long time and... I don't know, and I don't care because I wouldn't talk to them.

(Girl, 11 years old)

The meaning of each shortcut largely depends on what the participants understand as “normal” and the level of familiarity they have with a particular area. In well-known neighbourhoods, the participants expect to find children and young people engaging with other people like holding a conversation with

⁷ This result may be the consequence of a child not wanting to admit to doing something unapproved because carers were present during the interview.

a storekeeper or greeting a neighbour (as also observed by Crawford *et al.*, 2017). The presence of those individuals was also pointed out as desirable from carers' perspective because, through them, children assimilate social norms and codes, discriminate appropriate behaviours to be in public and learn how to share the limited space of the streets. As this young person asserts:

Interviewer: How is someone [acting] normal?

Boy: Minding their own business...not like being loud or whatever. [...] It's, like you don't just crowd around the pavement like if you're with friends you don't just take up the whole pavement. You like to be aware of your surroundings and other people who're around you

(Boy, 15 years old)

Contrastingly, the participants expect strangers' behaviours in non-familiar environments to be generic (common people "minding their business"); odd actions like loitering or disturbing passers-by (e.g., screaming, begging) may be a sign of danger. After talking about dangerous strangers, this carer described an "odd" behaviour:

Carer: I think that person would be less interested in their own business. They wouldn't be on their phone. They wouldn't be with a friend chatting. They would be looking and looking for potential people to rob or... So, I would look for that. I would look for body language, I would look for, "What are these people doing? Are they just sitting there? Why are they just sitting there if they're not on their phone? Are they meeting somebody?" You know, it's just... It's instinct that you get. [...] you can feel the energy and feel, "Do they have something that they're going to or are they just waiting and watching?" So, waiting and watching is what I look for.

(Carer of a 15 years old boy)

These interpretations generally refer to daylight hours as participants perceived the night as a natural amplifier of dangers (as also suggested by . Saraví, 2014 and Chaudhury *et al.*, 2019).

Finding support in familiar areas

The participants indicate that the local community (mostly the neighbourhood of residence and the school vicinities) plays a key role in children and young people's lives. It offers support in numerous ways (e.g., help in case of distress) and enriches their everyday activities (e.g., social interactions) and

accompanied or unaccompanied trips. Children meet the community in the streets and other local spaces (e.g., squares) as they become acquaintances with its members, interacting, for example, with storekeepers or other children, they develop social skills like communication with other people, build self-confidence, respect others' personal space, among others. Other scholars (Crawford *et al.*, 2017) also have reported that children feel safer when travelling in areas where they know the adults they might encounter. Furthermore, in the carers' narratives, the community has a prominent place in children's learning processes and, therefore, being in contact with it is desirable and encouraged.

The community can also secure the spaces where children and young people linger and travel. According to carers, its members, particularly seniors, greet children, watch the spaces, and, by doing so, are "eyes on the street" as described by Jacobs (1961) and others (Appleyard *et al.*, 1981; Gehl 1987; Whyte, 1988). The natural surveillance of the community can have an extended range, reaching and securing large parks and busy commercial spaces in the neighbourhoods that children and young people visit alone. Furthermore, people in the community can become "beacons" in the neighbourhoods; the places they inhabit (e.g., houses, facilities, footpath) are often characterised as landmarks and safe havens where children and young people can shelter in case of need. A 'good' community, as discussed by the participants and suggested by the literature (Visser, 2019; Porter *et al.*, 2020; Wales *et al.*, 2021), may encourage children to complete unaccompanied journeys:

Carer: I mean, obviously we know our neighbours, and that's great, and that's important for, you know, your sense of community and feeling that they'll be, kind of, looked out for by other people. Yeah, and also knowing, as you walk along, these houses that are your friends' house, or somebody from church, or... You know, that if you were alone, you could go to these houses. [...] Having people you know, and knowing where their houses are, would make it better if they were independent.

(Carer of a 6 years old girl and an 8 years old boy)

The above carer is also put this into practice, creating a sense of community as the son comments:

Interviewer [I]: And do you saw any strangers in the street?

Boy [B]: Yes. Sometimes mum makes friends with them... because there was an old [person] [...] A black man in the street one day, and he kept on staying there, and mum kept, um, stopping to say hello...

I: So, they are friends of your mum?

B: Yeah, and he says hello to me as well, and [name of his sister].

(Boy, 8 years old boy)

The participants suggest that two types of strangers can be found in familiar areas: frequent strangers and outsiders. Frequent strangers, and similarly to Paulos and Goodman's (2003) definition, include people with noteworthy physical characteristics (e.g., a senior woman with a beautiful bag), performing everyday activities such as waiting at the bus stop or walking the dog every day at the same time. After a child or young person sees them on a couple of occasions, these strangers become predictable and known faces. Outsiders are those who visit familiar areas for leisure or touristic reasons. Participants indicate that, in contrast to frequent strangers, outsiders do not follow regular patterns. For instance, outsiders are families having lunch or cycling in parks (e.g., just the weekend, some days of the week), or tourists meandering in daylight hours, looking distracted and asking for directions around points of interest. For children, young people and carers, these strangers still may secure the space for a child's journey, whilst potentially being a nuisance for children and young people by competing for the limited public space. The regularity of encounters with these strangers can be observed in this child's quote:

Interviewer [I]: Thinking on the people that you see when you go out, when you walk in the streets, who are these people that you may encounter?

Boy [B]: Strangers, sometimes I see familiar people from who I don't chat to, but I recognise them.

I: What are they doing, these people doing?

B: Walking to school, on their phones, chatting.

I: What do you think about them?

B: I don't notice them really, I just... it's normal.

(Boy, 11 years old boy)

The figure of the "stranger danger" (Valentine, 1996; Francis *et al.*, 2017) emerged several times during the interviews. Carers point out two forms in which strangers might represent a threat: unwanted interactions that may disturb a child or young person and the appropriation of public spaces. Regarding unwanted interactions, strangers approaching a child

are promptly related to stories of children persuaded to accept poisoned candies or fooled to get into their vehicles. Adults, young people and children participants share these beliefs, but none had (or knew someone who had) an experience of such nature. Concerning the appropriation of public spaces, the participants assert that the strangers who occupy footpaths and parks can be discourteous and unkind, restricting the actions of children, and young people in particular, when travelling unaccompanied. They add that those behaviours are most likely to be observed in groups of strangers gathered at blind spots (e.g., bottom of the road, hidden areas, alleys) without an apparent purpose. Carers argue that those groups projected a “loitering vibe”, could be trafficking or consuming drugs and alcohol, and could create complex situations and hostile environments for children and young people. Interestingly, these perceptions depict generic people with no distinctive or easily recognisable features. This indicates that, for the participants, anyone congregating in the public space is a potential threat. Similar to the findings of several authors (Foster *et al.*, 2014; Schoeppe *et al.*, 2015; Wolfe and McDonald, 2016; Francis *et al.*, 2017), the data also suggests that the concerns about stranger danger are more present in the narratives developed by carers.

Coinciding with several authors (Matthews *et al.*, 2000; Valentine, 2008; Milne, 2009), the fear towards groups of people tends to be more acute if those include teenagers. Carers fear that teenagers may intimidate or harm children and young people by bullying or assaulting them even with knives. They point out that there are disobedient and “bored” adolescents, sometimes coming from a “good family” upbringing, that might attack another child or young person with the sole purpose of having fun at their expenses:

Interviewer [I]: Can you go a bit deeper on why wouldn't make you nervous, these areas where he moves?

Carer [C]: What would have made me nervous is if there are a lot of teenage boys with not enough to do on the street. [...]

I: Can you describe me how are these teenagers that could be annoying, in a sense, during his trip, or could make you nervous during his trip?

- C: I think they would be on [close road name] certainly and even back and forth to Scouts. There are kids who are, not necessarily bad kids, but they're teenage boys, and I think teenage boys are always a little bit dangerous, even from excellent families. They have a lot of energy and they like to make things happen, and sometimes they will make things happen in a not good way. So there are kids certainly who have less advantages [...] there are boys who, you know, see somebody using a nice phone, they want to grab it. See somebody who is maybe vulnerable, they will take advantage. And that's the problem.
- I: What are these kids doing in the street or in the public spaces? Because they can do that stuff, but when they gather around what are they doing?
- C: They're enjoying themselves. They're with their friends. I don't think they're criminals. [...] I think that they're boys that are bored and... they're not playing a sport, they're not... doing an activity, they're not doing school work, they're just... They're out. They're bored. They're looking for something to do.

(Carer of a 15 years old boy)

Child and young person participants share the concerns expressed by their carers; adding that teenagers should also have a civilised behaviour. The analysis indicates that children see teenagers as an “example”; as individuals who should actively engage in healthy activities while being respectful to other people present in the public realm. The contrary case, that is, teenagers eating ‘unhealthy’ fast food (e.g., fried chicken, chips), holding loud conversations and annoying people on the streets, is strongly disapproved by children:

Girl [G]: Oh, I hate that one. Because there's a school. [...] It's like these secondary children, hundreds of them, maybe thousands, and every day they're just, like, talking. When I come back from school they're talking, and they have, like, ice-creams, or smoothies, or... There's this thing... There's this shop called [name of the fast food restaurant] just opposite, and it's like, it has this unhealthy, disgusting chicken, and with chips, and it's very unhealthy for them, and they just keep on eating it. Once, I saw, like, this humungous row of the children queueing up to just get a chicken with chips and ketchup. And that happens every day.

Interviewer: Why don't you like that?

G: Firstly, they're not eating... They're eating unhealthily. Secondly, just... It feels weird, just loads of children just chatting very, very, very loudly, and thirdly, they act like they're really cool, like they're adults, and that they get their own phones, and they get this, and they can do whatever they want.

(Girl, 9 years old)

Carers put into practice several strategies to prevent potentially undesirable encounters with teenagers, such as accompanying a child on their journey or instructing young people to avoid streets in which a “gang of teenagers” usually gathers. Those strategies are progressively transmitted to children whose apprehensions grow as they become older. Moreover, much of the fear towards teenagers seems sustained rather on a broader phenomena of distrust than on personal experiences (i.e., a cultural narrative of distrust towards teenagers, see Matthews *et al.*, 2000; Valentine, 2008; Milne, 2009). Referring to hostile encounters with teenagers, only a few participants remembered a threatening experience. Others commented on what they saw and heard from the news and word of mouth.

In contrast to threatening strangers, women and people in uniform are often described as safe beacons for children and young people travelling unaccompanied in familiar and non-familiar environments. If in distress, a child or young person may ask for help from officials and professionals such as police officers or doctors, easily recognisable by their uniforms, or managers inside facilities like supermarkets. In gendered patterns, carers advise children to look for help from women, preferably one on a uniform, with a stroller or pregnant. This gendered perspective seems to reproduce the belief that women are less threatening and more sensitive than men concerning a child in trouble:

Interviewer [I]: Which advice do you give her or them [when going out unaccompanied]?

Carer [C]: [...] You can tell who's safe. Oh, I know what I tell them. I tell them, “If you get scared, lost, separated, freaked out, find a woman, preferably with a uniform one, somebody who works in the store or somebody who will take you on, borrow their phone and call me. But a woman. Go find a woman in a... In a uniform.

(Carer of a 10 years old girl)

Identifying potential threats in unfamiliar areas

As detailed earlier, children and young people deduce from the physical environment the risks and threats they might encounter in unfamiliar environments (see Section 5.2.4); following a similar procedure, they also evaluate the observable characteristics of the individuals present in the public space. Those characteristics constitute a broad repertoire that children and young people use to navigate, interpret, understand, find comfort and, principally, discard any threat when travelling unaccompanied through unfamiliar areas.

Assumptions about people often are simplistic relations that tie well-known occupations or activities with outfits (e.g., school child wearing a uniform, office worker carrying a suitcase, commuter waiting for the bus, a shopkeeper selling goods). Providing more details, the participants, and especially young people, link particular clothes with socio-demographic aspects like income (e.g., aristocratic people wearing jewellery, high heels or ties, poor people in dirty clothes), gender (e.g., women in dresses, men in suits), religion (e.g., hijab), disability (e.g., cane, wheelchair), job or activity (e.g., formal outfit of business people, a tourist with cameras). Individuals wearing “generic” clothes (e.g., jeans) and accessories are categorised as “normal” people. As in familiar environments, carers advise children and young people to look for help from adults wearing uniforms (e.g., police officer) and women if they feel distressed. When asked about the people in a new street, this girl comments:

Interviewer [I]: Do you like that place?

Girl [G]: Yes

I: Why you like it?

G: Because there's trees with flowers. The houses are lovely made. The road... The cars are very nicely put into, they're not wonky. The gardens, they take care of them.

I: [...] Who you think you will see in a place like that?

G: Maybe a bit aristocratic people.

I: How are these aristocratic people?

G: [...] Well, aristocratic ladies, they will wear these fluffy scarves, a dress, some high heels, and they'll just be walking. [...] They'll be standing up straight. They won't be looking at their phones or something. And aristocratic men will be wearing ties, or normal men, just without headphones, just wearing ties, a suit, holding their bag and walking proudly to work.

(Girl, 9 years old)

Furthermore, clothes may also carry preconceptions, especially for a child and a young person travelling unaccompanied, as this carer illustrates about an unfamiliar street:

Interviewer [I]: Would you let your son go alone through that place?

Carer [C]: Yes, I would.

I: Why?

C: There are people out. It does not look... I see no graffiti... The building is well kept. [...] The people that are in the picture look middle class. The guy has a suit on. The girl has a nice look. Not that that really makes a difference, but that sort of lifts the confidence a little bit.

(Carer of a 15 years old boy)

Other cues described to identify potentially threatening individuals in unfamiliar areas consider a mixture of characteristics, such as gender and age (e.g., a family cluster with an adult man, a woman and a child), the density of people in an area (e.g., young professionals occupying crowded streets); and, as discussed in Section 5.2.4, the characteristics of the built environment (e.g., a congregation beside a church, people in a well-kept street). For instance, strangers present on aesthetically pleasing and clean streets, with beautiful facades, and dressed in colourful clothes⁸ are more likely to be wealthy and less likely to represent a threat. In contrast, people in dusty footpaths and uncared facades and wearing dirty or damaged clothes represent an imminent risk. In both examples, the combination of a particular environment with certain characteristics of the individuals either magnify or significantly reduce the participants' apprehensions:

Interviewer [I]: What do you think about that place?

Carer[C]: It seems much scarier, because there's no commerce, there's no stores, there's no park, it's just these houses, and it feels barren, and it feels a little bit empty. It just feels like there's nobody in this entire side of the block. There's a couple people here. Yeah, that feels a little bit desolate, a little bit isolated. [...]

I: Who do you think use that place?

⁸ Counter-intuitively, a few children participants examining black and white images indicated that strangers wore 'colourful' clothes.

- C: It seems more lower-middle class, middle-lower class. The fact that you see a single man, a single, not sure man or woman, and then maybe a woman in a hijab, it just feels like a little isolated, and maybe... The other main... Big giveaway is this paint. [...] They repaint, and they repaint. So, that looks, like, neglected, and so it makes you think that whoever lives in there doesn't care, or doesn't own it. [...] That is a really long block. It's just, you need a store, or a park where there's going to be people. There's nothing to pull anybody to this except to get to someplace, so you're... You're rolling the dice.
- I: Would you let your daughter go through that place?
- C: Probably not.

(Carer of a 10 years old girl)

Lastly, the participants indicate that the activities that people are performing are additional signs to identify danger. For instance, activities frequently seen in the city such as drinking alcohol could be regarded as potentially dangerous if combined with actions like staring at passers-by. Similarly, begging, talking to oneself, screaming or fighting other people may be interpreted as warning signs of potentially threatening strangers. In those cases, carers prefer that young people, and especially children, avoid strangers, changing transport modes (e.g., switching from walking to public transport) or walking away from them, as this couple relate:

- Carer 1 [C1]: The strangers [in this neighbourhood] are, I would say, similar to us. [...] I would say, maybe from 20 to 60 [years old]. I don't know. A real mix of people.
- Carer 2 [C2]: I mean, you get a real mix of people around here, [...] because you've got the new-builds down the end of the road, so you've got a lot of young professionals that live around here, er, who I can't imagine the kids would feel threatened by, but you do get the kind of drunk loiterers here.
- C1: This... This would probably be a little more scary. [...]
- C2: Yeah, [road name] is, like, a main thoroughfare. There's lots of cars, traffic, people, and it's sometimes not the cleanest, and you get, you'll often get, like, people begging for money around the station and stuff. [...]

C1: Yeah, I mean, as a kid, I could imagine that that might feel a little more scary. [...] So, while there's parts here that may seem a little [neglected]... there's also parts that they like. There's obviously always going to be people hanging out in pockets around the estate that maybe [...] that they don't know, who are just kind of hanging around cars, smoking. You know, doing stuff. I don't want to speculate, but you know what I mean. Stuff that... you know, isn't just your everyday, neighbourly kind of stuff. They've never really mentioned feeling weird about it.

C2 No.

C1: Like, I was on the bus the other day, and this little kid was identifying, "There's groups of teenagers," and they've never... Like, our kids have never identified groups of teenagers. I think they would probably, like, steer clear. The other thing is that, through here, they know all the routes and all the passages [...] so they have all these different, like, pathways that they know intimately. So, I feel like they'd feel fairly confident, even if they bumped into strangers.

(Carers of two 6 and one 9 years old girls)

Sharing the spaces with others

Participants stated that children and young people performed their accompanied or unaccompanied journeys in street environments with varying numbers of people. Similar to the community, the participants linked the density of people to natural surveillance. Most participants infer the expected density of people on a street from the environmental cues detailed earlier (see Section 5.2.4). For instance, the features of the built environment such as wide streets with a diverse number of services (e.g., high street) are linked to crowded footpaths. Likewise, the participants expected to find more people present in busy places (e.g., high streets, city centralities and well-served neighbourhoods) and few individuals in residential and homogenous areas.

According to participants, individuals hanging around an area may watch what is going on in the streets. In densely populated streets, participants express some relief for children and young people travelling in a crowded area, as someone will always be watching what is occurring in the public realm. The previously discussed fears of strangers coexists with the idea that strangers with bad intentions will be deterred from harming or assaulting children and young people because other people may oversee their doings. These perceptions could go beyond pedestrians and include motorised

vehicles that could stop and eventually assist a child in need. As this carer asserts when referring to a street:

Carer: This block, I don't think you could have too many bad things happen, because you can yell to that side, and you can yell to the park. If you started screaming on this block, you'd be pretty set. If you really could make some noise. And this one, you could... You could go here, and I'm not sure if you'd be set, from foot traffic, I mean. This doesn't feel like a foot trafficky road, and it could just be because there's no people in it. But if you went out on this block, and you took a... A picture, every minute, all day, it's a pretty busy block, I think because of the park. Much more foot traffic than, say, [park name], because you enter here. That's the main reason, I guess. It's very quiet up here. There's no foot traffic. If we lived up there, I wouldn't be as okay with them zipping to the store. Here, I know they're going to pass somebody. People will see them. They go to the park, people will see them. That's my biggest fear. I'm into people being around. To me, that seems like pure safety net. You just scream a little bit, and everyone's in. ... You're up here, where it's very pretty, look at that road that comes down, beautiful flowers everywhere... Silent. It's like being in the country. [...] As long as you see people, you're good. I think you're fine... To me, that's like the urban rule.

(Carer of a 9 years old girl)

An idea shared by their daughter discussing an unfamiliar neighbourhood:

Interviewer [I]: Would you go alone through that place?

Girl [G]: Yeah

I: Why?

G: [...] Yeah, I think I would, because like, if I were to live in one of these houses, it seems like a friendly neighbourhood [...]. It seems like there'd be a lot of people there, because there's, like, a lot of houses, and usually there's people that live in houses, and so I would think that there would be a lot of people, so it would be, like, safe.

(Girl, 9 years old)

Participants, however, described some disadvantages of these densely populated streets. Children walking may be distracted, disorientated or confused by the crowd, requiring them sufficient skills to navigate between people in a polite and respectful manner (as also observed by Christensen *et al.*, 2018). However, when talking about travelling among the crowds, the

participants never mentioned visibility (an issue that has been highlighted in the literature, see Francis *et al.*, 2017). The crowds can become an obstacle where children have to manoeuvre in limited footpath space (e.g., slowing down their pace, bypassing other pedestrians) to avoid hitting others. Particularly for young people, these situations are barely considered a problem on the streets with a low number of people.

Children travelling in deserted street environments could walk or run at the pace they wish, without the need for managing their impulses on the footpath⁹. Nevertheless, despite the freedom of movement in less occupied streets, they feel scared by the possibility of nobody present to assist them in case of need. The fear of being assaulted or harmed increase due to the absence of people watching and naturally restricting the actions of others. During night hours, carers and young people fears increased (as also suggested by Saraví, 2014 and Chaudhury *et al.*, 2019) as the streets tend to become desolated, creating, from their point of view, favourable conditions for dangerous encounters with strangers.

5. 2. 4. The built environment

Finding the way in the city

Participant descriptions of the environment of a favourite trip differ between children and young people and tended to reflect their environmental knowledge (see Shaw *et al.*, 2015; Brown *et al.*, 2008; Eisenlohr *et al.*, 2023). Older participants describe the environment from aerial perspectives (Figure 5.2 - B), setting the journey in a larger system of roads and buildings. Children exhibit a more self-centred view (Figure 5.2 - A), describing a journey in a limited system that includes observable and novel landmarks on the route. The broader system is omitted. The findings are consistent with those reported by Matthews (1992) who suggests that children move from self-centred perspectives to eccentric views.

In her sketch in Figure 5.2 – A, the girl drew the physical elements in the order she observed them on her route to the playground. Those elements are simplified 2D elements from the perspective of the viewer, drawn as seen while travelling. No references to streets appear in her sketch. On the other hand, the 14 years old girl's sketch in Figure 5.2 – B reflects the area of interest for her trip from an aerial perspective. In her sketch, she drew a complex street network including elements as a roundabout, crossings and

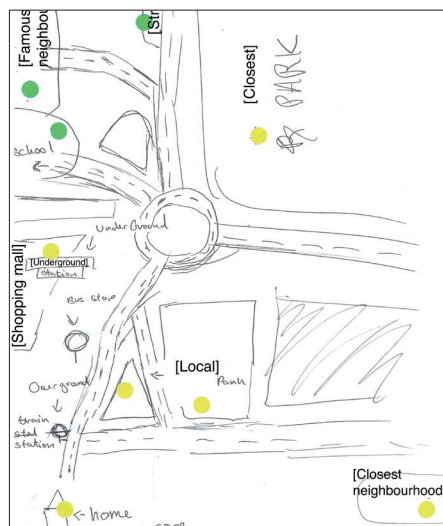
⁹ In deserted areas, children needed to be aware of the road as it may have fast-moving cars (see Section 5.2.4).

transport infrastructure like a bus stop, an underground and an overground station, suggesting that she is well aware of the context of her trip in the wider area. Also, the girl drew different neighbourhoods, probably the area through she travels normally, and landmarks of interest such as parks and a shopping mall relevant to the area. The contrasting drawings of the two girls suggest the evolution of the comprehension of the areas where they travel, from a small scale with unconnected buildings and other features, to a city landscape of connected and interrelated elements.

A - Girl, 7 years old



B - Girl, 14 years old¹⁰



Note: green and red dots indicate the features on the route that participants like or dislike, respectively. Yellow dots represent features neither liked nor disliked.

Figure 5.2. Map representations of older and younger children in London.

Source: author's own.

The environments characterised by the children and young people often included elements of different types (Joshi *et al.*, 1999). Participants mention features like the type of streets (e.g., high street, alley), quality and condition of pavements and roads (e.g., well-kept, dirty), type of borders (e.g., houses, fences), style of the facades (e.g., Victorian houses, contemporary buildings), maintenance of the facades (e.g., clean, muddy), facilities (e.g., shops, services, museums), greenery, (e.g., trees, flowers), amenities (e.g., playground, football court), traffic and natural infrastructure (e.g., roads, canal, bridge), among others (see Table 5.4). The most frequently identified features in children's favourite trip are street types, the maintenance of them, facades and facilities (e.g., swimming pool, school), along with the home of participants (i.e., origin or destination of journeys). Young people descriptions often mention similar features, providing more details and regardless of their place of residence or the area through which they travel.

¹⁰ The name of the features in brackets are hidden on purpose.

Table 5.4. Landmarks identified from the routes sketched by children in London.

Object	Children drawing the object	Times drew in total	Mean appearance per map
Home	20	20	0.87
Shops	9	16	0.70
Street	13	15	0.65
Park	14	14	0.61
Houses and buildings	10	11	0.48
School	11	11	0.48
Motorised vehicles	8	9	0.39
Bus stop	7	7	0.30
Landmark	5	6	0.26
Transport infrastructure	5	6	0.26
Church	4	4	0.17
Friend or relative's house	4	4	0.17
Hills, canals and rivers	4	4	0.17
Other facilities	4	4	0.17
Other objects	5	5	0.22
People	4	4	0.17
Public transport	4	4	0.17
Trees	4	4	0.17
Urban amenities	3	4	0.17
Zebra crossing	4	4	0.17
Footpath	3	3	0.13
Swimming pool	3	3	0.13
Fence	2	2	0.09
Flowers	2	2	0.09
Industry	2	2	0.09
Museum	2	2	0.09
Parking lot	2	2	0.09
Supermarket	2	2	0.09
Greenery	2	2	0.09
Recreational facilities	2	2	0.09
Traffic lights	1	1	0.04

Sample size: 25 participants.

Source: author's own

After describing their favourite trip, children and young people expressed their opinions about the features of the environment they liked and disliked. They were also asked to mention features that were neutral to them. The features they like included those found in streets and other places that support games and leisure (e.g., parks, playground, football court), relaxation or imagination (e.g. rail bridges, alley) or are perceived as aesthetically pleasing (e.g., car-free roads, shopping streets). Disliked features are associated with physically challenging topographies (e.g., a hill), unappealing facades (e.g. office buildings, factories), obstacles on the footpath (e.g., a crowded bus stop), or other places in which threatening people may gather (e.g., parks, alleys, dark areas). Lastly, neutral features included facilities (e.g., hospitals, community centre, shops) and traffic infrastructure (e.g., bus stop, roundabouts, bridges, highways) used to navigate inside a neighbourhood.

In some cases, participants also describe as “unremarkable” homogeneous facades without distinctive characteristics and the home where they live.

In young people’s opinions, most of the physical features in the environment were somewhat relevant for navigation. In frequent trips, landmarks and other features marked checkpoints on a route which serve to, in their own comprehension, estimate the extension travelled and how much is left to reach destination. Consequently, in homogeneous areas with no remarkable features, young people interpretation of a route were underestimated, vague and plain.

Enriching the travelling experience

The analysis suggests that the different features of the built environment can alter children and young people’s sensorial (and emotional) experience when travelling. Greenery (e.g., trees, bushes), urban furniture (e.g., bollards, skate parks, playgrounds), beautifully ornamented facades, or well-kept (e.g., footpath) and aesthetically pleasant (e.g., colourful facades) infrastructure might positively influence the senses (e.g., sounds, smells) and moods of boys and girls (as also observed by Bourke, 2017). Children and young people dislike neglected streets with rubbish or flanked by dirty facades. They avoided areas with those features, because they can also indicate the presence of potential threatening strangers (see Section 5.2.3).

Child and young person participants further identified elements of the built environment that enriched their travelling experience. In situations where public spaces frequently overlook children’ needs, the significant features are those that can be “transformed” using their imagination. For instance, railway viaducts and bridges on their path are part of imaginative landscapes when travelling. Bollards and fences, while limiting motorised vehicles and public property, are key pieces of equipment for climbing games and gates to other worlds. Such adaptations are evident and, like this girl who competes with her sister on an empty footpath, provide opportunities to play:

Girl [G]: There is almost nobody on this footpath so we can run [...]

Interviewer [I]: Why do you like to run [on the footpath]?

G: Because I like the feeling of the wind in my face and sometimes my sister and I compete [for who is the fastest].

(Girl, 9 years old)

Features of the environment and uncertainties along the route can, nonetheless, upset children and young people and affect negatively their

travelling experience. Roadworks on the footpath or crowded bus stops can block their way, requiring young people to dodge people or step into the road to pass by these places unaccompanied. Moreover, children express concerns about cars parked in a “wonky” order, making it difficult to see across the road. Carers add that children and young people often travel through places with physical arrangements that favour motorised vehicles instead of walking and cycling modes, as observed by other authors in the UK (Wood *et al.*, 2019).

Inferring risks and finding safety

The physical features also serve as cues to the social characteristics of the places. Children, young people and carers use facades, roads, facilities, urban furniture, neighbourhood landmarks and other aspects to identify potentially dangerous or safe spaces. In those evaluations, the participants, especially young people and carers, infer the character of a street (e.g., from the number of people and vehicles) and the persons that might appear in the child’s routes.

Regarding the character of a street, young people and carers associate the type of the street, its connection with the broader system and the facilities located around it with a certain number of people. Highly connected roads with several activity attractors¹¹ like those observed in high streets are linked to huge crowds with diverse strangers and activities (e.g. shopping). Quiet residential streets containing facades of houses and no services, suggest the presence of a few pedestrians (i.e., residents) scattered on the footpath. However, carers indicate that these features are often not enough to infer what kind of risk a child or young person travelling accompanied or unaccompanied might face. Some high streets, for instance, might be in a deteriorated condition, or deserted and, therefore, potentially dangerous.

Another significant aspect of the street’s character is the available space to safely walk. Participants judge the density of people and vehicles in an environment separately, by subdividing the streets into two components: the footpath (or pavement) and the road. Wide footpaths are described as signs of a high pedestrian density and may also indicate the availability of more space to move. As will be detailed in Section 5.2.3, some carers indicate that they may prefer narrower streets with a scattered number of pedestrians because wide—yet crowded—footpaths may be challenging for some children travelling accompanied or unaccompanied. Moreover, young

¹¹ Places of interest as the destination of trips.

people, children and carers also consider the space of the street dedicated to motorised vehicles. Roads with three or more vehicle lanes in total may imply larger traffic volume and a higher risk of being involved in an accident if compared to narrower roads. In general, the attention given to footpaths and roads spaces seems to be rooted in the carers' fear of traffic and the potential difficulties that children could face when travelling among crowds.

Studying other contexts, several authors have suggested that the built environment is often a “cue” from which people infer the social qualities of the places (Koskela and Pain, 2000; Figueroa *et al.*, 2019). In this research, this aspect of the built environment emerged on numerous occasions during the interviews. For instance, children and young people state that streets surrounded by clean and ornamented facades and with expensive cars parked should be inhabited by, in their words, “good people”, wealthy and refined individuals or families. Dirty street environments with uncared or unattractive facades are believed to be populated by poor people. Similarly, carers predict that medium to high-income families occupy streets with stylish facades (e.g., Victorian houses, modern buildings) and use more motorised vehicles (e.g., various cars parked on the road). Socially vulnerable citizens, in contrast, walk more, have fewer cars available and use spaces that are often neglected or abandoned. Carers point out that potentially threatening strangers may frequent more street environments surrounded by social housing estates or areas located close to industrial warehouses:

Carer [C]: We never go through the estate but mainly because you need to go in it if you live there... but it never feels like a particularly welcoming space, so is not so much to go on really.

Interviewer [I]: Why isn't it welcoming?

C: I think because it's just kind of quite tall five or six story blocs and then there's cars or parks in the middle ...and partly because its reputation as being quite a rough estate. I'm just always nervous there's gonna be someone dodgy in it and then... there's no openness within the block or that a sort of thing, so to make you feel safe.

(Carer of a 6 years old boy)

However, carers often add that, due to the social mix of London, it is difficult to precisely infer from building facades who might be encountered by a child or young person travelling unaccompanied there.

The participants also associate the kinds of facilities where people might linger in the spaces located nearby. They expect to find adults shopping at retail stores and supermarkets, drinking at pubs; groups of teenagers close to

fast-food restaurants, parks, secluded streets or alleys; and families enjoying parks or walking close to schools. Furthermore, the analysis suggested that children and young people often link facilities with particular genders and age range. For instance, from the young people's perspective, retail stores have more women or carers with school-age children than men. Likewise, a group of teenagers at hidden areas is more likely to be composed of boys. To some extent, carers' views seems to be linked to their experience in areas with similar facilities.

Negotiating the space of the streets

Children and young people's accompanied or unaccompanied journeys generally took place on streets with spaces extensively dedicated to motorised traffic. Carers and young people participants commented profusely on this situation and how it favours traffic and reduces the available spaces for walking and cycling and other forms of active mobility. The priority given to cars in the environment raises the participants' concerns and fears of road accidents, affecting children's health and travel experience, as several studies conducted in the UK suggest (Ward, 1990; Wood *et al.*, 2019).

Fear of traffic dominates carers' apprehensions about children and young people travelling on the streets. For them, children and young people might be at risk at road junctions as reckless drivers could pass through without paying attention to the traffic lights or, pedestrians right of way on a zebra crossing. Vehicles could lose control and encroach on the footpath beside the road and, eventually, hit passers-by. These worries diminish in street environments with light traffic and vehicles moving at slow speeds, or in areas without cars.

Carers and young people describe a few strategies to deal with traffic-related anxieties. These include detours in their routes to avoid traffic, preferring secluded footpaths with non-motorised traffic such as those found in pedestrian-only streets, alleys or parks. If travelling beside traffic is unavoidable, the participants prefer streets with less traffic, like those in residential areas when travelling unaccompanied.

Another significant aspect of the fear of traffic is drivers' behaviour. Participants perceived that fast-moving vehicles and aggressive driving may scare and jeopardise children and young people's safety. They expect to find those behaviours on busy streets (e.g., main roads, highways) that accommodate more traffic and allow higher speed limits, and areas well-served such as high streets that have several facilities and services. In addition, traffic in

those streets supports vehicles of different size, like buses or lorries, and has a dedicated transport infrastructure (e.g., bus lanes, bus stops) that also increase participants' concerns. For young people and children in particular, perceived threats on busy streets tend to decrease in familiar neighbourhoods or streets with "distractions" such as colourful and original displays. Such accounts are consistent with the findings of several authors (Evenson *et al.*, 2006; Panter *et al.*, 2010b; Carver *et al.*, 2013; Timperio *et al.*, 2018; Smith *et al.*, 2019) who argue that highly congested roads (with more exhaust fumes), high-speed traffic and high-volume of vehicles hinder children's mobility.

Conversely, for children, young people and carers, signs of quiet and calm environments include roads designed with one or two vehicle lanes and regulated streets that allow parking on the road, as they generally have few vehicles. The participants, and particularly young people, indicate that calmer roads often have cycling lanes and racks, which encourage and activities that are seen as less threatening, and bollards and speed bumps, which deter vehicles from moving fast. However, a few carers linked those elements to roads with menacing traffic that require measures to control it.

The participants describe traffic junctions as potentially dangerous spaces where children and young people need a number of skills to evaluate the time and the place to cross unaccompanied. The traffic direction (i.e., one way or two-way) requires adequate skills to see and guess the speed of vehicles coming from either side before attempting to cross. Greater road width, as indicated by carers, could imply more and faster traffic and, in general, more difficult crossings in comparison with narrower roads. Children and carers prefer traffic light junctions over other solutions. For instance, carers perceive that traffic light crossings could be easier to understand for children (i.e., easy to follow signs), whereas zebra crossings and pedestrian islands require them to be mature and skilful enough to negotiate traffic. Nonetheless, children and young people highlight the burden of crossing the street where traffic light junctions could take a long time to give them the right of way. Young people try to avoid these situations by choosing street junctions with reliable traffic light times. Regarding the frequency of junctions, the analysis suggests participant preferences for frequent pedestrian crossings along a route, because this provides more opportunities to cross the street if needed (e.g., go to a store across the street). As highlighted by numerous works (Hillman *et al.*, 1990; Panter *et al.*, 2010a; Carver *et al.*, 2013; Webb Jamme, 2018; Smith *et al.*, 2019), these concerns can have profound impacts on children and young people's mobility and severely limit their trips.

Visibility issues also emerge in the participant answers, suggesting that some road designs may better facilitate drivers' awareness of pedestrians and cyclists on the street. Poor visibility may be affected by the width of the road (for the participants, visibility is better in narrow streets) and by physical features such as trees and parked vehicles. Those may obstruct the sight of drivers, making difficult the clear identification of pedestrians on the road. For instance, drivers may overlook children at junctions or appearing between parked cars. Interestingly, carers commented that drivers seem to be more aware of cyclists than pedestrians. Although the participants did not develop this issue further, it seems to be a consequence of cyclist using the carriageway, noticeable cycling infrastructure or car drivers being cyclists in other moments and, therefore, more aware of their needs. Similarly, carers perceive that bus and taxi drivers are respectful to cyclists, probably knowing by training how to deal with them.

Reflecting on children and young people's safety, the participants indicate that restrictions for motorised vehicles tend to reduce their fears. Physical modal filters like bollards or local regulations deter car drivers from using local roads to avoid congested streets (i.e., "rat-running"), limiting the times of day at which motorised vehicles can travel through school roads and, hence, create more suitable spaces for children as this carer asserts:

Interviewer [I]: And what would you change in your neighbourhood to encourage more children to [make] unaccompanied trips?

Carer 1 [C1]: [...] This is controversial, and it's controversial in this area, but when they closed off some streets...

I: The one you pointed me before?

Carer 2 [C2]: And also some others they've blocked off.

C1: There's quite a few.

C2: Like they've blocked off the other end of that there.

C1: As soon as they close off the streets, the streets will become obviously safer, because you won't get through traffic.

(Carers of a 9 and 13 years old boys)

However, carers also believe that those restrictions may increase traffic on nearby roads and create hostile environments in otherwise safe areas.

As mentioned earlier, carers worry about children and young people's health and travel experiences. They describe a number of externalities provoked by moving vehicles (e.g., noise, pollution, exhaust emissions) that, in different ways, affect children's wellbeing (as other authors have acknowledged, see Waygood *et al.*, 2017). Children, and young people and carers in particular,

linked the “size” of the road with a certain speed and number of vehicles. For instance, they expect to find congestion and noise on wide roads; hostile conditions for children and young people who should travel unaccompanied preferably through quieter places. Deepening this understanding, carers state that loud traffic could distract children on a journey, or make it difficult for young children to carry out other activities such as chatting. Children point out that wide roads with large vehicles, like trucks and buses, are unpleasant and prefer local streets with lighter traffic. Young people add that traffic and pollution damages the environment and people’s health. Finally, carers indicate that “school runs” and the street space occupied by vehicles also affect children and young people’s experience when travelling. According to them, using a private car to drop off or pick up a child is a better option, but just for those occupying the vehicle. For the rest, including children and young people walking or cycling, it means congestion, noise and pollution.

5. 3. Conclusions and discussion

The qualitative data gathered indicated four aspects of the built environment that influence children’s trips, and unaccompanied journeys in particular: landmarks, travel experience-related features, environmental cues for risk and traffic-related features. **Landmarks** were described as those elements that bring some novelty to the homogeneity of some neighbourhoods and can be large (e.g., shopping centres, factories) or small elements (e.g., benches, post boxes). As also observed by other authors (Joshi *et al.*, 1999; Francis *et al.*, 2017; Webb Jamme *et al.*, 2018), those features provided sense of direction and had generic connotations (i.e., good, neutral, bad), especially relevant for children and young people’s unaccompanied trips. Landmarks were sketched on the maps that represented child and young person’s routes, showing differences between the self-centred perspectives used by children versus aerial perspectives used by young people. Those differences in perspectives have been detected in previous studies (Matthews, 1992).

The second relevant groups of features were those that affected **children and young people’s travel experience**. The most mentioned features were those that evoke “good feelings” (e.g., playgrounds, greenery), stimulate their senses (e.g. trees, animals), allow them to relax or find calm (e.g. parks, big trees), are beautiful to see (e.g. flowers, facades), are related to healthy lifestyles (e.g. open spaces) or prompt children’s imagination and creativity (e.g. playground, shop display). Disliked features included the lack of maintenance of urban spaces which negatively affects their moods and

senses (e.g., smell, visual appearance) as also has been observed by other authors (O'Brien *et al.*, 2000; Francis *et al.*, 2017; Bourke, 2017).

The third relevant group were **environmental cues for risk** or features used to infer the social qualities of a place (Koskela and Pain, 2000; Figueroa *et al.*, 2019). The participants, carers and young people in particular, highlighted a number of features of the built environment from which they infer the characteristics and behaviours of the individuals that may appear along unaccompanied trips, including features that may attract other children (e.g. parks, playgrounds), commuters or shoppers minding their business (e.g. bus stops, main avenues), antisocial people or substance abusers (e.g. enclosed public spaces), among others.

Traffic-related features also emerged in the participants' narratives and, as a vast number of research studies acknowledge (Evenson *et al.*, 2006; Ahlport *et al.*, 2008; Panter *et al.*, 2010a; Sharmin and Kamruzzaman, 2017; Webb Jamme *et al.*, 2018; Palma *et al.*, 2020), were described as aspects that affect carers, children and young people's perception of the risk of being involved in a vehicle accident. Streets with several vehicle lanes, without signalised crossings and poor visibility (e.g. parked cars, blind spots) increased the perception of risk and children and young people's exposition to noise and pollution. Conversely, streets with fewer or without vehicle lanes (e.g. pedestrian dedicated streets) and wider footpaths (compared to vehicle lanes) improved the perception of safety, were linked to healthier and better spaces that can ease unaccompanied trips, especially for young people, and were described as spaces where carers may "relax".

The narratives of the social environment were mostly related to the perception of safety and fear of crime and comprised: acquaintances and ties, activities and behaviours on the streets, individuals' physical characteristics and number of individuals present in the street.

The acquaintances and ties or the relationship between children, young people and the persons present in the environment (e.g., close relatives and friends, strangers) were described as highly relevant issues for underage people's unaccompanied trips and the time they spend on the neighbourhood. Similar to the findings of other scholars that have explored "neighbourliness" (Prezza *et al.*, 2001; Brown *et al.*, 2008; Mikkelsen and Christensen, 2009; Wolfe and McDonald, 2016; Crawford *et al.*, 2017), cohesive and supportive communities and the presence of close relatives and acquaintances in the streets secure the spaces for children and young people. Interestingly, these findings indicate that those "acquaintances" can also be paid surveillance in the wealthy areas of Santiago (e.g., guards).

The **activities** (people enjoying themselves, performing routine errands, travelling), **attitudes** (e.g. gentle, aggressive) and **behaviours** (e.g. careless, invasive) of the people present in the public space emerged profusely in the participants' narratives, being used to interpret strangers' intentions and prevent potentially threatening encounters for children and young people's trips. Activities that "privatise" the public space may discourage unaccompanied trips, particularly among children. Several studies have indicated that street activities are relevant (Ward, 1990; Webb Jamme *et al.*, 2018), but, to the researcher's knowledge, none has explored in detail what those activities are and what they represent for children and their trips.

The **physical characteristics** of those who are present in the public realm were also relevant to infer risks and included peoples' age, gender, clothes (e.g. uniforms, clean, elegant) and physical appearance (e.g. skin colour, dyed hair, visible tattoos). In general, women, older persons and people wearing uniforms were described as "safe" people for children and young people and can ease their trips. Meanwhile, men, teenagers and persons wearing sportive trousers and tops and T-shirts were represented as dangerous individuals. The findings, however, indicate that assumptions based on people's physical appearance are rooted in stereotypes and social constructs and often reproduce stigmas against disadvantaged individuals. Physical characteristics like age and gender have received some attention in the literature (especially for carers, see Francis *et al.*, 2017), but the impacts of clothes and physical appearance on children and young people's perceptions and trips are unclear and under-researched (Loukaitou-Sideris and Ehrenfeucht, 2009).

The **number of individuals** occupying the street can affect carers, children and young people's perception of safety when travelling unaccompanied. Spaces packed with people (i.e. crowded) can secure a street by increasing the natural surveillance (as suggested by Francis *et al.* 2017), but can be too challenging for some children. Areas with few visible individuals can facilitate young people and, especially, children's unaccompanied trips, yet can also raise fears.

Fears were highly contextual and so were the strategies children and young people employ to find safety. In London, children and young people travel unaccompanied across familiar and unfamiliar environments with frequency. When crossing familiar places, they find safety in the known faces they see in the public space. Meanwhile, when travelling through unfamiliar places, they infer strangers' intentions from their physical appearance, attitudes and activities. Children and young people from Santiago's wealthy areas

also travelled frequently through familiar and unfamiliar and tended to separate strangers according to their appearance. In Santiago' deprived areas, however, children and young people travelled unaccompanied mostly through familiar environments. Places where they know they could find help if an emergency arises (e.g., nearby relatives' houses).

Chapter 6. Findings - Quantitative stage I

Rating scales task

This chapter reports the findings of a questionnaire experiment that aimed to understand the preferences of carer and child participants for a street environment with particular characteristics for walking trips (objectives 4 and 5). The questionnaire contained a range of methods (see Chapter 4.2.2) and this chapter covers the analysis of the rating tasks. To facilitate the interpretation of the results, responses were analysed independently for London and Santiago and are brought together in the last section of this chapter.

6. 1. Rating scales

The participants completed a 5-point rating scale task (questionnaire section B, Chapter 4.2.2) to collect their opinions on selected street environment attributes which emerged from the interviews (see Chapter 5) and identified in the relevant literature. This section provides further evidence on the preference for those attributes on children walking. In detail, the attributes included features of the built environment such as facades, quality of footpaths, greenery, urban amenities, facilities and crossings. Social aspects of the environment were also explored, including different generations of people, strangers' gender, strangers' activities and the density of people on a given footpath. A detailed description of the attributes, such as medium or low density houses, can be found in Table 4.2 (Chapter 4.2).

6. 1. 1. Descriptive statistics and non-parametric tests

The responses to the rating scale questions were organised and analysed independently for Santiago and London using descriptive statistics (i.e., mean, mode, interquartile range) for each studied attribute. In addition, non-parametric tests report if the rating values of the attributes are statistically significantly different for the sampled groups (e.g., carers or children) with the Kruskal-Wallis test (K-W), or if values are independent for each group with the Pearson χ^2 test.

London

The mean, mode and interquartile range for the attributes in London are shown in Table 6.1. Additionally, a summary of the K-W and Pearson χ^2 tests for London data is shown in Table 6.2. Detailed information about the non-parametric tests can be found in Appendix 10.8. In general, different groups of participants in London exhibit similar preferences towards the attributes in a street environment. The variations that were found between groups are shown in Table 6.3 and described in detail below.

For participants in London, the median values are “very comfortable” (1) and “fairly comfortable” (2) for attributes considered “positive” such as *facades*, *well-kept footpaths*, the presence of *greenery (trees, grass)*, *urban amenities (playgrounds, bus stops, a playground and bust stop)*, *a variety of shops*, *a pub* and *crossings* (see Table 6.6). “Positive” social aspects had a similar mean, including other *children, teenagers, adults* and *elderly people* on the streets, *strangers’ walking, chatting or standing*, and *uncrowded footpaths*. Participants were “neutral” (3) towards street environments with a *variety of shops and a pub*, *crowded footpaths* and *no facilities* in the area —and felt “fairly uncomfortable” (4) and “very uncomfortable” (5) with *dirty footpaths* and *strangers’ drinking alcohol*.

In general, the median of the attributes matched the mode. The mode value is “more uncomfortable” than the median for the attributes *dirty footpaths* and *crowded streets*, and more comfortable for the attributes *trees, grass, a playground, a bus stop and a playground, signalised crossings, uncrowded footpaths, children* and *elderly people*. The interquartile range values for all attributes are similar to the level of (un)comfortable of the median, excepting *medium density houses* which ranges between “very comfortable” (1) and “neutral” (3), *low-density houses* which ranges between “fairly comfortable” (2) and “fairly uncomfortable” (4), and for *no greenery, no urban amenities, a pub, variety of shops and a pub, strangers’ standing* and *teenagers* which are closer to “neutral” (3) and “fairly uncomfortable” (4) values.

Table 6.1. Statistics for London attributes.

London	Complete sample			Child			Boy			Girl			Primary school			Secondary school		
	Median	Mode	Interquartile range	Median	Mode	Interquartile range	Median	Mode	Interquartile range	Median	Mode	Interquartile range	Median	Mode	Interquartile range	Median	Mode	Interquartile range
A1_Medium density houses	2	2	1 - 3	2	2	1 - 3	2	2	1 - 2	2	2	1 - 3	2	2	1 - 3	2	2	1 - 3
A2_Low density houses	2	2	2 - 4	2	2	2 - 3	2	2	2 - 3	2	2	2 - 4	2	2	2 - 3	2	2	2 - 3
B1_Well-kept footpaths	2	1 - 2	1 - 2	2	1	1 - 2	2	2	1 - 2	2	1	1 - 2	2	1	1 - 2	2	1	1 - 2
B2_Dirty footpaths	4	5	3 - 5	4	5	3 - 5	4	5	2 - 5	4	5	3 - 5	4	5	3 - 5	3	5	2 - 5
C1_Trees and Grass	1	1	1 - 2	1	1	1 - 2	1	1	1 - 2	1	1	1 - 2	1	1	1 - 2	1	1	1 - 2
C2_Trees (existence of)	2	1	1 - 2	1	1	1 - 2	1	1	1 - 2	2	1	1 - 2	2	1	1 - 2	1	1	1 - 2
C3_Grass (existence of)	2	1	1 - 2	2	1	1 - 3	2	1	1 - 2	2	1	1 - 3	1 - 2	1	1 - 3	2	1	1 - 2
C4_No Greenery	2	2	1 - 3	2	2	1 - 3	2	1	1 - 3	2	2	1 - 3	3	3	2 - 3	2	1 - 2	1 - 3
D1_Playground	2	1	1 - 2	2	1	1 - 2	2	1	1 - 2	1	1	1 - 2	2	1	1 - 2	1	1	1 - 2
D2_Bus stop	2	2	1 - 3	2	2	1 - 2	2	2	1 - 2	2	2	1 - 3	2	2	2 - 3	2	2	1 - 2
D3_Bus stop and play-ground	2	1	1 - 3	2	1	1 - 2	2	1	1 - 2	1	1	1 - 2	2	1	1 - 2	1	1	1 - 2
D4_No urban amenities	2	2	2 - 3	3	2	2 - 3	3	2	2 - 4	2	2	2 - 4	3	3	2 - 4	2	2	2 - 3
E1_Variety of shops	2	2	1 - 3	2	2	1 - 2	2	2	1 - 2	2	1 - 2	1 - 2	2	2	1 - 3	2	1	1 - 2
E2_Pub	2	2	2 - 4	2	2	2 - 3	2	2	1 - 3	2	2	2 - 3	2	2	2 - 4	2	2	1 - 2
E3_Variety of shops and pub	3	3	2 - 4	3	2	2 - 4	3	2	2 - 4	3	2 - 4	2 - 4	3 - 4	4	2 - 4	2	2	2 - 3
E4_No Facilities	3	2	2 - 3	2	2	2 - 3	2	2	2 - 4	2	2	2 - 3	2	2	2 - 4	2	2	2 - 3
F1_Chating	2	2	1 - 3	2	2	1 - 3	2	2	1 - 3	2	2	1 - 3	2	2	1 - 3	2	2	1 - 3
F2_Walking	2	2	1 - 2	2	2	1 - 2	2	2	1 - 2	2	2	1 - 2	2	2	1 - 2	2	1 - 2	1 - 2
F3_Drinking Alcohol	5	5	3 - 5	4	5	3 - 5	5	5	3 - 5	4	5	2 - 5	5	5	3 - 5	4	5	2 - 5
F4_Standing	2	2	2 - 3	2	2	1 - 3	2	2	1 - 3	2	3	1 - 3	2	2	1 - 3	2	2	1 - 3
G1_Children	2	1	1 - 3	1	1	1 - 2	1	1	1 - 2	2	1	1 - 2	1	1	1 - 2	2	1	1 - 3
G2_Teenagers	2	2	2 - 3	2	2	2 - 3	2	2	2 - 3	2	2	1 - 4	2	2 - 3	2 - 3	2	2	1 - 3
G3_Adults	2	2	1 - 3	2	2	1 - 3	2	2	1 - 3	2	2	1 - 3	2	2	1 - 3	2	2	1 - 2
G4_Elderly People	2	1	1 - 3	2	1	1 - 2	2	1	1 - 2	1	1	1 - 3	2	1	1 - 2	2	1	1 - 2
H1_Signalised crossing	2	1	1 - 3	2	1	1 - 2	1	1	1 - 2	2	1	1 - 3	2	1	1 - 3	1	1	1 - 2
H2_Zebra crossing	2	2	1 - 3	2	2	1 - 2	2	2	1 - 2	2	1	1 - 2	2	2	1 - 3	2	2	1 - 2
I1_Crowded footpath	3	4	2 - 4	3	2	2 - 4	3	2	2 - 4	3	2 - 5	2 - 5	3	2 - 4	2 - 4	3	2	2 - 4
I2_Uncrowded footpath	2	1	1 - 3	2	1	1 - 3	2	1	1 - 3	2	2	1 - 2	2	1	1 - 2	2	1	1 - 3

*Sample size: 226 participants. **The scale values: 1 = very comfortable, 2 = fairly comfortable, 3 = neutral, 4 = fairly uncomfortable, 5 = very uncomfortable.

Source: author's own.

Table 6.1. Statistics for London attributes (continued).

London	Carer			Boy (carers view)			Girl (carers views)			Primary school (carers' views)			Secondary school (carers' views)		
	Median	Mode	Interquartile range	Median	Mode	Interquartile range	Median	Mode	Interquartile range	Median	Mode	Interquartile range	Median	Mode	Interquartile range
A1_Medium density houses	2	2	2 - 3	2	2	1 - 3	2	2	2 - 3	2	2	2 - 3	2	2	1 - 3
A2_Low density houses	3	2	2 - 4	3	2	2 - 4	3	2	2 - 3	3	2	2 - 4	3	2	2 - 4
B1_Well-kept footpaths	2	2	1 - 2	2	2	1 - 3	2	1 - 2	1 - 2	2	2	1 - 3	2	1	1 - 2
B2_Dirty footpaths	4	4	3 - 4	3	4	2 - 4	4	4	3 - 5	4	4	3 - 4	3	4 - 5	2 - 5
C1_Trees and Grass	2	1	1 - 2	2	1	1 - 2	2	1	1 - 3	2	1	1 - 2	2	1	1 - 2
C2_Trees (existence of)	2	2	1 - 2	2	1 - 2	1 - 2	2	2	1 - 3	2	2	1 - 3	2	1	1 - 2
C3_Grass (existence of)	2	1	1 - 2	2	1	1 - 2	2	2	1 - 3	2	2	1 - 3	2	1	1 - 2
C4_No Greenery	2	2	1 - 3	2	3	1 - 3	2	2	1 - 3	3	3	1 - 3	2	2	1 - 3
D1_Playground	2	2	1 - 3	2	2	1 - 3	2	1	1 - 4	2	2	2 - 4	2	2	1 - 3
D2_Bus stop	2	2	2 - 3	2	2	1 - 3	2.5	3	2 - 3	2 - 3	2	2 - 3	2	1	1 - 3
D3_Bus stop and play-ground	2	2	1 - 3	2	2	1 - 3	2	1	1 - 4	3	2	2 - 4	2	1	1 - 3
D4_No urban amenities	2	2	2 - 3	2	2	2 - 3	2	2	2 - 4	2	2	2 - 3	2	2	1 - 3
E1_Variety of shops	2	2	2 - 4	2	2	2 - 3	2	2	2 - 4	3	2	2 - 4	2	2	1 - 3
E2_Pub	3	2	2 - 4	2	2	2 - 4	3	2 - 4	2 - 4	3	4	2 - 4	2	2	2 - 3
E3_Variety of shops and pub	3	3	2 - 4	3	2 - 3	2 - 4	4	4	3 - 4	4	3	3 - 5	3	2 - 3	2 - 4
E4_No Facilities	3	3	2 - 3	3	3	2 - 3	3	3	2 - 3	3	3	2 - 3	3	3	2 - 3
F1_Chatting	2	2	1 - 3	2	2	1 - 3	2	2	2 - 3	2	2	2 - 3	2	2	1 - 3
F2_Walking	2	2	1 - 3	2	2	1 - 2	2	2	2 - 3	2	2	1 - 3	2	2	1 - 3
F3_Drinking Alcohol	5	5	4 - 5	4	5	3 - 5	5	5	4 - 5	5	5	4 - 5	5	5	4 - 5
F4_Standing	3	2	2 - 4	2	2	2 - 3	3	3	2 - 4	3	2	2 - 4	2	2	2 - 3
G1_Children	2	2	1 - 3	2	2	1 - 3	2	1	1 - 4	2	2	2 - 4	2	1	1 - 3
G2_Teenagers	3	3	2 - 4	2	1 - 2	1 - 3	3	3	2 - 4	3	2 - 4	2 - 4	2 - 3	1 - 3	1 - 3
G3_Adults	2	2	1 - 3	2	2	1 - 3	2	2	1 - 3	2	2	1 - 3	2	2	1 - 3
G4_Elderly People	2	2	1 - 3	2	2	1 - 3	2	1 - 2	1 - 3	2	2	1 - 2	2	1	1 - 3
H1_Signalised crossing	2	1	1 - 3	2	1	1 - 3	2	1 - 2	1 - 4	3	2	2 - 4	1	1	1 - 2
H2_Zebra crossing	2	2	2 - 3	2	2	1 - 3	2	2	2 - 3	2	2	2 - 3	2	2	1 - 3
I1_Crowded footpath	3	4	2 - 4	3	4	2 - 4	3	3 - 4	2 - 4	4	4	2 - 4	3	3 - 4	2 - 4
I2_Uncrowded footpath	2	2	1 - 3	2	2	1 - 3	2	1 - 2	1 - 4	2	2	1 - 3	2	2	1 - 3

*Sample size: 226 participants. **The scale values: 1 = very comfortable, 2 = fairly comfortable, 3 = neutral, 4 = fairly uncomfortable, 5 = very uncomfortable

Source: author's own.

Table 6.2. Summary of non-parametric tests to see differences between groups in London.

Attribute	Statistic	Parent vs Child	Boy vs girl	Primary vs secondary school	Boy vs girl (carers views)	Primary vs secondary school (carers views)
A1 - Medium density houses	<i>Kruskal-Wallis p</i>	0.024	0.431	0.981	0.312	0.009
	<i>Pearson X² p</i>	0.211	0.448	0.859	0.795	0.125
A2 - Low density houses	<i>Kruskal-Wallis p</i>	0.079	0.197	0.446	0.489	0.211
	<i>Pearson X² p</i>	0.209	0.740	0.344	0.353	0.604
B1 - Well-kept footpaths	<i>Kruskal-Wallis p</i>	0.479	0.391	0.664	0.102	0.018
	<i>Pearson X² p</i>	0.873	0.163	0.765	0.188	0.078
B2 - Dirty footpaths	<i>Kruskal-Wallis p</i>	0.395	0.266	0.069	0.040	0.125
	<i>Pearson X² p</i>	0.224	0.600	0.081	0.231	0.075
C1 - Trees and Grass	<i>Kruskal-Wallis p</i>	0.091	0.617	0.406	0.263	0.892
	<i>Pearson X² p</i>	0.316	0.387	0.868	0.597	0.592
C2 - Trees (existence of)	<i>Kruskal-Wallis p</i>	0.032	0.139	0.117	0.058	0.170
	<i>Pearson X² p</i>	0.111	0.453	0.346	0.121	0.695
C3 - Grass (existence of)	<i>Kruskal-Wallis p</i>	0.994	0.234	0.773	0.025	0.167
	<i>Pearson X² p</i>	0.597	0.559	0.319	0.164	0.603
C4 - No Greenery	<i>Kruskal-Wallis p</i>	0.991	0.669	0.077	0.239	0.176
	<i>Pearson X² p</i>	0.913	0.695	0.235	0.313	0.347
D1 - Playground	<i>Kruskal-Wallis p</i>	0.000	0.624	0.607	0.301	0.029
	<i>Pearson X² p</i>	0.001	0.078	0.859	0.072	0.096
D2 - Bus stop	<i>Kruskal-Wallis p</i>	0.004	0.799	0.026	0.349	0.018
	<i>Pearson X² p</i>	0.008	0.371	0.165	0.557	0.029
D3 - Bus stop and playground	<i>Kruskal-Wallis p</i>	0.000	0.411	0.268	0.697	0.002
	<i>Pearson X² p</i>	0.000	0.527	0.368	0.558	0.019
D4 - No urban amenities	<i>Kruskal-Wallis p</i>	0.714	0.681	0.228	0.468	0.402
	<i>Pearson X² p</i>	0.875	0.904	0.588	0.647	0.352
E1 - Variety of shops	<i>Kruskal-Wallis p</i>	0.000	0.748	0.004	0.230	0.001
	<i>Pearson X² p</i>	0.002	0.681	0.046	0.546	0.019
E2 - Pub	<i>Kruskal-Wallis p</i>	0.001	0.387	0.000	0.053	0.000
	<i>Pearson X² p</i>	0.007	0.771	0.002	0.389	0.007
E3 - Variety of shops and pub	<i>Kruskal-Wallis p</i>	0.040	0.265	0.008	0.029	0.003
	<i>Pearson X² p</i>	0.107	0.106	0.045	0.034	0.022

*Sample size: 226 participants. Note: In bold (green) are shown significant attributes at 95% of confidence

Source: author's own.

Table 6.2. Summary of non-parametric tests to see differences between groups in London (continued).

Attribute	Statistic	Parent vs Child	Boy vs girl	Primary vs secondary school	Boy vs girl (carers views)	Primary vs secondary school (carers views)
E4 - No Facilities	<i>Kruskal-Wallis p</i>	0.864	0.484	0.681	0.645	0.595
	<i>Pearson X² p</i>	0.433	0.918	0.400	0.894	0.968
F1 - Chatting	<i>Kruskal-Wallis p</i>	0.099	0.868	0.613	0.084	0.683
	<i>Pearson X² p</i>	0.106	0.840	0.704	0.318	0.766
F2 - Walking	<i>Kruskal-Wallis p</i>	0.028	0.762	0.938	0.007	0.851
	<i>Pearson X² p</i>	0.070	0.236	0.299	0.048	0.117
F3 - Drinking Alcohol	<i>Kruskal-Wallis p</i>	0.279	0.600	0.032	0.094	0.947
	<i>Pearson X² p</i>	0.462	0.376	0.075	0.237	0.633
F4 - Standing	<i>Kruskal-Wallis p</i>	0.004	0.446	0.733	0.037	0.383
	<i>Pearson X² p</i>	0.012	0.409	0.116	0.121	0.931
G1 - Children	<i>Kruskal-Wallis p</i>	0.000	0.167	0.166	0.615	0.357
	<i>Pearson X² p</i>	0.000	0.107	0.175	0.354	0.163
G2 - Teenagers	<i>Kruskal-Wallis p</i>	0.274	0.433	0.864	0.225	0.357
	<i>Pearson X² p</i>	0.651	0.685	0.494	0.813	0.676
G3 - Adults	<i>Kruskal-Wallis p</i>	0.114	0.695	0.704	0.672	0.418
	<i>Pearson X² p</i>	0.469	0.231	0.313	0.840	0.100
G4 - Elderly People	<i>Kruskal-Wallis p</i>	0.102	0.631	0.949	0.554	0.758
	<i>Pearson X² p</i>	0.358	0.160	0.398	0.722	0.164
H1 - Signalised crossing	<i>Kruskal-Wallis p</i>	0.011	0.268	0.018	0.236	0.000
	<i>Pearson X² p</i>	0.092	0.153	0.115	0.570	0.000
H2 - Zebra crossing	<i>Kruskal-Wallis p</i>	0.008	0.882	0.085	0.294	0.010
	<i>Pearson X² p</i>	0.089	0.547	0.110	0.514	0.017
I1 - Crowded footpath	<i>Kruskal-Wallis p</i>	0.419	0.201	0.265	0.908	0.093
	<i>Pearson X² p</i>	0.578	0.223	0.413	0.814	0.342
I2 - Uncrowded footpath	<i>Kruskal-Wallis p</i>	0.044	0.592	0.177	0.068	0.827
	<i>Pearson X² p</i>	0.044	0.252	0.450	0.183	0.650

*Sample size: 226 participants. Note: In bold (green) are shown significant attributes at 95% of confidence

Source: author's own.

Table 6.3. Interquartile range for groups with significantly different attribute preferences in London.

Attribute	Participant		Child gender (carers views)		Child age		Child age (carers views)	
	child	carer	boy	girl	primary school	secondary school	primary school	secondary school
A1 - Medium density houses								
A2 - Low density houses								
B1 - Well-kept footpaths								
B2 - Dirty footpaths								
C1 - Trees and Grass								
C2 - Trees								
C3 - Grass								
C4 - No Greenery								
D1 - Playground								
D2 - Bus stop								
D3 - Bus stop and playground								
D4 - No urban amenities								
E1 - Variety of shops								
E2 - Pub								
E3 - Variety of shops and pub								
E4 - No Facilities								
F1 - Chatting								
F2 - Walking								
F3 - Drinking Alcohol								
F4 - Standing								
G1 - Children								
G2 - Teenagers								
G3 - Adults								
G4 - Elderly People								
H1 - Signalised crossing								
H2 - Zebra crossing								
I1 - Crowded footpath								
I2 - Uncrowded footpath								

Note: no difference were observed for the child's gender Very comfortable Fairly comfortable Neutral Fairly uncomfortable Very uncomfortable

Sample size: 226 participants

Source: author's own

The Kruskal-Wallis and Pearson χ^2 tests show a number of differences between the carers and children participants on all the explored attributes excepting the quality of footpaths. Carers' ratings indicate that they are less positive than children with the attribute *trees*, "neutral" with the attributes *a playground*, *a bus stop*, *a bus stop and a playground*, *signalised crossings*, *zebra crossings* and *uncrowded footpaths*, the social attributes *children* and *strangers' walking*, and more negative with the attributes *a variety of shops*, *a pub*, and *other children*. Conversely, children were more positive than carers with *medium density houses*, *trees*, *a bus stop*, *a variety of shops*, *zebra crossings*, and the strangers' activity *standing*.

No apparent differences are observed among children when the ratings are divided according to their gender. However, carers' ratings differ when the gender of the child is considered. Carers tend to be more cautious with girls, leaning to "neutral" values for the attributes *grass* and *strangers' walking*, and "uncomfortable" values for *dirty footpaths* and *strangers' standing*. For these attributes, carers of boys tend to be more positive and "neutral", reporting "comfortable" values for the attributes *a variety of shops* and *a pub*. In the case of child age, primary school children results are "neutral" for the attributes *a variety of shops* and *signalised crossings*, and "uncomfortable" for *a variety of shops* and *a pub*. Meanwhile, secondary school children report "comfortable" values in all the previous attributes, exceptions are *a variety of shops* and *a pub* and *strangers' drinking alcohol*. Both attributes have "neutral" values.

Carers' appreciation varies when considering the children's age. The values show that carers of primary school children are less positive than carers of older children with the attributes *well-kept footpaths* and *zebra crossings* and "uncomfortable" with *a playground*, *a bus stop* and *a playground*, *a variety of shops*, *a pub*, *a variety of shops and a pub* and *signalised crossings*. Carers of secondary school children are one or more points more positive than carers of younger children with the attributes *medium density houses*, *a playground*, *a bus stop*, *a bus stop and a playground*, *a variety of shops*, *a variety of shops and a pub*, *the signalised* and *zebra crossings*.

Interestingly, the studied groups (i.e., children and carers, boys and girls, primary and secondary school children) showed no differences when evaluating the physical environment attributes *low-density houses*, *trees and grass*, *no greenery*, *no urban amenities*, *no facilities* and the social aspects *teenagers*, *adults*, *elderly people*, *strangers' chatting* and *crowded footpaths*.

The preferences above suggest that children and carers like to walk through environments containing "nice" people and "pleasant" physical features.

The responses given by the participants from London tended to be more “extreme” than in Santiago, which may be linked to non-declared agendas (e.g., extreme positive response for trees to give the idea these are most needed somewhere) (see Louviere *et al.*, 2005) or cultural/social beliefs/practices/expressions.

Santiago

The descriptive statistics for the attributes in Santiago are shown in Table 6.4. Detailed information about the non-parametric tests can be found in Appendix 10.8. A summary of the K-W and Pearson χ^2 tests data is shown in Table 6.5. Similar to the previous analysis, different groups of participants the city had distinct preferences for the attributes in a street environment. A visual representation of those preferences is shown in Table 6.6. The differences between the studied groups are described in detail in this section.

In contrast to London, participants in Santiago were more likely to have mid-point preferences. Results show that they are either ambivalent or more neutral when answering the questionnaire. In particular, the attribute medians are spread within an attribute group (see Table 6.6), with participants being “fairly comfortable” (2) with *well-kept footpaths, greenery, playgrounds, a bus stop and a playground, schools, local shops, no vehicles parked on the footpath, children* and *female strangers*. The interquartile ranges for those attributes reach “neutral” (3) values, with *well-kept footpaths* and *trees and grass* being the only attributes with “very comfortable” (1) values.

Participants have neutral attitudes towards *facades, bus stops* and street environments with *no urban amenities, no facilities* and *vehicles parked on the footpaths*. Results show an equivalent perception for strangers on the footpath like *teenagers, adults* and *elderly people, males*, and for strangers’ activities such as *chatting, walking* or *standing*. Interquartile ranges are “fairly comfortable” (2) to “fairly uncomfortable” (4) for all attributes, except for *no facilities, vehicles parked on the footpath, male* strangers and people *standing* on the footpath, which tended to lean towards uncomfortable values. The attributes mode matched the median for all the attributes except for *permeable fences* and *elderly people*, with “fairly comfortable” (2) and not “neutral” (3) being the most common values. The attributes that were uncomfortable according to the participants’ answers were the *quality of footpaths*, those that included any version of dirty and neglected footpaths, *no greenery*, the presence of *off-licence* and strangers’ *drinking alcohol*. The interquartile ranges for all the previous attributes ranged between “fairly uncomfortable” (4) and “very uncomfortable” (5), excepting *no greenery* and *off-licence* that tended to display “neutral” (3) values.

Table 6.4. Statistics for Santiago attributes.

Santiago	Complete sample			Child			Boy			Girl			Primary school			Secondary school		
	Median	Mode	Interquartile range	Median	Mode	Interquartile range	Median	Mode	Interquartile range	Median	Mode	Interquartile range	Median	Mode	Interquartile range	Median	Mode	Interquartile range
A1_Permearable fences	3	2	2 - 3	3	2	2 - 3	3	2 - 3	2 - 3	3	2	2 - 3	3	2	2 - 4	3	2 - 3	2 - 3
A2_Closed fences	3	3	2 - 4	3	3	2 - 3	3	3	2 - 3	3	3	2 - 3	3	3	2 - 4	3	3	2 - 3
B1_Well-kept footpaths	2	2	1 - 3	2	2	1 - 3	2	2	1 - 3	2	1 - 2	1 - 2	2	1 - 2	1 - 3	2	2	1 - 2
B2_Dirty footpaths	4	4	4 - 5	4	4	4 - 5	4	4	3 - 5	4	4	4 - 5	4	4	4 - 5	4	4	3 - 4
B3_Neglect footpaths	4	4	4 - 5	4	4	4 - 5	4	4 - 5	4 - 5	4	4	4 - 5	4	4 - 5	4 - 5	4	4	3 - 5
B4_Dirty and neglected footpaths	5	5	4 - 5	5	5	4 - 5	5	5	4 - 5	4	5	4 - 5	5	5	4 - 5	4	5	4 - 5
C1_Trees and Grass	2	2	1 - 2	2	2	1 - 2	2	1 - 2	1 - 2	2	2	1 - 2	2	2	1 - 2	2	2	1 - 2
C2_Trees (existence of)	2	2	2 - 3	2	2	2 - 3	2	2	2 - 2	2	2	2 - 3	2	2	2 - 3	2	2	2 - 2
C3_Grass (existence of)	2	2	2 - 3	2	2	2 - 3	2	2	2 - 3	2	2	2 - 3	2	2	2 - 3	2	2	2 - 3
C4_No Greenery	4	4	3 - 4	3	4	3 - 4	3	4	3 - 4	3	4	3 - 4	3	3	3 - 4	4	4	3 - 4
D1_Playground	2	2	1 - 3	2	2	1 - 2	2	2	1 - 2	2	1 - 2	1 - 3	2	1	1 - 2	2	2	1 - 2
D2_Bus stop	3	3	2 - 4	3	3	2 - 3	3	2	2 - 3	3	3	2 - 3	3	3	2 - 4	3	3	2 - 3
D3_Bus stop and playground	2	2	2 - 3	2	2	1 - 3	2	2	1 - 3	2	2	2 - 3	2	2	1 - 3	2	2	1 - 3
D4_No urban amenities	3	3	2 - 4	3	3	3 - 4	3	3	3 - 4	3	3	2 - 4	3	3	2 - 4	3	3	3 - 4
E1_School	2	2	2 - 3	2	2	2 - 3	2	2	2 - 3	2	2	2 - 3	2	2	2 - 3	2	2	2 - 3
E2_Local shops	2	2	2 - 3	2	2	2 - 3	2	2	2 - 2	2	2	2 - 3	2	2	2 - 3	2	2	2 - 3
E3_Off-licence	4	4	3 - 5	3	4	2 - 4	3	3	2 - 4	4	4	3 - 5	4	4	2 - 4	3	3	2 - 4
E4_No Facilities	3	3	3 - 4	3	3	2 - 4	3	3	3 - 4	3	3	2 - 4	3	3	3 - 4	3	3	2 - 3
F1_Chatting	3	3	2 - 3	3	2	2 - 3	2	2	2 - 3	3	3	2 - 3	3	2	2 - 3	2	2	2 - 3
F2_Walking	3	3	2 - 3	2	2	2 - 3	2	2	2 - 3	2	2	2 - 3	2	2	2 - 3	2	2	2 - 3
F3_Drinking Alcohol	5	5	4 - 5	5	5	4 - 5	4	5	4 - 5	5	5	4 - 5	5	5	4 - 5	4	4 - 5	4 - 5
F4_Standing	3	3	3 - 4	3	3	2 - 4	3	2	2 - 4	3	3	2 - 4	3	3	2 - 4	3	3	2 - 4
G1_Children	2	2	2 - 3	2	2	1 - 3	2	2	1 - 2	2	2	2 - 3	2	2	2 - 3	2	2	1 - 3
G2_Teenagers	3	3	2 - 4	3	3	2 - 3	3	3	2 - 3	3	3	2 - 4	3	3	2 - 4	2	3	2 - 3
G3_Adults	3	3	2 - 4	3	2 - 3	2 - 3	2	2 - 3	2 - 3	3	2 - 3	2 - 4	2	2	2 - 4	3	3	2 - 3
G4_Elderly People	3	2	2 - 3	3	3	2 - 3	2	3	2 - 3	3	2	2 - 3	3	2	2 - 4	2	3	2 - 3
H1_Vehicles parked on footpath	3	3	3 - 4	3	3	2 - 4	3	3	2 - 4	3	4	3 - 4	3	4	2 - 4	3	3	2 - 4
H2_No parked vehicles	2	2	2 - 3	2	2	2 - 3	2	2	2 - 3	2	2	2 - 3	2	1	1 - 3	2	2	2 - 3
I1_Male (stranger)	3	3	3 - 4	3	3	2 - 4	2	2	2 - 3	3	3	3 - 4	3	3	2 - 4	3	3	2 - 4
I2_Female (stranger)	2	2	2 - 3	2	2	2 - 3	2	2	2 - 3	2	2	2 - 3	2	2	2 - 3	2	2	2 - 3

*Sample size: 204 participants. **The scale values: 1 = very comfortable, 2 = fairly comfortable, 3 = neutral, 4 = fairly uncomfortable, 5 = very uncomfortable

Source: author's own

Table 6.4. Statistics for Santiago attributes (continued).

Santiago	Carer			Boy (carers' views)			Girl (carers' views)			Primary school (carers' views)			Secondary school (carers' views)		
	Median	Mode	Interquartile range	Median	Mode	Interquartile range	Median	Mode	Interquartile range	Median	Mode	Interquartile range	Median	Mode	Interquartile range
A1_Permearable fences	3	2	2 - 3	3	2	2 - 3	3	3	2 - 3	3	2	2 - 4	2	2	2 - 3
A2_Closed fences	3	3	3 - 4	3	3	3 - 4	3	3	3 - 4	4	4	3 - 4	3	3	3 - 4
B1_Well-kept footpaths	2	2	1 - 3	2	2	1 - 3	2	2	1 - 4	2	2	1 - 4	2	2	1 - 2
B2_Dirty footpaths	4	4	4 - 5	4	4	4 - 5	4	4	4 - 5	4	5	4 - 5	4	4	4 - 5
B3_Neglect footpaths	4	5	4 - 5	4	4	4 - 5	5	5	4 - 5	5	5	4 - 5	4	5	4 - 5
B4_Dirty and neglected footpaths	5	5	4 - 5	5	5	4 - 5	5	5	4 - 5	5	5	4 - 5	5	5	4 - 5
C1_Trees and Grass	2	2	1 - 3	2	2	1 - 2	2	2	2 - 3	2	2	2 - 4	2	2	1 - 2
C2_Trees (existence of)	2	2	2 - 3	2	2	2 - 2	3	3	2 - 3	2 - 3	2	2 - 4	2	2	2 - 3
C3_Grass (existence of)	2	2	2 - 3	2	2	2 - 2	2	2	2 - 3	2	2	2 - 4	2	2	2 - 3
C4_No Greenery	4	4	3 - 4	3 - 4	4	3 - 4	4	4	3 - 4	4	4	3 - 4	4	4	3 - 4
D1_Playground	2	2	1 - 3	2	2	2 - 3	2	1 - 2	1 - 3	2	2	1 - 4	2	2	1 - 3
D2_Bus stop	3	3	2 - 4	3	3	2 - 4	3	4	2 - 4	4	4	3 - 5	3	3	2 - 3
D3_Bus stop and playground	2	2	2 - 4	2	2	2 - 3	3	2	2 - 4	3	2	2 - 4	2	2	2 - 3
D4_No urban amenities	3	2	2 - 4	3	2	2 - 4	3	3	2 - 4	3	2	2 - 4	3	2 - 3	2 - 4
E1_School	2	2	2 - 3	2	2	2 - 3	3	2	2 - 3	3	2	2 - 3	2	2	2 - 3
E2_Local shops	2	2	2 - 3	2	2	2 - 3	3	2	2 - 4	3	2	2 - 4	2	2	2 - 3
E3_Off-licence	4	4	3 - 5	4	4	3 - 5	4	5	4 - 5	4	5	3 - 5	4	4	3 - 5
E4_No Facilities	3	4	3 - 4	3	4	2 - 4	4	4	3 - 4	4	4	2 - 4	3	3	3 - 4
F1_Chatting	3	3	2 - 3	3	2	2 - 3	3	3	2 - 3	3	3	2 - 4	3	3	2 - 3
F2_Walking	3	3	2 - 3	3	3	2 - 3	3	3	2 - 4	3	3	2 - 4	3	3	2 - 3
F3_Drinking Alcohol	5	5	5 - 5	5	5	5 - 5	5	5	5 - 5	5	5	5 - 5	5	5	4 - 5
F4_Standing	3	3	3 - 4	3	3	3 - 4	4	4	3 - 4	4	4	3 - 4	3	3	3 - 4
G1_Children	2	2	2 - 3	2	2	2 - 3	2	2	2 - 3	2	2	2 - 4	2	2	2 - 3
G2_Teenagers	3	4	2 - 4	3	3 - 4	2 - 4	4	4	3 - 4	4	4	3 - 4	3	3	2 - 4
G3_Adults	3	4	3 - 4	3	2 - 3	2 - 4	4	4	3 - 4	4	4	3 - 4	3	3	3 - 4
G4_Elderly People	3	2	2 - 4	2	2	2 - 3	3	4	2 - 4	3	4	2 - 4	3	2 - 3	2 - 3
H1_Vehicles parked on footpath	4	4	3 - 5	4	4	3 - 4	4	5	3 - 5	4	4	4 - 5	3	3	3 - 4
H2_No parked vehicles	2	2	2 - 4	2	2	2 - 4	2 - 3	2	2 - 4	3	2 - 4	2 - 4	2	2	2 - 3
I1_Male (stranger)	4	4	3 - 4	3	3	3 - 4	4	4	4 - 5	4	4	3 - 5	4	4	3 - 4
I2_Female (stranger)	3	2	2 - 3	3	3	2 - 3	3	2	2 - 4	3	2	2 - 4	3	3	2 - 3

*Sample size: 204 participants. **The scale values: 1 = very comfortable, 2 = fairly comfortable, 3 = neutral, 4 = fairly uncomfortable, 5 = very uncomfortable

Source: author's own.

Table 6.5. Summary of non-parametric tests to see differences between groups in Santiago.

Attribute	Statistic	Parent vs Child	Boy vs girl	Primary vs secondary school	Boy vs girl (carers views)	Primary vs secondary school (carers views)
A1 - Permeable fences	Kruskal-Wallis <i>p</i>	0.759	0.069	0.064	0.696	0.002
	Pearson X^2 <i>p</i>	0.582	0.054	0.000	0.087	0.000
A2 - Closed fences	Kruskal-Wallis <i>p</i>	0.000	0.619	0.947	0.261	0.002
	Pearson X^2 <i>p</i>	0.000	0.577	0.002	0.757	0.030
B1 - Well-kept footpaths	Kruskal-Wallis <i>p</i>	0.094	0.524	0.343	0.277	0.104
	Pearson X^2 <i>p</i>	0.277	0.536	0.188	0.281	0.113
B2 - Dirty footpaths	Kruskal-Wallis <i>p</i>	0.079	0.767	0.049	0.242	0.136
	Pearson X^2 <i>p</i>	0.236	0.331	0.226	0.365	0.159
B3 - Neglect footpaths	Kruskal-Wallis <i>p</i>	0.056	0.397	0.019	0.839	0.102
	Pearson X^2 <i>p</i>	0.284	0.716	0.073	0.163	0.135
B4 - Dirty and neglected footpaths	Kruskal-Wallis <i>p</i>	0.278	0.625	0.015	0.731	0.051
	Pearson X^2 <i>p</i>	0.718	0.592	0.046	0.346	0.154
C1 - Trees and Grass	Kruskal-Wallis <i>p</i>	0.000	0.387	0.694	0.059	0.001
	Pearson X^2 <i>p</i>	0.000	0.488	0.270	0.046	0.024
C2 - Trees (existence of)	Kruskal-Wallis <i>p</i>	0.026	0.047	0.506	0.001	0.067
	Pearson X^2 <i>p</i>	0.004	0.239	0.464	0.012	0.051
C3 - Grass (existence of)	Kruskal-Wallis <i>p</i>	0.919	0.281	0.871	0.056	0.021
	Pearson X^2 <i>p</i>	0.068	0.667	0.797	0.045	0.022
C4 - No Greenery	Kruskal-Wallis <i>p</i>	0.269	0.710	0.699	0.368	0.521
	Pearson X^2 <i>p</i>	0.773	0.649	0.651	0.332	0.956
D1 - Playground	Kruskal-Wallis <i>p</i>	0.008	0.352	0.636	0.701	0.348
	Pearson X^2 <i>p</i>	0.024	0.263	0.035	0.556	0.473
D2 - Bus stop	Kruskal-Wallis <i>p</i>	0.002	0.096	0.060	0.573	0.000
	Pearson X^2 <i>p</i>	0.004	0.331	0.096	0.038	0.006
D3 - Bus stop and playground	Kruskal-Wallis <i>p</i>	0.000	0.124	0.782	0.754	0.038
	Pearson X^2 <i>p</i>	0.004	0.200	0.712	0.391	0.112
D4 - No urban amenities	Kruskal-Wallis <i>p</i>	0.898	0.713	0.534	0.171	0.655
	Pearson X^2 <i>p</i>	0.008	0.563	0.121	0.501	0.362

*Sample size: 204 participants. Note: In bold (green) are shown significant attributes at 95% of confidence

Source: author's own

Table 6.5. Summary of non-parametric tests to see differences between groups in Santiago (continued).

Attribute	Statistic	Parent vs Child	Boy vs girl	Primary vs secondary school	Boy vs girl (carers views)	Primary vs secondary school (carers views)
E1 - School	Kruskal-Wallis p	0.094	0.189	0.872	0.276	0.112
	Pearson X ² p	0.223	0.699	0.431	0.616	0.223
E2 - Local shops	Kruskal-Wallis p	0.001	0.055	0.854	0.218	0.110
	Pearson X ² p	0.021	0.049	0.439	0.409	0.303
E3 - Off-licence	Kruskal-Wallis p	0.000	0.025	0.703	0.138	0.720
	Pearson X ² p	0.001	0.182	0.949	0.049	0.458
E4 - No Facilities	Kruskal-Wallis p	0.013	0.837	0.125	0.065	0.883
	Pearson X ² p	0.034	0.241	0.143	0.379	0.281
F1 - Chatting	Kruskal-Wallis p	0.045	0.023	0.162	0.104	0.022
	Pearson X ² p	0.251	0.170	0.049	0.124	0.008
F2 - Walking	Kruskal-Wallis p	0.000	0.287	0.286	0.851	0.031
	Pearson X ² p	0.000	0.405	0.591	0.539	0.071
F3 - Drinking Alcohol	Kruskal-Wallis p	0.000	0.112	0.001	0.904	0.044
	Pearson X ² p	0.002	0.246	0.008	0.839	0.162
F4 - Standing	Kruskal-Wallis p	0.001	0.244	0.605	0.195	0.323
	Pearson X ² p	0.003	0.248	0.931	0.414	0.198
G1 - Children	Kruskal-Wallis p	0.011	0.035	0.131	0.162	0.020
	Pearson X ² p	0.130	0.147	0.086	0.721	0.093
G2 - Teenagers	Kruskal-Wallis p	0.000	0.031	0.002	0.123	0.000
	Pearson X ² p	0.000	0.118	0.031	0.525	0.001
G3 - Adults	Kruskal-Wallis p	0.000	0.048	0.550	0.005	0.040
	Pearson X ² p	0.001	0.256	0.066	0.034	0.003
G4 - Elderly People	Kruskal-Wallis p	0.057	0.298	0.104	0.015	0.033
	Pearson X ² p	0.132	0.374	0.110	0.117	0.125
H1 - Vehicles parked on footpath	Kruskal-Wallis p	0.000	0.131	0.056	0.835	0.030
	Pearson X ² p	0.001	0.227	0.057	0.389	0.034
H2 - No parked vehicles	Kruskal-Wallis p	0.571	0.967	0.934	0.536	0.051
	Pearson X ² p	0.069	0.240	0.012	0.230	0.011
I1 - Male stranger	Kruskal-Wallis p	0.000	0.000	0.679	0.000	0.079
	Pearson X ² p	0.000	0.000	0.848	0.000	0.521
I2 - Female stranger	Kruskal-Wallis p	0.000	0.633	0.491	0.928	0.030
	Pearson X ² p	0.005	0.440	0.747	0.146	0.003

*Sample size: 204 participants. Note: In bold (green) are shown significant attributes at 95% of confidence

Source: author's own.

Table 6.6. Interquartile range for groups with significantly different attribute preferences in Santiago.

Attribute	Participant		Child gender		Child gender (carers views)		Child age		Child age (carers views)	
	child	carer	boy	girl	boy	girl	primary school	secondary school	primary school	secondary school
A1 - Permeable fences										
A2 - Closed fences										
B1 - Well-kept footpaths										
B2 - Dirty footpaths										
B3 - Neglect footpaths										
B4 - Dirty and neglected footpaths										
C1 - Trees and Grass										
C2 - Trees										
C3 - Grass										
C4 - No Greenery										
D1 - Playground										
D2 - Bus stop										
D3 - Bus stop and playground										
D4 - No urban amenities										
E1 - School										
E2 - Local shops										
E3 - Off-licence										
E4 - No Facilities										
F1 - Chatting										
F2 - Walking										
F3 - Drinking Alcohol										
F4 - Standing										
G1 - Children										
G2 - Teenagers										
G3 - Adults										
G4 - Elderly People										
H1 - Vehicles parked on footpath										
H2 - No parked vehicles										
I1 - Male stranger										
I2 - Female stranger										

Very comfortable
 Fairly comfortable
 Neutral
 Fairly uncomfortable
 Very uncomfortable

Sample size: 226 participants

Source: author's own.

Considering the Kruskal-Wallis and Pearson χ^2 test results, carers and children's ratings show numerous differences. Children are more positive than carers with the physical attributes *a bus stop and a playground, off-licence, no facilities, vehicles parked on the footpath*, and the social attributes *children, adults, male and female strangers*, and strangers' *walking and standing*. For the attribute strangers' *drinking alcohol*, carers are more negative than children. Additionally, carers are one point more negative or "neutral" with the physical attributes *permeable fences, trees and grass, a playground, a bus stop, a bus stop and a playground, an off-licence, vehicles parked on the footpath* and the social aspects including *teenagers, adults, female strangers* and strangers' *walking*. For the rest of the attributes, carers and children show no significant differences.

Considering children's gender, differences appear in the attributes *greenery, facilities* and those that are characteristics of strangers (e.g., age, gender). Boys are generally more positive than girls in the perceptions of the attributes *an off-licence* and other *children, teenagers, male strangers* and stranger's *chatting*. By contrast, girls are more negative with the physical attributes *trees* and *off-licence*, and the social attributes *children, teenagers, adults, male strangers* and strangers' *chatting*. Carers' ratings also show differences when the child gender is considered. Carers of boys are more positive than carers of girls with the attributes *trees* and *adults*, and "neutral" with the attribute *male strangers*. Carers of girls tend to be more negative than carers of boys with the attributes *elderly people* and *male strangers*.

Results for children of different ages show differences for the quality for footpaths attributes, *teenagers* and strangers' *drinking alcohol*. Primary school children's answers indicate that they are more negative than secondary school children with the attributes *dirty and neglected footpaths, strangers' drinking alcohol* and *teenagers*. Secondary school children rating values are "neutral" for *dirty footpaths* and *neglected footpaths*, and "fairly uncomfortable" for strangers' *drinking alcohol*.

When carers' ratings are divided according to the children age, the data show that carers of primary school children tend to be "uncomfortable" with the attributes *permeable fences and closed fences, trees and grass and grass, a bus stop and a bus stop and a playground*, and *vehicles parked on the footpath*; but more "comfortable" with other *children*. They also tend to have more negative values than carers of older children for the social aspects *teenagers, adults, elderly people, strangers' chatting, walking or drinking alcohol*, and *female strangers*. Conversely, carers of secondary school children tend to be "comfortable" with the attributes *trees and grass*,

a bus stop, teenagers, “neutral” with closed fences, vehicles parked on the footpath and adults, and “uncomfortable” with strangers’ drinking alcohol.

6. 2. Summary and discussion

The rating analyses showed the preference of each attribute of the built and the social environments. In London and Santiago, the attribute *well-kept footpaths* was preferred in the ratings for children's unaccompanied walking trips, like the findings of Evenson *et al.* (2006) and De Meester *et al.* (2014). The attribute *dirty footpaths* was equally disliked as also found by Day and Wager (2010). Additionally, any version of *neglected footpaths* was disliked in Santiago. The rating of *dirty footpaths* was worse among carers of girls than carers of boys in London. In Santiago, the rating for the same attribute was worse among younger children than older children.

Low and *medium density houses* were preferred by the participants in London. Nonetheless, facades attributes are neutral in Santiago, similar to the interpretations of Iglesias *et al.* (2013) who explored the preferences of another group from the city (i.e., adults). *Permeable fences* and *medium density houses* in London were preferred more by children and carers of secondary school children and less by carers. In Santiago, *permeable fences* and *closed fences* are disliked more by carers of young children than carers of older children.

Similar to the findings of other authors (Kamargianni and Polydoropoulou, 2014; Webb Jamme *et al.*, 2018), greenery attributes are preferred in both cities, but the absence of greenery was disliked only in Santiago. Children prefer more the attributes related to greenery than carers in both cities, while *grass* in Santiago and *trees* in London were preferred more by boys and their carers than girls and their carers. In Santiago, carers of older children preferred more the attribute *trees and grass*.

Regarding urban amenities, the presence of *playgrounds* are preferred in both cities, similar to the findings of several authors (Carver *et al.*, 2008; Christian *et al.*, 2015). In both cities, children tended to prefer the attribute *playgrounds* more than carers. This is also the case for carers' views according to children's age, carers of older children prefer more than carers of younger children the attribute *a playground*. The attribute *a bus stop* has been often considered positive (Elshater, 2018; Singh and Vasudevan, 2018) and negative (Zhu and Lee, 2009) in other contexts, yet the data indicated that, in Santiago, *a bus stop* is neither positive nor negative. This is, however, similar to the findings of Foster *et al.* (2015).

Facilities like *shops* in both cities, *pubs* in London and *schools* in Santiago were preferred, coinciding with the findings of other authors (Kerr *et al.*, 2006; Carver *et al.*, 2014a), and differing from the conclusions of Zhu and Lee (2009). The attribute *a variety of shops* in London was preferred more by boys and carers of boys than girls and their carers. Boys and carers of boys also disliked the attribute of *a pub*, but less than other groups. In contrast, *an off-licence* in Santiago was particularly disliked among carers and girls. Those gendered patterns have also been observed by Valentine (1997b) and Crawford *et al.* (2017). Traffic-related attributes *signalised* and *zebra crossing* were preferred in London, as also suggested by other scholars (Ahern *et al.*, 2017; Smith *et al.*, 2019). Moreover, crossing facilities were preferred in the ratings of older children and carers of older children. In Santiago, *no vehicles parked on the footpath* were preferred, whereas *vehicles parked on the footpath* are neither preferred nor disliked.

Strangers' activities like *chatting* and *walking* were preferred in London but neither liked nor disliked in Santiago. Strangers *walking* were preferred in the rating of children, whereas carers of young children in Santiago and carers of girls in London disliked more this attribute than other carers. Although those activities can enrich the public space, carers' apprehensions for younger children and girls seems to be more relevant than the potential benefits for the public. Activities linked to antisocial behaviours like *drinking alcohol* are equally disliked in both cities, as also described in other works (Freeman, 2010). Furthermore, strangers *drinking alcohol* were disliked more by carers and primary school children.

Other *children* on the streets were preferred in both cities as other authors suggest (Porter *et al.*, 2020; Wales *et al.*, 2021). In both cities, other *children* were more preferred by children than carers. In Santiago, the attribute other *children* was preferred more by carers of primary school children, whereas *teenagers* was preferred more by carers of older children. Both attributes were also preferred more by boys than girls. The attribute *adults* was disliked more by girls and carers of young children. These differences support the findings of several authors (Valentine, 1997a; Brown *et al.*, 2008; Furneaux and Manaugh, 2019) who suggest that younger children and girls are perceived as more vulnerable individuals.

In Santiago, the attribute *female* strangers was preferred by all as also observed by Francis *et al.* (2017). *Male* strangers were neither preferred nor disliked. Additionally, boys and carers of boys prefer more male strangers than girls and carers of girls. In London, *crowded footpaths* are neither preferred nor disliked, coinciding with the ambivalent findings of Nansen *et al.* (2015) and Francis *et al.* (2017).

Chapter 7. Findings - Quantitative stage II

Discrete choice models, verification and ranking tasks

This chapter reports the findings of a questionnaire experiment that aimed to understand the impact of street environments with particular characteristics on children's unaccompanied walking trips (objectives 4 and 5). As described in Chapter 4.2.2, children, young people and carers completed a questionnaire with a range of methods, and this chapter covers three of them: the stated preferences tasks, the verification task and the ranking question. To facilitate the interpretation of the results, responses were analysed independently for each dataset and are brought together in the last section of this chapter. The sample characteristics can be found in Chapter 4.4.2.

7. 1. Discrete choice models

Discrete choice models are used to estimate the preferences of individuals on a set of attributes (i.e., impact of the attributes) in a choice context like the choice of a street environment for walking unaccompanied. The modeller usually has a notion of the expected signs of the attributes considering the available literature and previous experiments (Ortúzar and Willumsen, 2011). For the attributes studied in this research¹, the selection process is described in Chapter 4.2, and the expected signs are shown in Table 7.1.

Children, young people and carers completed a stated preferences questionnaire task, as described in Chapter 4.2.2 (questionnaire sections D, F1 and F2). The data from that task was analysed using discrete choice modelling methods, which provided a measure of the relative weight of the attributes by comparing each attribute-level in relation to the sociodemographic characteristics of respondents.

¹ All the attributes were tested in the pilot stage (Chapter 4) and were successfully interpreted by participants. Only two attributes, *lane width* and *traffic*, were dropped before the pilot stage because that would have required an extra task, increasing the complexity of the experiment. All of the studied attributes were incorporated into the final models, including not significant ones, as suggested by Ortúzar and Willumsen (2011).

Table 7.1. Expected signs of studied attributes.

Attribute	Attribute level	Expected sign
Facades	Medium density houses	(+)
	Low density houses	(-)
	Permeable Fences	(+)
	Closed Fences	(-)
Quality of footpaths	Well-kept footpaths	(+)
	Dirty footpaths	(-)
	Neglect footpaths	(-)
	Dirty and neglected footpaths	(-)
Greenery	Trees and grass	(+)
	Trees	(+)
	Grass	(+)
	No greenery	not clear
Urban amenities	Playground	(+)
	Bus stop	(+)
	Bus stop and playground	(+)
	No urban amenities	not clear
Facilities	School	(+)
	Variety of shops / Local shops	(+)
	Pub	(+)
	Variety of shops and pub	not clear
	Off-licence	(-)
	No Facilities	not clear
Parked vehicles	Vehicles Parked on Footpath	(-)
	No Parked Vehicles	(+)
Crossings	Signalised crossing	not clear
	Zebra crossing	(+)
	Dropped kerbs (informal crossing)	not clear
Vehicles lane direction	One-way traffic	(+)
	Two way traffic	(-)
Traffic composition	Car traffic only	(+)
	Car and bus traffic	(-)
Strangers' activities	Chatting	not clear
	Walking	(+)
	Drinking alcohol	(-)
	Standing	(-)
Strangers' age	Children	(+)
	Teenegers	not clear
	Adults	not clear
	Elderly people	not clear
Strangers' gender	Male	(-)
	Female	(+)
Density of people	Crowded footpath	not clear
	Uncrowded footpath	not clear

Source: author's own

The studied attributes described in Chapter 4.2 were arranged in six route choice models (see details in Chapter 4.2.2) as follows²:

- » For London participants, two sets with five attributes each were used for the estimation of two models, named LON1 and LON2.
- » Santiago participants were also shown two sets with five attributes each, named SLC1, SCL2.
- » Participants from both cities were presented with the same attributes and choices, for a "generic" city; one set with five attributes was used to estimate the generic city "street link" named GC-Link and one set with three attributes was used to estimate the generic city "street junction" model named GC-Junction.

The data from children, young people and carers is used for estimating the models. On all six models but GC-Junction, the alternatives were "Street A", "Street B" (both with a different set of attributes), "Both streets are acceptable", and "Neither of the streets". The alternatives for model GC-Junction were "Crossing A", "Crossing B", "Both streets are acceptable", and "Neither of the crossings". Additionally, "I don't know" was included along with all the alternatives. The dependent variable in all the models was the reported choice (Ben-Akiva and Lerman, 1985; Louviere *et al.*, 2000). The statistics for the alternatives of each model are shown in Table 7.2.

The estimated models consider several assumptions. First, the utility functions were considered strictly additive with independent marginal utilities and included only main effects (i.e., no interaction effects). Some authors (Louviere *et al.*, 2000) refer to this structure as "simplistic and naïve", potentially leading to the "omitted-variables problem". However, the complexity of the choice task limited the inclusion of interaction effects. Additionally, a block design was used to account for the large experimental design (see Chapter 4) that assumes respondents' homogeneity of preferences. Second, the multinomial logit models (MNL) estimated have an error component (ε_{iq}) that was assumed to be distributed independently and identically (IID) Gumbel with mean zero and variance σ (Ben-Akiva and Lerman, 1985, Ortúzar and Willumsen, 2011). The IID error assumption was relaxed for the Mix Logit models (MMNL) to account those respondents who answered in more than one choice situation, for instance, assuming that the respondents have similar marginal utility parameters. This, however, may vary across choice situations.

² Several model structures that combined datasets were tested (Louviere *et al.*, 2011). For instance, London and Santiago's datasets were combined considering some attributes common to both (e.g., greenery, strangers' activities). However, these models were dropped because they generated less intuitive models and required a more resource-intensive modelling process.

Table 7.2. Statistics of the alternatives for the models.

	Number of observations (%)					
	LON 1	LON 2	SCL 1	SCL 2	GC-Link	GC-Junction
Street A	411 (44%)	413 (47%)	320 (41%)	370 (44%)	1452 (42%)	-
Street B	406 (44%)	344 (39%)	254 (32%)	364 (43%)	1314 (38%)	-
Crossing A	-	-	-	-	-	777 (45%)
Crossing B	-	-	-	-	-	681 (40%)
Neither of the alternatives	89 (10%)	98 (11%)	175 (22%)	93 (11%)	594 (17%)	229 (13%)
Don't know	22 (2%)	25 (3%)	35 (4%)	21 (2%)	80 (2%)	33 (2%)
Total observations	1080		1632		3440	1720

Source: author's own

To obtain the best possible multinomial logit models (MNL), a stepwise backward process was adopted. The initial model included all the parameters, then this was reduced by discarding the least significant parameter ($|t\text{-test}| < 1.96$ for 95% of confidence) one at the time, until all the remaining parameters were statistically significant. In addition, following the guidelines outlined in Chapter 4.2.1, non-significant policy parameters³ with the correct sign were kept in the model. The loglikelihood, likelihood ratio index and parameters for models LON1, LON2, SCL1 and SCL2 are shown in Tables 7.3, 7.4, 7.5 and 7.6, respectively. The generic models are described later in the chapter. No alternative specific constants (ASC) are estimated in unlabelled alternatives (Louviere *et al.*, 2000), and estimated parameters are generic (i.e., have the same value across alternatives). The only ASC included in the models were the “neither street alternative” to capture the average effect of not measured factors. Additionally, mix logit model structures (MMNL) were estimated to incorporate heterogeneity across multiple observations for each participant (i.e., pseudo-panel effect) using intra-individual mixing of policy attributes (using random coefficients) as described by Hess and Palma (2019). A model with random coefficients was chosen because it seems more appropriate to capture variations of policy parameters assuming differences for the participants responding to several stated preference task but with different attribute values (Ortúzar and Willumsen, 2011; Hess and Palma, 2019).

³ Policy parameters in all the models are the studied attributes without taste variations.

The LON1 model specification is as follows:

$$\begin{aligned}
 U^{StreetA}, U^{StreetB} = & (\theta_{A1} + \theta_{A1-ChildDirectlyRecruited} \cdot ChildDirectlyRecruited) \cdot A1 \\
 & + (\theta_{B1} + \theta_{B1-NonSchoolTrip(Child)} \cdot NonSchoolTrip_{Child}) \cdot B1 \\
 & + (\theta_{D1} + \theta_{D1-PrimarySchoolChild(Carer)} \cdot PrimarySchoolChild_{Carer} \\
 & + \theta_{D1-CarerAge18-30} \cdot CarerAge18-30) \cdot D1 \\
 & + (\theta_{D2} + \theta_{D2-PrimarySchoolChild} \cdot PrimarySchoolChild \\
 & + \theta_{D2-LastTripUnaccompanied(Carer)} \cdot LastTripUnaccompanied_{Carer} \\
 & + \theta_{D2-LastTripAnotherChild(Child)} \cdot LastTripUnaccompanied_{Child}) \cdot D2 \\
 & + (\theta_{D3} + \theta_{D3-PrimarySchoolChild} \cdot PrimarySchoolChild \\
 & + \theta_{D3-IMDCrime(Carer)} \cdot IMDCrime_{Carer}) \cdot D3 \\
 & + (\theta_{E1} + \theta_{E1-PrimarySchoolChild(Carer)} \cdot PrimarySchoolChild_{Carer} \\
 & + \theta_{E1-CarerAge18-30} \cdot CarerAge18-30 \\
 & + \theta_{E1-ChildDirectlyRecruited} \cdot ChildDirectlyRecruited) \cdot E1 \\
 & + (\theta_{E2} + \theta_{E2-PrimarySchoolChild(Carer)} \cdot PrimarySchoolChild_{Carer} \\
 & + \theta_{E2-IMDLivingEnvironment(Carer)} \cdot IMDLivingEnvironment_{Carer}) \cdot E2 \\
 & + (\theta_{E3} + \theta_{E3-Boy} \cdot Boy + \theta_{E3-Boy(Carer)} \cdot Boy_{Carer} \\
 & + \theta_{E3-LastTripAnotherChild(Child)} \cdot LastTripAnotherChild_{Child}) \cdot E3 \\
 & + (\theta_{H1} + \theta_{H1-LastTripAnotherChild(Carer)} \cdot LastTripAnotherChild_{Carer} \\
 & + \theta_{H1-IMDIncome(Child)} \cdot IMDIncome_{Child}) \cdot H1 + \varepsilon
 \end{aligned}$$

$$U^{NeitherStreet} = ASC^{NeitherStreet}$$

Where,

- $A1 = 1$ if the attribute *medium density houses* is included, 0 otherwise;
 $B1 = 1$ if the attribute *well-kept footpaths* is included, 0 otherwise;
 $D1 = 1$ if the attribute *playground* is included, 0 otherwise;
 $D2 = 1$ if the attribute *bus stop* is included, 0 otherwise;
 $D3 = 1$ if the attribute *bus stop and playground* is included, 0 otherwise;
 $E1 = 1$ if the attribute *variety of shops* is included, 0 otherwise;
 $E2 = 1$ if the attribute *pub* is included, 0 otherwise;
 $E3 = 1$ if the attribute *variety of shops and a pub* is included, 0 otherwise;
 $H1 = 1$ if the attribute *signalised crossing* is included, 0 otherwise; and
 ε = error term

The LON1 MMNL version of the model (Table 7.3) has the superior log-likelihood, log-likelihood ratio index and a likelihood ratio test (LR) of $96.098 < 16.919 = \chi^2_{(9, 95\%)}$; the null hypothesis is not rejected and, therefore, the MMNL model version is statistically stronger than the MNL model. All policy parameters in the LON1 MMNL model have the correct sign. Five policy parameters are significant, while four are not significant at 95% confidence level. These latter parameters are kept in the model following the advice of Ortúzar and Willumsen (2011). Also, the non-policy parameters in the model are significant at 90% confidence.

Table 7.3. MNL and MMNL models outputs and estimates for LON1.

	LON1 MNL		LON1 MMNL	
LL(final)	-627.228		-579.179	
Estimated parameters	29		38	
ρ^2 ρ^2 adj.	0.37 0.341		0.418 0.38	
Sample size / Number of observations	232 / 906		232 / 906	
Attributes	Estimate	t-ratio	Estimate	t-ratio
ASC Neither option	-0.156	-0.677	0.583	1.288
A1 - Medium density houses	0.321	1.509	0.488	1.188
A2 - Low density houses	0.000	-	0.000	-
B1 - Well-kept footpaths	1.595	13.171 **	3.665	5.586 **
B2 - Dirty footpaths	0.000	-	0.000	-
D1 - Playground	0.058	0.311	0.334	0.855
D2 - Bus stop	-0.020	-0.079	0.044	0.078
D3 - Bus stop and playground	0.286	0.985	1.153	1.780 *
D4 - No urban amenities	0.000	-	0.000	-
E1 - Variety of shops	0.235	1.269	0.402	0.895
E2 - Pub	0.438	2.236 **	0.772	1.710 *
E3 - Variety of shops and pub	-0.659	-2.553 **	-1.298	-2.140 **
E4 - No Facilities	0.000	-	0.000	-
H1 - Signalised crossing	-0.218	-1.834 *	-0.553	-2.042 **
H2 - Zebra crossing	0.000	-	0.000	-
Taste variations (in italics)				
A1 - Medium density houses * <i>child participant directly recruited</i>	-1.073	-2.947 **	-1.947	-2.741 **
B1 - Well-kept footpaths * <i>non-school trip (child views)</i>	0.618	2.907 **	1.750	2.382 **
D1 - Playground * <i>primary school child (carer views)</i>	0.763	2.371 **	1.311	1.888 *
D1 - Playground * <i>carer age 18-30</i>	-1.033	-2.362 **	-1.944	-1.919 *
D2 - Bus stop * <i>primary school child</i>	-0.919	-2.765 **	-1.674	-2.036 **
D2 - Bus stop * <i>last trip unaccompanied (carer views)</i>	0.985	2.917 **	1.941	2.324 **
D2 - Bus stop * <i>last trip with another child (child views)</i>	1.427	3.144 **	3.021	2.377 **
D3 - Bus stop and playground * <i>primary school child</i>	-0.857	-2.773 **	-2.383	-2.539 **
D3 - Bus stop and playground * <i>IMD crime domain (carer views)</i>	-0.636	-2.190 **	-1.754	-2.235 **
E1 - Variety of shops * <i>primary school child (carer views)</i>	-1.245	-3.721 **	-2.720	-2.980 **
E1 - Variety of shops * <i>carer age 18-30</i>	1.222	2.777 **	2.818	2.616 **
E1 - Variety of shops * <i>child participant directly recruited</i>	1.518	3.936 **	3.520	3.272 **
E2 - Pub * <i>primary school child (carer views)</i>	-1.272	-4.036 **	-1.901	-2.968 **
E2 - Pub * <i>IMD living environment domain (carer views)</i>	0.671	2.486 **	1.544	2.860 **
E3 - Variety of shops and pub * <i>boy (carer views)</i>	0.883	2.914 **	2.296	2.845 **
E3 - Variety of shops and pub * <i>boy</i>	0.769	2.426 **	1.897	2.321 **
E3 - Variety of shops and pub * <i>last trip with another child (child views)</i>	1.416	3.179 **	3.027	2.216 **
H1 - Signalised crossing * <i>last trip with another child (carer views)</i>	0.603	2.282 **	1.182	1.980 **
H1 - Signalised crossing * <i>IMD income domain (child views)</i>	0.479	2.175 **	1.058	2.167 **
Random coefficients				
η A1 - Medium density houses	-	-	-0.640	-1.275
η B1 - Well-kept footpaths	-	-	-2.602	-4.931 **
η D1 - Playground	-	-	1.319	2.018 **
η D2 - Bus stop	-	-	-2.694	-4.083 **
η D3 - Bus stop and playground	-	-	-2.557	-3.879 **
η E1 - Variety of shops	-	-	1.509	2.298 **
η E2 - Pub	-	-	-0.277	-0.437
η E3 - Variety of shops and pub	-	-	-1.706	-2.679 **
η H1 - Signalised crossing	-	-	-0.813	-2.199 **

* Significant at 90% confidence | ** Significant at 95% confidence

Source: author's own

The attributes in LON 1 MMNL model with the most relevant positive effect are *well-kept footpaths*, a *bus stop* and a *playground* and a *pub*. Other attributes with a positive effect are *medium density houses*, a *playground*, a *bus stop* and a *variety of shops*, but they are not significant. The attributes with the most relevant negative and significant effect are streets with a *variety of shops* and a *pub* and *signalised crossings*.

The LON 1 MMNL model taste variations show that the attribute *medium density houses* has a negative value for child participants directly recruited. The attribute *well-kept footpaths* shows a positive effect on the utility for a child completing a non-school trip. Results for the attribute a *playground* has a positive impact on carers of a primary school child and a negative impact on carers aged 18-30. The effect of the attribute a *bus stop* is negative on a primary school child's utility. Likewise, the attribute a *bus stop* and a *playground* has a negative value for children in primary school and carers residing in the most deprived areas according to the crime domain (i.e., higher crime rates). Results show that the attribute a *variety of shops* decreases the utility for carers of primary school children, but increases the utility for carers aged 18 to 30 and for a child participant that was directly recruited. The attribute a *pub* has a negative effect on carers of a primary school and a positive effect on carers from a deprived area in terms of the living environment domain. In different proportion, the attribute a *variety of shops* and a *pub* increases the utility for boys and their carers. Lastly, the attribute *signalised crossings* has a positive value for a child living in one of the most income-deprived areas.

The model also shows other positive associations that are statistically significant. The attribute a *bus stop* has a positive effect on a child that travelled unaccompanied on his/her last trip and a child that travelled with another child. A *variety of shops* and a *pub* is positive for a child that travelled with another child. Meanwhile, the attribute *signalised crossings* is positive for a carer of a child that travelled with another child.

The LON2 model specification is as follows:

$$\begin{aligned}
 U^{StreetA}, U^{StreetB} = & \theta_{A1} \cdot A1 + (\theta_{C1} + \theta_{C1-CarerAge18-30} \cdot CarerAge18-30) \cdot C1 + \theta_{C2} \cdot C2 \\
 & + \theta_{C3} \cdot C3 \\
 & + (\theta_{F1} + \theta_{F1-IMDCrime(Carer)} \cdot IMDCrime_{Carer} \\
 & + \theta_{F1-LastTripChildAdult(Carer)} \cdot LastTripChildAdult_{Carer} \\
 & + \theta_{F1-NonSchoolTrip(Child)} \cdot NonSchoolTrip_{Child}) \cdot F1 \\
 & + (\theta_{F2} + \theta_{F2-IMDCrime(Carer)} \cdot IMDCrime_{Carer} \\
 & + \theta_{F2-IMDCrime(Child)} \cdot IMDCrime_{Child}) \cdot F2 \\
 & + (\theta_{F3} + \theta_{F3-IMDCrime(Carer)} \cdot IMDCrime_{Carer}) \cdot F3 \\
 & + (\theta_{G1} + \theta_{G1-Carer} \cdot Carer \\
 & + \theta_{G1-LastTripUnaccompanied(Child)} \cdot LastTripUnaccompanied_{Child}) \cdot G1 \\
 & + (\theta_{G2} + \theta_{G2-IMDIncome(Carer)} \cdot IMDIncome_{Carer} \\
 & + \theta_{G2-IMDIncome(Child)} \cdot IMDIncome_{Child}) \cdot G2 \\
 & + (\theta_{G3} + \theta_{G3-ChildDirectlyRecruited} \cdot ChildDirectlyRecruited) \cdot G3 \\
 & + (\theta_{I1} + \theta_{I1-LastTripAnotherChild(Child)} \cdot LastTripAnotherChild_{Child}) \cdot I1 + \varepsilon
 \end{aligned}$$

$$U^{NeitherStreet} = ASC^{NeitherStreet}$$

Where

A1 = 1 if the attribute *medium density houses* is included, 0 otherwise;

C1 = 1 if the attribute *trees and grass* is included, 0 otherwise;

C2 = 1 if the attribute *trees* is included, 0 otherwise;

C3 = 1 if the attribute *grass* is included, 0 otherwise;

F1 = 1 if the attribute *chatting* is included, 0 otherwise;

F2 = 1 if the attribute *walking* is included, 0 otherwise;

F3 = 1 if the attribute *drinking alcohol* is included, 0 otherwise;

G1 = 1 if the attribute *children* is included, 0 otherwise;

G2 = 1 if the attribute *teenagers* is included, 0 otherwise;

G3 = 1 if the attribute *adults* is included, 0 otherwise;

I2 = 1 if the attribute *uncrowded footpath* is included, 0 otherwise; and

ε = error term

The mix logit structure (MMNL) version of the LON 2 model (Table 7.4) has a superior log-likelihood, log-likelihood ratio index and a likelihood ratio test (LR) of $69.088 < 19.675 = \chi^2_{(11,95\%)}$ compared to the MNL version, proving that the MMNL model is statistically better. All policy parameters in the LON2 MMNL model have a correct sign, and nine are significant (90% confidence). Three policy parameters are not significant but are kept in the model. The non-policy parameters in the model are significant at 90% confidence. One parameter is not significant but is kept because it has a correct sign and was estimated after a resource-intensive modelling process.

In the LON2 MMNL model, the parameters with the most relevant positive effect in the utility are strangers *walking* and *grass* on the street. Other attributes that have a positive –but smaller– effect are *medium density houses*, *trees and grass*, *strangers chatting* and other *children* on the footpath. The

Table 7.4. MNL and MMNL models outputs and estimates for LON2.

	LON2 MNL			LON2 MMNL		
LL(final)	-708.676			-674.132		
Estimated parameters	25			36		
ρ^2 ρ^2 adj.	0.246 0.219			0.282 0.244		
Sample size / Number of observations	220 / 855			220 / 855		
Attributes	Estimate	t-ratio		Estimate	t-ratio	
ASC Neither option	-1.491	-6.931	**	-1.455	-3.986	**
A1 - Medium density houses	0.349	3.843	**	1.177	3.175	**
A2 - Low density houses	0.000	-		0.000	-	
C1 - Trees and grass	0.958	4.708	**	1.607	2.350	**
C2 - Trees	0.692	3.674	**	0.908	1.621	
C3 - Grass	1.063	6.424	**	2.446	3.185	**
C4 - No greenery	0.000	-		0.000	-	
F1 - Chatting	0.575	3.393	**	1.434	2.731	**
F2 - Walking	0.878	4.160	**	2.558	3.224	**
F3 - Drinking alcohol	-1.308	-5.076	**	-1.705	-2.509	**
F4 - Standing	0.000	-		0.000	-	
G1 - Children	0.295	1.254		1.294	1.876	*
G2 - Teenagers	-0.355	-1.485		0.503	0.675	
G3 - Adults	-0.558	-3.357	**	-0.380	-0.820	
G4 - Elderly People	0.000	-		0.000	-	
I1 - Crowded footpath	-0.525	-5.775	**	-1.501	-3.606	**
I2 - Uncrowded footpath	0.000	-		0.000	-	
Taste variations (in italics)						
C1 - Trees and grass * carer age 18-30	1.301	3.207	**	4.477	2.823	**
F1 - Chatting * IMD crime domain (carer views)	-0.605	-2.329	**	-1.520	-2.091	**
F1 - Chatting * last trip with a child and an adult (carer views)	1.164	2.323	**	4.048	2.390	**
F1 - Chatting * non-school trip (child views)	-0.736	-2.802	**	-1.815	-2.481	**
F2 - Walking * IMD crime domain (carer views)	-0.890	-3.099	**	-2.401	-2.591	**
F2 - Walking * IMD crime domain (child views)	-0.765	-2.916	**	-2.408	-2.604	**
F3 - Drinking alcohol * IMD crime domain (carer views)	-0.716	-2.330	**	-3.070	-2.337	**
G1 - Children * carer	-0.625	-2.523	**	-0.897	-1.281	
G1 - Children * last trip unaccompanied (child views)	-0.890	-2.427	**	-2.231	-2.052	**
G2 - Teenagers * IMD income domain (carer views)	-1.035	-3.990	**	-1.718	-2.128	**
G2 - Teenagers * IMD income domain (child views)	-0.837	-3.202	**	-1.987	-2.151	**
G3 - Adults * child participant directly recruited	-1.017	-2.208	**	-2.764	-1.883	*
I1 - Crowded footpath * last trip with another child (child views)	-0.942	-2.112	**	-2.481	-2.068	**
Random coefficients						
η A1 - Medium density houses	-	-		1.038	2.540	**
η C1 - Trees and grass	-	-		2.510	3.119	**
η C2 - Trees	-	-		1.726	2.340	**
η C3 - Grass	-	-		-3.384	-3.421	**
η F1 - Chatting	-	-		0.066	0.112	
η F2 - Walking	-	-		-2.335	-2.897	**
η F3 - Drinking alcohol	-	-		4.903	3.314	**
η G1 - Children	-	-		-1.172	-2.302	**
η G2 - Teenagers	-	-		2.844	3.116	**
η G3 - Adults	-	-		-2.683	-3.149	**
η I1 - Crowded footpath	-	-		2.740	4.146	**

* Significant at 90% confidence | ** Significant at 95% confidence

Source: author's own

attributes *trees* and *teenagers* on the footpath also have a positive effect, but it is not significant.

The attributes with the greatest negative effect on the utility were a *crowded footpath* and *strangers drinking alcohol*. The attribute *adults* on the street also has a negative effect on the utility, but it is not significant.

The LON2 MMNL taste variations results show a positive effect of the attribute *trees and grass* on the utility of carers aged 18 to 30 years old. The attribute *strangers chatting* has a small positive impact on children completing non-school trips and a small negative effect on carers living in areas with high crime rates. The attribute *strangers walking* has a small positive effect on children and carers living in areas with high crime rates. In contrast, the attribute *strangers drinking alcohol* has a negative effect on the utility of carers living in the areas with high crime rates. The attribute other *children* on the street has a positive effect on the utility of carers. Meanwhile, the attribute *teenagers* has a negative effect on children and carers living in the most income-deprived areas. Lastly, the attribute *adults* on the footpath has a negative effect on child participants directly.

Other associations that emerged from the models include: the positive effect of *strangers chatting* on the utility of a child that travelled with another child and an adult during his/her last trip and the negative effect of the attributes other *children* and *crowded footpaths* on children walking unaccompanied and children travelling with another child, respectively. Further evidence is required to understand those associations.

The SCL1 model specification is as follows:

$$\begin{aligned}
 U^{StreetA}, U^{StreetB} = & \\
 & (\theta_{A1} + \theta_{A1-NonSchoolTrip(Child)} \cdot NonSchoolTrip_{Child} \\
 & + \theta_{A1-LastTripUnaccompanied(Child)} \cdot LastTripUnaccompanied_{Child}) \cdot A1 \\
 & + (\theta_{B1} + \theta_{B1-Carer} \cdot Carer \\
 & + \theta_{B1-LastTripChildAndAdult(Carer)} \cdot LastTripChildAndAdult_{Carer}) \cdot B1 \\
 & + \theta_{B3} \cdot B3 \\
 & + (\theta_{B4} + \theta_{B4-WealthyArea(Child)} \cdot WealthyArea_{Child} \\
 & + \theta_{B4-LastTripUnaccompanied(Child)} \cdot LastTripUnaccompanied_{Child} \\
 & + \theta_{B4-LastTripAnotherChild(Child)} \cdot LastTripAnotherChild_{Child}) \cdot B4 \\
 & + (\theta_{D1} + \theta_{D1-PrimarySchoolChild(Carer)} \cdot PrimarySchoolChild_{Carer} \\
 & + \theta_{D1-WealthyArea(Child)} \cdot WealthyArea_{Child}) \cdot D1 \\
 & + (\theta_{D2} + \theta_{D2-PrimarySchoolChild(Carer)} \cdot PrimarySchoolChild_{Carer} \\
 & + \theta_{D2-Boy} \cdot Boy + \theta_{D2-WealthyArea(Child)} \cdot WealthyArea_{Child}) \cdot D2 \\
 & + (\theta_{D3} + \theta_{D3-Boy} \cdot Boy + \theta_{D3-WealthyArea(Child)} \cdot WealthyArea_{Child}) \cdot D3 \\
 & + (\theta_{E1} + \theta_{E1-PrimarySchoolChild} \cdot PrimarySchoolChild_{Child} \\
 & + \theta_{E1-PrimarySchoolChild(Carer)} \cdot PrimarySchoolChild_{Carer} \\
 & + \theta_{E1-LastTripChildAndAdult(Carer)} \cdot LastTripChildAndAdult_{Carer}) \cdot E1 \\
 & + \theta_{E2} \cdot E2 + (\theta_{E3} + \theta_{E3-Boy} \cdot Boy) \cdot E3 + (\theta_{H1} + \theta_{H1-Boy} \cdot Boy) \cdot H1 + \varepsilon
 \end{aligned}$$

$$U^{NeitherStreet} = ASC^{NeitherStreet}$$

Where

- A1 = 1 if the attribute *permeable fences* is included, 0 otherwise;
- B1 = 1 if the attribute *well-kept footpaths* is included, 0 otherwise;
- B3 = 1 if the attribute *neglect footpaths* is included, 0 otherwise;
- B4 = 1 if the attribute *dirty and neglected footpaths* is included, 0 otherwise;
- D1 = 1 if the attribute *playground* is included, 0 otherwise;
- D2 = 1 if the attribute *bus stop* is included, 0 otherwise;
- D3 = 1 if the attribute *bus stop and a playground* is included, 0 otherwise;
- E1 = 1 if the attribute *school* is included, 0 otherwise;
- E2 = 1 if the attribute *local shops* is included, 0 otherwise;
- E3 = 1 if the attribute *off-licence* is included, 0 otherwise;
- H1 = 1 if the attribute *vehicles parked on footpath* is included, 0 otherwise;
- ε = error term

The analysis of the SCL1 models (Table 7.5) shows that the mix logit structure (MMNL) version has a superior log-likelihood, log-likelihood ratio index and a likelihood ratio test (LR) of $93.504 < 19.675 = \chi^2_{(11,95\%)}$ proving that the MMNL model is statistically stronger than the MNL model. All the SCL1 MMNL policy parameters have a correct sign and are statistically significant, except one parameter that is non-significant at a 90% confidence level. This parameter, however, was kept in the model because it has a correct sign. All non-policy parameters in the model are significant at 90% confidence.

In the SCL1 MMNL model, the attributes with the greatest positive effect on the preferences are *well-kept footpaths*, *playgrounds* and *neglected footpaths*. Other positive effects are also observed for the attributes *permeable fences*,

Table 7.5. MNL and MMNL models outputs and estimates for SCL1.

	SCL1 MNL			SCL1 MMNL		
LL(final)	-579.058			-532.306		
Estimated parameters	29			40		
ρ^2 ρ^2 adj.	0.296 0.261			0.353 0.305		
Sample size / Number of observations	196 / 749			196 / 749		
Attributes	Estimate	t-ratio		Estimate	t-ratio	
ASC Neither option	0.899	4.081	**	2.805	3.500	**
A1 - Permeable Fences	0.711	4.566	**	1.892	3.185	**
A2 - Closed Fences	0.000	-		0.000	-	
B1 - Well-kept footpaths	2.201	9.174	**	5.609	4.264	**
B2 - Dirty footpaths	0.000	-		0.000	-	
B3 - Neglect footpaths	0.880	4.900	**	2.439	3.244	**
B4 - Dirty and neglected footpaths	-0.337	-1.393		-0.477	-0.768	
D1 - Playground	1.202	5.687	**	3.182	3.461	**
D2 - Bus stop	1.216	4.727	**	2.075	2.948	**
D3 - Bus stop and playground	1.161	4.988	**	2.178	3.086	**
D4 - No urban amenities	0.000	-		0.000	-	
E1 - School	0.913	4.353	**	2.209	3.010	**
E2 - Local shops	0.393	1.947	*	1.531	2.483	**
E3 - Off-licence	-1.655	-5.626	**	-3.305	-3.555	**
E4 - No Facilities	0.000	-		0.000	-	
H1 - Vehicles Parked on Footpath	-1.082	-7.081	**	-2.857	-3.896	**
H2 - No Parked Vehicles	0.000	-		0.000	-	
Taste variations (<i>in italics</i>)						
A1 - Permeable Fences * <i>non-school trip (child views)</i>	-0.631	-2.832	**	-1.753	-2.355	**
A1 - Permeable Fences * <i>last trip unaccompanied (child views)</i>	0.649	2.083	**	1.902	1.747	*
B1 - Well-kept footpaths * <i>last trip with a child and an adult (carer views)</i>	-1.494	-2.108	**	-3.745	-1.843	*
B1 - Well-kept footpaths * <i>carer</i>	-0.745	-2.694	**	-1.758	-2.179	**
B4 - Dirty and neglected footpaths * <i>wealthy area (child views)</i>	-1.993	-3.208	**	-5.613	-2.766	**
B4 - Dirty and neglected footpaths * <i>last trip unaccompanied (child views)</i>	1.005	2.003	**	2.612	1.845	*
B4 - Dirty and neglected footpaths * <i>last trip with another child (child views)</i>	2.203	3.062	**	5.722	2.553	**
D1 - Playground * <i>primary school child (carer views)</i>	-0.987	-3.249	**	-2.585	-2.004	**
D1 - Playground * <i>wealthy area (child views)</i>	1.166	2.610	**	4.372	2.436	**
D2 - Bus stop * <i>primary school child (carer views)</i>	-1.398	-3.507	**	-3.717	-3.029	**
D3 - Bus stop and playground * <i>boy</i>	0.831	2.542	**	1.619	1.911	*
D3 - Bus stop and playground * <i>wealthy area (child views)</i>	1.435	3.242	**	4.084	2.742	**
E1 - School * <i>primary school child</i>	-0.826	-2.507	**	-2.158	-2.087	**
E1 - School * <i>primary school child (carer views)</i>	-0.814	-2.315	**	-1.969	-1.950	*
E1 - School * <i>last trip with a child and an adult (carer views)</i>	-2.107	-2.401	**	-5.200	-2.054	**
E3 - Off-licence * <i>boy (carer views)</i>	0.979	2.840	**	2.765	2.229	**
H1 - Vehicles Parked on Footpath * <i>boy</i>	0.482	2.044	**	1.459	2.037	**
Random coefficients						
η A1 - Permeable Fences	-	-		2.315	3.593	**
η B1 - Well-kept footpaths	-	-		-2.051	-2.211	**
η B3 - Neglect footpaths	-	-		-2.229	-2.607	**
η B4 - Dirty and neglected footpaths	-	-		1.522	1.233	
η D1 - Playground	-	-		-3.562	-3.583	**
η D2 - Bus stop	-	-		-0.459	-0.569	
η D3 - Bus stop and playground	-	-		1.674	2.021	**
η E1 - School	-	-		1.653	1.645	*
η E2 - Local shops	-	-		2.593	2.808	**
η E3 - Off-licence	-	-		-2.901	-2.933	**
η H1 - Vehicles Parked on Footpath	-	-		-1.796	-2.310	**

* Significant at 90% confidence | ** Significant at 95% confidence

Source: author's own

a bus stop and *a bus stop and a playground, a school and local shops*. By contrast, the attributes *off-licence*, *vehicles parked on the footpath* and *dirty and neglected footpaths* have the greatest negative effect on the preferences for a street environment. However, the effect of *dirty and neglected footpaths* is not statistically significant.

The taste variations in SCL1 MMNL show that the attribute *permeable fences* has a modest positive effect on the utility of a child doing a non-school trip. The attribute *well-kept footpaths* also has a small positive effect on carers. The attribute *dirty and neglected footpaths* has a great negative influence on a child living in a wealthy area. Considering the attributes that are urban amenities, *a playground* has a positive impact on carers of primary school children and a child living in a wealthy area, but in different proportions. The attribute *a bus stop* has a negative impact on carers of primary school children. The attribute *a bus stop and a playground* has a positive effect on boys and a child living in a wealthy area. Results for the attribute *school* also show that it has a—modest—positive effect on primary school children and their carers. The attribute *an off-licence* has a small negative impact on carers of boys. Lastly, the attribute *vehicles parked on the footpath* has a positive effect on boys.

The model also shows other associations with significant statistical relevance. The attribute *permeable fences* has a positive influence on children whose last trip was completed unaccompanied. The attribute *dirty and neglected footpaths* has a positive impact on the same group and children that travel with another child. *Well-kept footpaths* have a positive impact on a child travelling with another child and an adult. The attribute *a school* has a negative impact on carers of children travelling with another child and an adult.

The SCL2 model specification is as follows:

$$\begin{aligned}
 U^{StreetA}, U^{StreetB} = & (\theta_{A1} + \theta_{A1-PrimarySchoolChild(Carer)} \cdot PrimarySchoolChild_{Carer} \\
 & + \theta_{A1-WealthyArea(Child)} \cdot WealthyArea_{Child} + \theta_{A1-Carer} \cdot Carer) \cdot A1 \\
 & + (\theta_{C1} + \theta_{C1-Carer} \cdot Carer + \theta_{C1-WealthyArea(Carer)} \cdot WealthyArea_{Carer}) \cdot C1 \\
 & + (\theta_{C2} + \theta_{C2-Carer} \cdot Carer + \theta_{C2-MaleCarer} \cdot MaleCarer) \cdot C2 \\
 & + (\theta_{C3} + \theta_{C3-PrimarySchoolChild(Carer)} \cdot PrimarySchoolChild_{Carer} \\
 & + \theta_{C3-LastTripChildAdult(Carer)} \cdot LastTripChildAdult_{Carer} \\
 & + \theta_{C3-CarerAge18-30} \cdot CarerAge18-30 \\
 & + \theta_{C3-WealthyArea(Child)} \cdot WealthyArea_{Child} \\
 & + \theta_{C3-WealthyArea(Carer)} \cdot WealthyArea_{Carer}) \cdot C3 \\
 & + (\theta_{F1} + \theta_{F1-PrimarySchoolChild(Carer)} \cdot PrimarySchoolChild_{Carer} \\
 & + \theta_{F1-Boy} \cdot Boy) \cdot F1 \\
 & + (\theta_{F2} + \theta_{F2-PrimarySchoolChild(Carer)} \cdot PrimarySchoolChild_{Carer} \\
 & + \theta_{F2-Boy(Carer)} \cdot Boy_{Carer}) \cdot F2 + (\theta_{F3} + \theta_{F3-MaleCarer} \cdot MaleCarer) \cdot F3 \\
 & + (\theta_{G1} + \theta_{G1-PrimarySchoolChild(Carer)} \cdot PrimarySchoolChild_{Carer}) \cdot G1 \\
 & + (\theta_{G2} + \theta_{G2-Carer} \cdot Carer) \cdot G2 + \theta_{G3} \cdot G3 \\
 & + (\theta_{I1} + \theta_{I1-Boy} \cdot Boy + \theta_{I1-Boy(Carer)} \cdot Boy_{Carer} \\
 & + \theta_{I1-LastTripChildAndAdult(Carer)} \cdot LastTripChildAndAdult_{Carer}) \cdot I1 + \varepsilon
 \end{aligned}$$

$$U^{NeitherStreet} = ASC^{NeitherStreet}$$

Where

A1 = 1 if the attribute permeable fences is included, 0 otherwise;

C1 = 1 if the attribute trees and grass is included, 0 otherwise;

C2 = 1 if the attribute trees is included, 0 otherwise;

C3 = 1 if the attribute grass is included, 0 otherwise;

F1 = 1 if the attribute chatting is included, 0 otherwise;

F2 = 1 if the attribute walking is included, 0 otherwise;

F3 = 1 if the attribute drinking alcohol is included, 0 otherwise;

G1 = 1 if the attribute children is included, 0 otherwise;

G2 = 1 if the attribute teenagers is included, 0 otherwise;

G3 = 1 if the attribute adults is included, 0 otherwise;

I1 = 1 if the attribute male (stranger) is included, 0 otherwise; and

ε = error term

The SCL2 models' results (Table 7.6) suggest that the mix logit structure (MMNL) version has a superior log-likelihood, log-likelihood ratio index and a likelihood ratio test (LR) of $71.438 < 18.307 = \chi^2_{(10,95\%)}$, proving that the MMNL model is statistically stronger than the MNL version. Seven policy parameters in SCL2 MMNL have a correct sign and are significant at 95% confidence, and four policy parameters are not statistically significant, but are kept in the model because they have a correct sign. All but two non-policy parameters in the model are significant at 90% confidence. The two non-significant parameters are kept in the model because they have a correct sign and were estimated after a resource-intensive modelling process.

Table 7.6. MNL and MMNL models outputs and estimates for SCL2.

	SCL2 MNL		SCL2 MMNL	
LL (final)	-569.3		-533.581	
Estimated parameters	34		44	
ρ^2 ρ^2 adj.	0.373 0.336		0.413 0.364	
Sample size / Number of observations	212 / 827		212 / 827	
Attributes	Estimate	t-ratio	Estimate	t-ratio
ASC Neither option	-1.227	-4.637 **	-2.081	-2.979 **
A1 - Permeable Fences	0.059	0.343	0.890	1.340
A2 - Closed Fences	0.000	-	0.000	-
C1 - Trees and grass	1.052	3.965 **	2.551	2.780 **
C2 - Trees	0.872	3.159 **	2.536	2.615 **
C3 - Grass	0.770	3.712 **	2.698	2.939 **
C4 - No greenery	0.000	-	0.000	-
F1 - Chatting	0.812	4.020 **	2.982	2.978 **
F2 - Walking	0.407	1.439	0.594	0.824
F3 - Drinking alcohol	-2.175	-7.709 **	-8.806	-3.122 **
F4 - Standing	0.000	-	0.000	-
G1 - Children	1.139	4.394 **	3.399	2.748 **
G2 - Teenagers	-0.067	-0.310	-1.160	-1.427
G3 - Adults	-0.404	-1.703 *	-0.951	-1.173
G4 - Elderly people	0.000	-	0.000	-
I1 - Male (stranger)	-1.430	-8.707 **	-4.553	-4.318 **
I2 - Female (stranger)	0.000	-	0.000	-
Taste variations (in italics)				
A1 - Permeable Fences * <i>primary school child (carer views)</i>	-0.650	-2.322 **	-1.940	-1.812 *
A1 - Permeable Fences * <i>wealthy area (child views)</i>	0.766	2.512 **	2.063	1.712 *
A1 - Permeable Fences * <i>carer</i>	1.079	3.823 **	3.085	2.618 **
C1 - Trees and grass * <i>carer</i>	-1.017	-2.900 **	-2.256	-1.893 *
C1 - Trees and grass * <i>wealthy area (carer views)</i>	1.502	3.027 **	5.013	2.448 **
C2 - Trees * <i>carer</i>	-0.956	-2.993 **	-3.207	-2.555 **
C2 - Trees * <i>male carer</i>	1.124	2.408 **	2.563	1.520
C3 - Grass * <i>primary school child (carer views)</i>	-0.765	-2.466 **	-3.207	-2.461 **
C3 - Grass * <i>last trip with a child and an adult (carer views)</i>	-1.447	-2.486 **	-4.197	-1.985 **
C3 - Grass * <i>carer age 18-30</i>	0.964	2.345 **	3.270	2.027 **
C3 - Grass * <i>wealthy area (child views)</i>	0.978	2.327 **	3.189	1.834 *
C3 - Grass * <i>wealthy area (carer views)</i>	1.438	3.284 **	5.424	2.568 **
F1 - Chatting * <i>primary school child (carer views)</i>	-0.837	-2.905 **	-2.666	-2.453 **
F1 - Chatting * <i>boy</i>	-0.599	-2.122 **	-1.935	-1.720 *
F2 - Walking * <i>primary school child (carer views)</i>	-1.180	-3.443 **	-1.952	-2.605 **
F2 - Walking * <i>boy (carer views)</i>	0.695	1.974 **	1.537	1.763 *
F3 - Drinking alcohol * <i>male carer</i>	1.610	2.632 **	6.439	2.004 **
G1 - Children * <i>primary school child (carer views)</i>	-0.978	-2.948 **	-2.801	-2.092 **
G2 - Teenagers * <i>carer</i>	-0.676	-2.369 **	-1.299	-1.360
I1 - Male (stranger) * <i>boy (carer views)</i>	0.595	2.432 **	1.674	2.026 **
I1 - Male (stranger) * <i>last trip with a child and an adult (carer views)</i>	1.180	2.781 **	3.441	2.235 **
I1 - Male (stranger) * <i>boy</i>	1.090	4.493 **	3.465	3.072 **
Random coefficients				
η A1 - Permeable Fences	-	-	-2.624	-3.773 **
η C1 - Trees and grass	-	-	-2.822	-2.990 **
η C2 - Trees	-	-	1.706	1.700 *
η C3 - Grass	-	-	-2.774	-2.625 **
η F1 - Chatting	-	-	2.919	3.120 **
η F2 - Walking ^a	-	-	0.000	-
η F3 - Drinking alcohol	-	-	-4.882	-2.629 **
η G1 - Children	-	-	4.800	3.503 **
η G2 - Teenagers	-	-	2.443	2.268 **
η G3 - Adults	-	-	-2.072	-1.732 *
η I1 - Male (stranger)	-	-	1.942	2.508 **

Significant at 90% confidence | ** Significant at 95% confidence | ^a attribute discarded due to identifiability issues

Source: author's own

The SCL2 MMNL attributes with the greatest positive effect are other *children* and *strangers chatting*. The attributes that follow those are, in descending order, the greenery attributes *grass*, *trees and grass*, and *trees*. The attributes *permeable fences* and *strangers walking* also have a positive effect, but they are not significant. Strangers *drinking alcohol*, followed by *male* strangers, have the greatest negative effect. The attributes *teenagers* and *adults* also have a negative, but not significant, effect.

The taste variations in the SCL2 MMNL model show that the attribute *permeable facades* has a positive effect on the utility of carers and children living in wealthy areas, but a negative effect on carers of primary school children. The attribute *trees and grass* also has a positive effect on carers and children from wealthy areas, but in different proportions. Results for the attributes *trees* show that it has a negative impact on the utility of carers and a positive effect on male carers. The attribute *grass* has also a dual effect; a positive effect on the utility of carers aged 18 to 30 and children living in wealthy areas and a negative impact on carers of primary school children. The strangers' activity *chatting* has a small positive impact on boys and carers of primary school children. The attribute *strangers walking* has a positive impact on carers of boys, but a negative impact on carers of primary school children. The results for the attribute *strangers drinking alcohol* suggest that it has a small negative effect on male carers. In the case of the attribute *other children*, results show that it has a small positive impact on carers of primary school children, whereas the attribute *teenagers* has a negative impact on carers. The effects of the attribute *male* strangers is negative on boys and carers of boys, but in different proportions.

Similar to the previous models, the SCL2 MMNL models show other associations with significant statistical relevance. The attribute *grass* has a negative effect on carers of children that completed his/her last trip accompanied by a child and an adult. Meanwhile, the attribute *male* strangers has a positive effect on the same group.

Given the nature of the GC-Link data, it is possible to estimate a model with a structure that combines the common attributes of the participants from London and Santiago. To evaluate which attributes could be considered "common," independent GC-Link models were estimated for London (LON) and Santiago (SCL). These models can be found in Appendix 10.9. In the next iteration of the GC-Link model, the policy attributes in London were considered common in both datasets, while the policy attributes in Santiago were estimated as a dummy to capture the difference between datasets. If a dummy parameter was non-significant it was deleted, and, therefore,

the attribute should be considered common in London and Santiago. Taste variations were left independent for each city.

The GC-Link model specification is as follows:

$$\begin{aligned}
 U^{StreetA}, U^{StreetB} = & (\theta_{B1} + (\theta_{B1-IMDIncome(Child)}^{LON} \cdot IMDIncome_{Child} \\
 & + \theta_{B1-IMDLivingEnvironment(Carer)}^{LON} \cdot IMDLivingEnvironment_{Carer}) \cdot LON \\
 & + (\theta_{B1}^{SCL} + \theta_{B1-Boy}^{SCL} \cdot Boy + \theta_{B1-PrimarySchoolChild}^{SCL} \cdot PrimarySchoolChild \\
 & + \theta_{B1-PrimarySchoolChild(Carer)}^{SCL} \cdot PrimarySchoolChild_{Carer}) \cdot SCL) \cdot B1 \\
 & + (\theta_{C1} + (\theta_{C1}^{SCL} + \theta_{C1-Boy}^{SCL} \cdot Boy) \cdot SCL) \cdot C1 + \theta_{C2} \cdot C2 + (\theta_{C3} \\
 & + \theta_{C3-LastTripUnaccompanied(Carer)}^{LON} \cdot LastTripUnaccompanied_{Carer} \cdot LON) \cdot C3 \\
 & + (\theta_{D1} + \theta_{D1-ChildDirectlyRecruited}^{LON} \cdot ChildDirectlyRecruited \cdot LON \\
 & + \theta_{D1-PrimarySchoolChild(Carer)}^{SCL} \cdot PrimarySchoolChild_{Carer} \cdot SCL) \cdot D1 + (\theta_{D2} \\
 & + \theta_{D2-PrimarySchoolChild}^{LON} \cdot PrimarySchoolChild \cdot LON \\
 & + \theta_{D2-PrimarySchoolChild(Carer)}^{SCL} \cdot PrimarySchoolChild_{Carer} \cdot SCL) \cdot D2 + (\theta_{D3} \\
 & + (\theta_{D3-IMDIncome(Child)}^{LON} \cdot IMDIncome_{Child} \\
 & + \theta_{D3-IMDIncome(Carer)}^{LON} \cdot IMDIncome_{Carer}) \cdot LON + (\theta_{D3-Boy}^{SCL} \cdot Boy \\
 & + \theta_{D3-PrimarySchoolChild(Carer)}^{SCL} \cdot PrimarySchoolChild_{Carer}) \cdot SCL) \cdot D3 + (\theta_{F1} \\
 & + \theta_{F1-Carer}^{SCL} \cdot Carer \cdot SCL) \cdot F1 + (\theta_{F2} \\
 & + \theta_{F2-LastTripUnaccompanied(Child)}^{SCL} \cdot LastTripUnaccompanied_{Child} \cdot SCL) \cdot F2 \\
 & + (\theta_{F3} + (\theta_{F3-NonSchoolTrip(Child)}^{LON} \cdot NonSchoolTrip_{Child} \\
 & + \theta_{F3-IMDIncome(Child)}^{LON} \cdot IMDIncome_{Child} \\
 & + \theta_{F3-IMDLivingEnvironment(Carer)}^{LON} \cdot IMDLivingEnvironment_{Carer}) \cdot LON \\
 & + \theta_{F3-MaleCarer}^{SCL} \cdot MaleCarer \cdot SCL) \cdot F3 + (\theta_{G1} + (\theta_{G1-Carer}^{SCL} \cdot Carer \\
 & + \theta_{G1-Boy(Carer)}^{SCL} \cdot Boy_{Carer} + \theta_{G1-NonSchoolTrip(Carer)}^{SCL} \cdot NonSchoolTrip_{Carer} \\
 & + \theta_{G1-LastTripAnotherChild(Child)}^{SCL} \cdot LastTripAnotherChild_{Child}) \cdot SCL) \cdot G1 \\
 & + (\theta_{G2} + (\theta_{G2-PrimarySchoolChild}^{LON} \cdot PrimarySchoolChild \\
 & + \theta_{G2-CarerAge18-30}^{LON} \cdot CarerAge18-30 \\
 & + \theta_{G2-IMDIncome(Child)}^{LON} \cdot IMDIncome_{Child} \\
 & + \theta_{G2-IMDLivingEnvironment(Carer)}^{LON} \cdot IMDLivingEnvironment_{Carer}) \cdot LON \\
 & + (\theta_{G2}^{SCL} + \theta_{G2-Boy(Carer)}^{SCL} \cdot Boy_{Carer} \\
 & + \theta_{G2-PrimarySchoolChild}^{SCL} \cdot PrimarySchoolChild \\
 & + \theta_{G2-Carer}^{SCL} \cdot Carer) \cdot SCL) \cdot G2 + (\theta_{G3} \\
 & + (\theta_{G3-NonSchoolTrip}^{LON} \cdot NonSchoolTrip_{Carer} \\
 & + \theta_{G3-LastTripChildAndAdult(Carer)}^{LON} \cdot LastTripChildAndAdult_{Carer} \\
 & + \theta_{G3-IMDCrime(Carer)}^{LON} \cdot IMDCrime_{Carer}) \cdot LON + (\theta_{G3}^{SCL} + \theta_{G3-Carer}^{SCL} \cdot Carer \\
 & + \theta_{G3-Boy(Carer)}^{SCL} \cdot Boy_{Carer} + \theta_{G3-NonSchoolTrip(Carer)}^{SCL} \cdot NonSchoolTrip_{Carer} \\
 & + \theta_{G3-LastTripAnotherChild(Child)}^{SCL} \cdot LastTripAnotherChild_{Child}) \cdot SCL) \cdot G3 + \varepsilon
 \end{aligned}$$

$$U^{NeitherStreet} = ASC^{NeitherStreet}$$

Where

B1 = 1 if the attribute *well-kept footpaths* is included, 0 otherwise;

B2 = 1 if the attribute *dirty footpaths* is included, 0 otherwise;

C1 = 1 if the attribute *trees and grass* is included, 0 otherwise;

C2 = 1 if the attribute *trees* is included, 0 otherwise;

C3 = 1 if the attribute *grass* is included, 0 otherwise;

D1 = 1 if the attribute *playground* is included, 0 otherwise;

D2 = 1 if the attribute *bus stop* is included, 0 otherwise;

D3 = 1 if the attribute *bus stop and playground* is included, 0 otherwise;

F1 = 1 if the attribute *chatting* is included, 0 otherwise;
 F2 = 1 if the attribute *walking* is included, 0 otherwise;
 F3 = 1 if the attribute *drinking alcohol* is included, 0 otherwise;
 G1 = 1 if the attribute *children* is included, 0 otherwise;
 G2 = 1 if the attribute *teenagers* is included, 0 otherwise;
 G3 = 1 if the attribute *adults* is included, 0 otherwise;
 LON = 1 if the attribute is included for the London dataset, 0 otherwise;
 SCL = 1 if the attribute is included for the Santiago dataset, 0 otherwise;
 ε = error term

The outputs and estimates of the best GC-Link are shown in Table 7.7. The model likelihood ratio test (LR) of the combined GC-Link model against the independent London and Santiago models is $9.504 < 19.675 = \chi^2_{(11,95\%)}$, therefore, the null hypothesis is not rejected, and the GC-Link model is stronger at explaining the data. Sixteen of the GC-Link policy parameters are significant and have a correct sign, while two policy parameters were not statistically significant at 90% confidence. The latter parameters were kept in the model following the advice of Ortúzar and Willumsen (2011). All the non-policy parameters in the GC-Link model are significant at 95% confidence.

The GC-Link model structure adopted was also used to estimate a model with a mix logit structure (MMNL) to incorporate the correlation between multiple responses from each participant (pseudo-panel effect), using random coefficients. This model, together with the log-likelihood, likelihood ratio index and estimated parameters are also shown in Table 7.7. The MMNL version of the GC-Link model has a superior log-likelihood, log-likelihood ratio index and a likelihood ratio test (LR) of $126.024 > 27.587 = \chi^2_{(17,95\%)}$, rejecting the null hypothesis and demonstrating that the MMNL version is statistically stronger than the MNL version of the model and, therefore, better at explaining the data. Like the MNL GC-Link version, all policy parameters have the correct sign and are statistically significant, excepting two of them which are not significant at 90% of confidence. All the other non-policy parameters are significant with the exception of one of them, which the modeller decided to keep because it has a correct sign and was estimated after a resource intensive modelling process.

In the GC-Link MMNL model (Table 7.7), a *well-kept footpath* is the attribute with the greatest positive effect on the preference for a street environment in London. The impact of this attribute is smaller in Santiago because the parameter *well-kept footpath SCL dummy* has a negative effect. Similarly, the greenery attributes also have a relevant positive effect, with *trees and grass* having a minor effect for Santiago as a consequence of the negative value of the *trees and grass (SCL dummy)* parameter. In both cities, the

Table 7.7. MNL and MMNL models outputs and estimates for GC-Link.

			GC-Link MNL			GC-Link MMNL		
LL(final)			-2809.639			-2746.627		
Estimated parameters			57			78		
ρ^2 ρ^2 adj.			0.239 0.223			0.256 0.236		
Sample size / Number of observations			860 / 3360			860 / 3360		
Dataset		Attributes	Estimate	t-ratio		Estimate	t-ratio	
<i>London Santiago</i>								
x	x	ASC Neither option	0.164	1.282		0.220	1.149	
x	x	B1 - Well-kept footpaths	2.109	17.535	**	3.229	10.110	**
	x	B1 - Well-kept footpaths (SCL dummy)	-0.803	-5.427	**	-1.232	-3.961	**
x	x	B2 - Dirty footpaths	0.000	-		0.000	-	
x	x	C1 - Trees and grass	0.814	7.067	**	0.974	5.493	**
	x	C1 - Trees and grass (SCL dummy)	-0.505	-3.461	**	-0.915	-3.445	**
x	x	C2 - Trees	0.600	7.424	**	0.705	5.487	**
x	x	C3 - Grass	0.366	4.723	**	0.340	2.690	**
x	x	C4 - No greenery	0.000	-		0.000	-	
x	x	D1 - Playground	0.448	5.113	**	0.330	2.289	**
x	x	D2 - Bus stop	0.410	4.588	**	0.464	3.124	**
x	x	D3 - Bus stop and playground	0.649	6.604	**	0.753	4.477	**
x	x	D4 - No urban amenities	0.000	-		0.000	-	
x	x	F1 - Chatting	-0.021	-0.253		-0.103	-0.712	
x	x	F2 - Walking	0.216	2.953	**	0.272	2.046	**
x	x	F3 - Drinking alcohol	-2.584	-17.814	**	-3.884	-9.676	**
x	x	F4 - Standing	0.000	-		0.000	-	
x	x	G1 - Children	0.185	2.071	**	0.000	0.003	
x	x	G2 - Teenagers	-1.299	-7.818	**	-1.815	-6.433	**
	x	G2 - Teenagers (SCL dummy)	1.708	7.015	**	2.594	5.939	**
x	x	G3 - Adults	-0.284	-2.355	**	-0.389	-1.864	*
	x	G3 - Adults (SCL dummy)	0.378	2.213	**	0.514	1.682	*
x	x	G4 - Elderly people	0.000	-		0.000	-	
Taste variations (<i>in italics</i>)								
x		B1 - Well-kept footpaths * <i>IMD income domain (child views)</i>	-0.571	-3.263	**	-0.765	-2.346	**
x		B1 - Well-kept footpaths * <i>IMD living environment domain (carer views)</i>	-0.598	-3.721	**	-0.869	-2.880	**
	x	B1 - Well-kept footpaths * <i>primary school child</i>	-0.687	-4.132	**	-1.256	-3.622	**
	x	B1 - Well-kept footpaths * <i>primary school child (carers views)</i>	-0.353	-2.162	**	-0.624	-1.872	*
	x	B1 - Well-kept footpaths * <i>boy</i>	0.686	4.312	**	1.255	3.658	**
	x	C1 - Trees and grass * <i>boy</i>	0.566	2.617	**	0.840	2.131	**
x		C3 - Grass * <i>last trip unaccompanied (carer views)</i>	-0.661	-2.912	**	-1.066	-2.753	**
x		D1 - Playground * <i>child participant directly recruited</i>	0.559	2.115	**	0.930	2.157	**
	x	D1 - Playground * <i>primary school child (carers views)</i>	-0.528	-2.575	**	-0.592	-1.902	*
x		D2 - Bus stop * <i>primary school child</i>	-0.473	-2.623	**	-0.730	-2.528	**
	x	D2 - Bus stop * <i>primary school child (carers views)</i>	-0.837	-3.905	**	-1.124	-3.330	**
x		D3 - Bus stop and playground * <i>IMD income domain (child views)</i>	0.590	3.191	**	0.746	2.381	**
x		D3 - Bus stop and playground * <i>IMD income domain (carer views)</i>	0.540	2.984	**	0.649	2.140	**
	x	D3 - Bus stop and playground * <i>primary school child (carers views)</i>	-0.571	-2.758	**	-0.713	-2.015	**
	x	D3 - Bus stop and playground * <i>boy</i>	0.530	2.785	**	0.797	2.364	**
	x	F1 - Chatting * <i>carer</i>	0.424	3.106	**	0.880	3.586	**
	x	F2 - Walking * <i>last trip unaccompanied (child views)</i>	0.499	2.361	**	0.818	2.090	**
x		F3 - Drinking alcohol * <i>non-school trip (child views)</i>	1.260	4.426	**	2.180	3.794	**

Source: author's own

Table 7.7. MNL and MMNL models outputs and estimates for GC-Link (continued).

		GC-Link MNL		GC-Link MMNL	
LL(final)		-2809.639		-2746.627	
Estimated parameters		57		78	
ρ^2 ρ^2 adj.		0.239 0.223		0.256 0.236	
Sample size / Number of observations		860 / 3360		860 / 3360	
Dataset	Attributes	Estimate	t-ratio	Estimate	t-ratio
<i>London Santiago</i>					
x	F3 - Drinking alcohol * <i>IMD income domain (child views)</i>	0.913	3.224 **	1.691	3.218 **
x	F3 - Drinking alcohol * <i>IMD living environment domain (carer views)</i>	1.167	4.918 **	2.103	4.311 **
x	F3 - Drinking alcohol * <i>male carer</i>	1.293	3.046 **	2.072	2.608 **
x	G1 - Children * <i>carer</i>	-1.106	-2.918 **	-1.963	-2.671 **
x	G1 - Children * <i>boy (carer views)</i>	0.499	1.984 **	0.756	1.592
x	G1 - Children * <i>non-school trip (carer views)</i>	0.897	2.409 **	1.699	2.306 **
x	G1 - Children * <i>last trip with another child (child views)</i>	1.022	2.709 **	1.667	2.246 **
x	G2 - Teenagers * <i>primary school child</i>	0.743	3.733 **	1.106	3.400 **
x	G2 - Teenagers * <i>carer age 18-30</i>	0.932	3.884 **	1.362	3.452 **
x	G2 - Teenagers * <i>IMD income domain (child views)</i>	0.731	3.474 **	0.909	2.761 **
x	G2 - Teenagers * <i>IMD living environment domain (carer views)</i>	0.823	4.012 **	1.124	3.503 **
x	G2 - Teenagers * <i>primary school child</i>	-0.678	-2.717 **	-1.059	-2.531 **
x	G2 - Teenagers * <i>carer</i>	-1.075	-4.272 **	-1.547	-3.683 **
x	G2 - Teenagers * <i>boy (carer views)</i>	0.890	3.668 **	1.249	3.078 **
x	G3 - Adults * <i>non-school trip (carer views)</i>	0.588	2.740 **	1.029	2.657 **
x	G3 - Adults * <i>last trip with a child and an adult (carer views)</i>	1.153	2.510 **	2.017	2.376 **
x	G3 - Adults * <i>IMD crime domain (carer views)</i>	-0.681	-3.186 **	-1.182	-3.023 **
x	G3 - Adults * <i>carer</i>	-1.423	-3.477 **	-2.318	-3.150 **
x	G3 - Adults * <i>boy (carer views)</i>	0.750	2.967 **	1.050	2.292 **
x	G3 - Adults * <i>non-school trip (carer views)</i>	0.891	2.317 **	1.395	2.094 **
x	G3 - Adults * <i>last trip with another child (child views)</i>	1.003	2.420 **	1.413	1.844 *
Random coefficients					
x	x	η B1 - Well-kept footpaths	-	-	1.384 7.036 **
	x	η B1 - Well-kept footpaths (SCL dummy)	-	-	0.478 0.834
x	x	η C1 - Trees and grass	-	-	0.294 0.451
	x	η C1 - Trees and grass (SCL dummy)	-	-	-1.245 -2.716 **
x	x	η C2 - Trees	-	-	0.812 2.820 **
x	x	η C3 - Grass	-	-	-0.765 -2.431 **
x	x	η D1 - Playground	-	-	0.757 2.351 **
x	x	η D2 - Bus stop	-	-	0.732 2.774 **
x	x	η D3 - Bus stop and playground	-	-	-0.043 -0.122
x	x	η F1 - Chatting	-	-	0.384 0.726
x	x	η F2 - Walking	-	-	-1.221 -6.047 **
x	x	η F3 - Drinking alcohol	-	-	-1.906 -3.442 **
x	x	η G1 - Children	-	-	-1.728 -6.656 **
x	x	η G2 - Teenagers	-	-	0.617 2.210 **
	x	η G2 - Teenagers (SCL dummy)	-	-	-0.345 -0.607
x	x	η G3 - Adults	-	-	-0.925 -3.086 **
	x	η G3 - Adults (SCL dummy)	-	-	-0.488 -0.762

* Significant at 90% confidence | ** Significant at 95% confidence

Source: author's own

urban amenities a *playground*, a *bus stop* and a *bus stop and a playground* have a positive effect. Among the attributes that describe strangers' activities, *walking* is the only one with a positive effect; *drinking alcohol* and *chatting* have a negative effect, but the last attribute is not significant. The attributes that describe the presence of strangers on the street have a couple of differences according to the city. The attributes *teenagers* and *adults* have a negative effect in London, and a positive effect in Santiago when adding the parameters *teenagers (SCL dummy)* and *adults (SCL dummy)*. The impact of the attribute *children* is similar in both cities, yet it is not significant.

The taste variations in the GC-Link model show that, in London, the attribute *well-kept footpaths* has a small positive impact on the utility of individuals living in the most income-deprived areas and carers living in the most deprived areas according to the living environment domain. In Santiago, the attribute *well-kept footpaths* has a small positive impact on boys, primary school children and their carers. In the case of the greenery attribute *trees and grass* results show that it has a positive effect on boys in Santiago.

The urban amenities attribute a *playground* has a small negative influence on the utility of carers of primary school children in Santiago, but a positive influence on children from London that were directly recruited. The attribute a *bus stop* has a small negative effect on primary school children from London and carers of primary school children from Santiago. In London, the attribute a *bus stop and a playground* has a positive effect a positive effect on children and carers living in the most income-deprived areas. In Santiago, the effect of this attribute is also positive on boys and carers of primary school children.

The attribute strangers *chatting* has a positive influence on the utility of carers from Santiago. In London, the attribute strangers *drinking alcohol* has a negative influence on children that completed a non-school trip, children living in income-deprived areas and carers living in the most deprived areas according to the living environment domain. This attribute also has a small negative influence on male carers from Santiago.

In Santiago, the attribute *other children* has a negative influence on carers, but a positive influence on carers of boys and carers of children whose last trip was not related to the school. In London, the attribute *teenagers* has a small negative influence on primary school children, carers aged 18 to 30, children in income-deprived areas and carers living in the most deprived areas according to the living environment domain. In Santiago, the attribute *teenagers* has a small negative effect on the utility of primary school children and carers. This attribute has a positive influence on carers of boys living in Santiago. In London, the attribute *adults* has a positive effect on carers of

children whose last trip was not related to the school, but has a negative effect on carers residing in areas with higher crime rates. In Santiago, this attribute affects negatively carers and positively impacts carers of boys and carers of children whose last trip was not related to the school.

Other associations with significant statistical relevance were observed in the model. The attribute *grass* has a negative effect on a child that travelled unaccompanied in London. Likewise, the attribute *adults* that has a positive effect on carers of a child that walked with another child and an adult. In Santiago, the attribute *strangers walking* has a positive effect on a child that travels unaccompanied. The attribute *other children* and *adults* also have a positive effect, but on a child travelling with another child.

Following the same iterative process of the GC-Link model, independent generic city street junction models (GC-Junction) were estimated for London and Santiago. Then, a combined GC-Junction model was estimated. The combined model has likelihood ratio test (LR) of $5.462 < 5.991 = \chi^2_{(2,95\%)}$; hence, the null hypothesis is not rejected and the combined GC-Junction model is stronger at explaining the data compared to the other models. The model loglikelihood and the estimated parameters are shown in Table 7.8. All policy and non-policy parameters were kept in the model as they have a correct sign and are statistically significant (95% confidence level), except for one non-policy parameter significant at the 90% of confidence, and a non-significant policy parameter.

The GC-Junction model specification is as follows:

$$\begin{aligned}
 U^{CrossingA}, U^{CrossingB} = & (\theta_{J1} + (\theta_{J1-LastTripUnaccompanied(Child)}^{LON} \cdot LastTripUnaccompanied_{Child} \\
 & + \theta_{J1-LastTripUnaccompanied(Carer)}^{LON} \cdot LastTripUnaccompanied_{Carer}) \cdot LON \\
 & + (\theta_{J1}^{SCL} + \theta_{J1-LastTripUnaccompanied(Child)}^{SCL} \cdot LastTripUnaccompanied_{Child} \\
 & + \theta_{J1-LastTripUnaccompanied(Carer)}^{SCL} \cdot LastTripUnaccompanied_{Carer} \\
 & + \theta_{J1-LastTripAnotherChild(Carer)}^{SCL} \cdot LastTripAnotherChild_{Carer} \\
 & + \theta_{J1-LastTripChildAndAdult(Carer)}^{SCL} \cdot LastTripChildAndAdult_{Carer}) \cdot SCL) \cdot J1 \\
 & + (\theta_{L1} + (\theta_{L1-PrimarySchoolChild(Carer)}^{LON} \cdot PrimarySchoolChild_{Carer} \\
 & + \theta_{L1-LastTripUnaccompanied(Child)}^{LON} \cdot LastTripUnaccompanied_{Child} \\
 & + \theta_{L1-IMDIncome(Child)}^{LON} \cdot IMDIncome_{Child}) \cdot LON \\
 & + (\theta_{L1-PrimarySchoolChild}^{SCL} \cdot PrimarySchoolChild \\
 & + \theta_{L1-PrimarySchoolChild(Carer)}^{SCL} \cdot PrimarySchoolChild_{Carer} \\
 & + \theta_{L1-LastTripUnaccompanied(Child)}^{SCL} \cdot LastTripUnaccompanied_{Child}) \cdot SCL) \cdot L1 \\
 & + (\theta_{M1} + (\theta_{M1-PrimarySchoolChild(Carer)}^{LON} \cdot PrimarySchoolChild_{Carer} \\
 & + \theta_{M1-CarerAge18-30}^{LON} \cdot CarerAge18-30 \\
 & + \theta_{M1-LastTripUnaccompanied(Child)}^{LON} \cdot LastTripUnaccompanied_{Child} \\
 & + \theta_{M1-IMDIncome(Carer)}^{LON} \cdot IMDIncome_{Carer}) \cdot LON + (\theta_{M1}^{SCL} \\
 & + \theta_{M1-PrimarySchoolChild}^{SCL} \cdot PrimarySchoolChild \\
 & + \theta_{M1-PrimarySchoolChild(Carer)}^{SCL} \cdot PrimarySchoolChild_{Carer}) \cdot SCL) \cdot M1 + \varepsilon
 \end{aligned}$$

$$U^{NeitherCrossing} = ASC^{NeitherCrossing}$$

Where

J1 = 1 if the attribute *zebra crossing* is included, 0 otherwise;

L1 = 1 if the attribute *one-way traffic* is included, 0 otherwise;

M1 = 1 if the attribute *car traffic only* is included, 0 otherwise;

LON = 1 if the attribute is included for the London dataset, 0 otherwise;

SCL = 1 if the attribute is included for the Santiago dataset, 0 otherwise;

ε = error term

The GC-Junction model structure was also used to estimate a MMNL version of the model with a complex model structure. The MMNL version of the GC-Junction model has a superior log-likelihood and log-likelihood ratio index, with the parameters shown in Table 7.8 and a LR test of $134.924 > 11.07 = \chi^2_{(5,95\%)}$, rejecting the null hypothesis and being the preferred model to explain the data. All policy parameters have a correct sign and are statistically significant at 95% level of confidence. All the other non-policy parameters are significant at 90% level of confidence with the exception of two of them, which the modeller decided to keep because it has a correct sign and were estimated after a resource intensive modelling process.

The results for the GC-Junction MMNL model (Table 7.8) shows that *zebra crossings* is the attribute with the most considerable positive effect on the preferences for crossings in London. The effect of this attribute is larger in Santiago after considering the *zebra crossing (SCL dummy)* parameter. The attributes *one-way traffic* and *car traffic only* also have a positive effect

Table 7.8. MNL and MMNL models outputs and estimates for GC-Junction.

			GC-Junction MNL		GC-Junction MMNL	
LL(final)			-1258.739		-1192.64	
Estimated parameters			27		31	
ρ^2 ρ^2 adj.			0.321 0.306		0.357 0.340	
Sample size / Number of observations			860 / 1687		860 / 1687	
Dataset	Attributes		Estimate	t-ratio	Estimate	t-ratio
London	Santia- go					
x	x	ASC Neither option (LON)	0.308	1.513	1.075	2.914 **
	x	ASC Neither option (SCL)	0.956	4.240 **	2.145	4.717 **
x	x	J1 - Zebra crossing	1.720	12.187 **	3.757	7.309 **
	x	J1 - Zebra crossing (SCL dummy)	0.526	2.583 **	1.064	2.103 **
x	x	J2 - Dropped kerbs	0.000	-	0.000	-
x	x	L1 - One-way traffic	0.937	6.271 **	1.882	5.396 **
x	x	L2 - Two way traffic	0.000	-	0.000	-
x	x	M1 - Car traffic only	0.230	1.372	0.840	2.494 **
	x	M1 - Car traffic only (SCL dummy)	0.726	3.194 **	1.228	2.827 **
x	x	M2 - Car and bus traffic	0.000	-	0.000	-
Taste variations (in italics)						
x		J1 - Zebra crossing * last trip unaccompanied (child views)	0.761	2.264 **	1.151	1.558
x		J1 - Zebra crossing * last trip unaccompanied (carer views)	1.080	3.520 **	2.304	2.899 **
	x	J1 - Zebra crossing * last trip unaccompanied (child views)	1.148	3.041 **	2.433	2.569 **
	x	J1 - Zebra crossing * last trip unaccompanied (carer views)	0.812	2.423 **	1.790	2.070 **
	x	J1 - Zebra crossing * last trip with another child (child views)	1.264	2.039 **	2.746	1.773 *
	x	J1 - Zebra crossing * last trip with another child (carer views)	2.415	2.357 **	5.366	2.504 **
	x	J1 - Zebra crossing * last trip with a child and an adult (carer views)	-0.736	-2.018 **	-1.848	-1.740 *
x		L1 - One-way traffic * primary school child (carer views)	-0.844	-3.559 **	-1.439	-3.146 **
x		L1 - One-way traffic * last trip unaccompanied (child views)	1.398	3.565 **	2.359	3.451 **
x		L1 - One-way traffic * IMD income domain (child views)	-0.597	-2.768 **	-1.053	-2.438 **
	x	L1 - One-way traffic * primary school child	-0.606	-2.320 **	-1.027	-2.133 **
	x	L1 - One-way traffic * primary school child (carer views)	-0.678	-2.633 **	-0.954	-2.040 **
	x	L1 - One-way traffic * last trip unaccompanied (child views)	1.071	3.004 **	1.837	2.751 **
x		M1 - Car traffic only * primary school child (carer views)	-0.628	-2.386 **	-0.900	-1.957 *
x		M1 - Car traffic only * carer age 18-30	0.693	2.100 **	1.006	1.697 *
x		M1 - Car traffic only * last trip unaccompanied (child views)	1.077	2.857 **	2.014	3.074 **
x		M1 - Car traffic only * IMD income domain (carer views)	0.524	2.325 **	0.714	1.731 *
	x	M1 - Car traffic only * primary school child	-0.642	-2.291 **	-0.916	-1.943 *
	x	M1 - Car traffic only * primary school child (carer views)	-1.311	-4.627 **	-2.161	-4.122 **
Random coefficients						
x	x	η J1 - Zebra crossing	-	-	3.390	6.941 **
	x	η J1 - Zebra crossing (SCL dummy)	-	-	-0.537	-0.495
x	x	η L1 - One-way traffic	-	-	-1.878	-5.408 **
x	x	η M1 - Car traffic only	-	-	1.458	3.890 **
	x	η M1 - Car traffic only (SCL dummy)	-	-	0.204	0.267

* Significant at 90% confidence | ** Significant at 95% confidence

Source: author's own

on the preference for a crossing in both cities, yet it has a bigger impact in Santiago because the parameter *car traffic only* (*SCL dummy*) is positive.

Considering the GC-Junction MMNL model taste variations, the attribute *one-way traffic* has a small positive impact on the utilities of primary school children in Santiago and carers of primary school children in both cities. This attribute also has a positive effect on children living in the most income-deprived areas of London. The attribute *car traffic only* has a positive impact on carers aged 18 to 30 and children living in the most income-deprived areas of London. In Santiago, this attribute has a negative impact on primary school children and their carers.

Other significant associations that emerged in the models included the positive impact of the attribute *zebra crossings* on children from both cities that completed their last trip unaccompanied, and their carers. In Santiago, the attribute *zebra crossings* has a positive effect on the preferences of children travelling with another child. This attribute has a negative effect on children travelling with another child and an adult (from a carer's point of view). The attribute *one-way traffic* positively influences child from both cities who travelled unaccompanied. *Car traffic only* positively influences the same group, but only in London.

7. 1. 1. Average Marginal Effects (AME)

Using the average marginal effects methods described in Chapter 4.2.1., it is possible to interpret the model estimates on a probability scale, that is, the change in the probability of choosing a street to walk down unaccompanied by the inclusion of a particular attribute. The average marginal effects for all models are shown below. These values identify the effects of each attribute on carers and children, boys and girls, and primary or secondary school children.

LON1 and LON2 average marginal effects

The average marginal effects (AME) results for the model **LON1** are shown in Table 7.9. The AME results for LON1 indicate that only three attributes are significant and increase or decrease the probabilities of a child choosing a street environment to walk down unaccompanied. The attributes with a positive effect are *well-kept footpaths*, increasing the probability by 31.9%, and a *pub*, doing so by 5.7%; and with a negative effect, a *bus stop* by -3.3%. The rest of the attributes are not significant in the general case (i.e.,

considering all participants) but are relevant to individuals with specific characteristics.

The attribute *medium density houses* increase the probabilities of choosing a street for secondary school boys by 3.9%, girls by 2.5% and the carers of boys by 3.6%. For all the rest of the groups, the impact of the attribute is unclear (i.e., not statistically significant).

The only attribute with a significant and positive effect for all groups is *well-kept footpaths*. The smallest increase caused by this attribute appears among carers of primary school girls (29.1%). The greatest increases stimulated by this attribute emerge among secondary school children and their carers (between 32% and 35.5%).

The attribute a *playground* has a positive effect on the probabilities of boys and their carers. The increase is higher among carers of primary school boys (6.6%) in comparison with carers of secondary school boys (5%). The attribute a *bus stop* decreases the probabilities of primary school children and their carers, between -3.9% and -6.9%, and increases the probabilities of secondary school children between 6.4% and 8.2%. Results for a *bus stop* are not significant for primary school boys and carers of secondary school girls. In the case of the attribute *a bus stop and a playground*, the effect on the probabilities is significant and negative for carers of primary school children and primary school girls (between -4.9% and -6.4%).

The facilities attribute a *variety of shops* is relevant for carers of primary school girls and for secondary school children. The probabilities of carers of primary school girls considering that attribute decrease by -7.4%. By contrast, the probabilities for secondary school children increase by 8.2% for girls and by 7.4% for their carers, and by 9.4% for boys and by 10.4% for their carers. Results for the attribute a *pub* are similar, it decreases the probabilities of primary school girls by -3.9%, and increases the probabilities of secondary school children and their carers between 9.6% and 12.6%. The attribute is not significant for primary school children and the carers of boys. The results of the last facilities attribute, *a variety of shops and a pub*, are contrasting. For primary school boys, it increases the probabilities by 8.4% for boys, but for primary school girls and their carers it decreases the probabilities by -5.6% and -9.4%, respectively. *A variety of shops and a pub* is not significant for carers of primary school boys. In the case of secondary school children, *a variety of shops and a pub* has a positive effect on boys (11%) and their carers (11.4%), and is not significant for girls and their carers.

Table 7.9. LON1 model average marginal effects.

Attribute	General			Primary school boy			Secondary school boy			Primary school girl			Secondary school girl		
	CI [LL] ¹	mean	CI [UL] ²	CI [LL]	mean	CI [UL]	CI [LL]	mean	CI [UL]	CI [LL]	mean	CI [UL]	CI [LL]	mean	CI [UL]
A1 - Medium density houses	-2.8%	1.2%	5.7%	-2.6%	2.4%	7.5%	1.8%	3.9%	6.5%	-4.8%	0.0%	5.4%	0.5%	2.5%	4.7%
B1 - Well-kept footpaths	27.1%	31.9%	36.3%	27.0%	32.0%	36.8%	29.8%	35.2%	40.0%	26.0%	30.6%	35.3%	28.8%	33.8%	38.4%
D1 - Playground	-0.3%	4.5%	8.7%	1.9%	5.9%	9.8%	1.0%	5.8%	10.2%	-1.1%	4.0%	8.6%	-0.4%	4.6%	9.1%
D2 - Bus stop	-5.7%	-3.3%	-0.4%	-9.5%	-2.1%	4.6%	2.4%	8.2%	14.2%	-12.2%	-6.9%	-0.9%	0.9%	6.9%	12.3%
D3 - Bus stop and playground	-5.2%	2.1%	9.4%	-10.5%	-1.7%	8.4%	-0.5%	7.8%	16.4%	-12.4%	-6.4%	-0.2%	-1.6%	6.5%	15.8%
E1 - Variety of shops	-3.0%	2.7%	8.6%	-3.5%	2.1%	9.0%	3.5%	9.4%	15.9%	-6.5%	-0.3%	6.3%	1.9%	8.2%	14.5%
E2 - Pub	0.1%	5.7%	12.7%	-1.6%	4.5%	10.4%	6.6%	11.4%	17.0%	-4.2%	2.2%	8.6%	5.3%	10.2%	15.7%
E3 - Variety of shops and pub	-5.4%	0.7%	7.9%	2.3%	8.4%	17.7%	3.9%	11.1%	20.5%	-9.9%	-5.6%	-1.0%	-10.5%	-3.3%	4.7%
H1 - Signalised crossing	-4.9%	-1.8%	1.4%	-3.9%	-0.9%	2.4%	0.4%	2.0%	3.6%	-5.4%	-2.9%	-0.2%	-2.6%	0.4%	3.5%

Attribute	Primary school boy (carers' views)			Secondary school boy (carers' views)			Primary school girl (carers' views)			Secondary school girl (carers' views)		
	CI [LL]	mean	CI [UL]	CI [LL]	mean	CI [UL]	CI [LL]	mean	CI [UL]	CI [LL]	mean	CI [UL]
A1 - Medium density houses	-4.5%	0.7%	4.5%	0.7%	3.6%	6.1%	-6.8%	-1.8%	3.1%	-2.8%	1.5%	6.4%
B1 - Well-kept footpaths	25.6%	30.7%	35.7%	29.9%	35.5%	40.7%	24.6%	29.1%	34.3%	26.8%	32.0%	37.1%
D1 - Playground	2.2%	6.6%	13.1%	0.0%	5.0%	10.0%	-1.0%	4.6%	11.9%	-4.0%	2.1%	7.3%
D2 - Bus stop	-7.5%	-3.9%	-0.7%	0.2%	6.4%	12.1%	-11.1%	-6.7%	-2.4%	-1.6%	4.6%	11.4%
D3 - Bus stop and playground	-10.0%	-4.9%	-1.1%	-2.6%	5.4%	12.5%	-10.7%	-5.9%	-1.1%	-4.2%	3.9%	11.0%
E1 - Variety of shops	-10.3%	-3.9%	3.5%	3.9%	10.4%	15.6%	-13.7%	-7.4%	-2.7%	0.7%	7.4%	12.7%
E2 - Pub	-7.3%	-0.9%	6.6%	7.7%	12.6%	18.5%	-8.7%	-3.9%	-0.1%	4.3%	9.6%	15.7%
E3 - Variety of shops and pub	-1.7%	7.4%	17.6%	2.1%	11.4%	22.6%	-16.4%	-9.4%	-2.6%	-14.2%	-6.5%	1.4%
H1 - Signalised crossing	-5.8%	-2.6%	1.0%	0.2%	1.8%	3.8%	-8.6%	-5.0%	-1.6%	-5.4%	-1.6%	1.9%

Note: not significant attributes
(95% confidence) are in grey.

¹ Confidence interval lower limit

² Confidence interval upper limit

Source: author's own

Table 7.9. LON1 model average marginal effects (continued).

Attribute	Primary school			Secondary school			Primary school (carers' views)			Secondary school (carers' views)		
	CI [LL]	mean	CI [UL]	CI [LL]	mean	CI [UL]	CI [LL]	mean	CI [UL]	CI [LL]	mean	CI [UL]
A1 - Medium density houses	-4.1%	0.8%	6.4%	0.9%	2.4%	4.0%	-5.4%	-0.8%	3.7%	0.5%	2.7%	4.7%
B1 - Well-kept footpaths	26.1%	30.7%	35.3%	29.0%	33.9%	38.5%	24.7%	29.4%	34.6%	29.0%	34.1%	39.1%
D1 - Playground	-0.3%	4.5%	8.8%	0.4%	2.5%	4.7%	0.3%	5.4%	12.3%	-1.9%	3.7%	8.9%
D2 - Bus stop	-11.1%	-6.1%	-0.5%	1.2%	7.0%	12.6%	-9.7%	-5.5%	-2.0%	-1.3%	5.1%	10.7%
D3 - Bus stop and playground	-12.3%	-3.3%	7.1%	-1.5%	6.6%	15.7%	-9.8%	-4.8%	-0.4%	-4.0%	4.1%	11.5%
E1 - Variety of shops	-4.6%	0.5%	7.5%	2.3%	8.3%	14.5%	-11.1%	-5.9%	-1.6%	2.5%	9.1%	14.2%
E2 - Pub	-3.4%	2.9%	9.1%	5.4%	10.2%	15.7%	-9.0%	-2.3%	5.4%	6.2%	11.2%	17.1%
E3 - Variety of shops and pub	-2.9%	2.6%	9.1%	-0.1%	5.3%	12.1%	-6.0%	-3.2%	-0.4%	-3.0%	4.4%	12.3%
H1 - Signalised crossing	-5.5%	-2.4%	0.8%	-2.2%	0.5%	3.5%	-7.2%	-4.0%	-0.7%	-3.4%	0.0%	3.5%

Source: author's own

The attribute *signalised crossings* has a negative effect on primary school girls (-2.9%) and their carers (-5%). This attribute has a marginal yet positive effect on secondary school children (1.8% - 2%). Results show that this attribute is not significant for primary school boys, secondary school girls, and their respective carers.

The average marginal effects results for the model **LON2** are shown in Table 7.10. Only two attributes of a street increase the probabilities for all the groups: *grass* by 12.2% and *trees and grass* by 10%. On the contrary, three attributes reduce the probabilities in all cases; *strangers drinking alcohol* (-14.1%), *crowded footpaths* (-11.3%), and *teenagers* (-5.9%). The six remaining attributes are not significant. The results show no differences according to the child's age and gender.

The facade attribute *medium density houses* is not significant for groups with different characteristics. In the case of greenery attributes, *grass* is the only attribute with a significant impact, increasing the probabilities by 8.5% for children and by 7.6% for carers. The remaining greenery attributes, *trees* and *trees and grass*, are not significant in all cases. Two of the attributes describing strangers' activities are not significant: *chatting* and *walking*. The only significant attribute of this group is *strangers drinking alcohol*, which decreases the probabilities for a street environment by -17% for children and by -20% for carers.

The attributes describing strangers on the street decrease the probabilities of choosing a street in all cases, with a greater effect on carers compared to children. In decreasing order, *children* on a street reduce the probabilities by -4.8% for a child and by -5.9% for a carer, *adults* by -7.9% for a child and by -8.8% for a carer, and *teenagers* by -9.9% for a child and by -11.2% for a carer. The attribute *crowded footpaths* decreases the probabilities by -15% for children and by -15.5% for carers.

SCL1 and SCL2 average marginal effects

The average marginal effects results for the model **SCL1** are shown in Table 7.11. The attributes that increase the probabilities the most are *well-kept footpaths* (24.7%), *a playground* (16.6%), and *a bus stop and a playground* (15.9%). Conversely, the attributes with a relevant negative effect on the probabilities are an *off-licence* (-14%) and *vehicles parked on the footpaths* (-13.4%). The rest of the attributes increase the probabilities between 6% and 13.5%. The attribute *dirty and neglected footpaths* is the only exception and has a not significant effect.

The facades attribute *permeable facades* increase the probabilities of primary school boys by 8.3%, yet it decreases the probabilities of carers of primary school girls by -8.2%. A not significant effect is observed among primary school girls and carers of primary school boys. The attribute increases the probabilities of secondary school children (by 9.3% for boys and by 11.5% for girls), and their carers (by 5.2% for carers of girls and by 8.8% for carers of boys).

The quality of footpath's attribute *dirty and neglected footpaths* decrease the probabilities from -6%, for primary school boys, to -14.5%, for carers of primary school girls. The results are not significant for secondary school children and the carers of secondary school boys. In the case of *neglected footpaths*, the probabilities of children and carers increase between 7.6% and 16%, with a not significant effect for carers of primary school girls.

The results indicate that *well-kept footpaths* increases the probabilities for choosing a street environment in all cases; by 12.5% and 16.6% for carers of primary school girls and boys, respectively, and by 24.7% and 27.2% for secondary school girls and boys, respectively.

In the case of urban amenities attributes, *a playground* considerably increases the probabilities of choosing a street for secondary school children by 22.2% for boys, 20.4% for girls, and by 16.6% and 20.5% for carers of girls and boys, respectively. The attribute also increases the probabilities of primary school children but by a smaller proportion (12.8% for boys and by 9.9% for girls). A playground is not significant for carers of primary school children. The results for attribute a bus stop show a different pattern because the probabilities decrease for carers of primary school boys (-14.9%) and girls (-18.6%), and the probabilities are not significant for primary school children. In contrast, the attribute *a bus stop* increases the probabilities for secondary school children (11.5% - 13.7%), and for their carers (8.1% - 11.8%). The last attribute in this group, *a bus stop and a playground*, has only positive impacts and has the most significant impact on boys and carers of secondary school children. The attribute increases the probabilities of primary school boys (18.1%), their carers (8.4%) and primary school girls (8.9%). The attribute is not significant for carers of primary school girls. The impact of *a bus stop and a playground* among secondary school children is greater for boys (22%) than girls (14.4%). Likewise, the attribute increases the probabilities for carers of boys (16.4%) and girls (10.5%).

The facilities attribute *school* has a negative effect on the probabilities of primary school children; -8.6% among girls, -10.6% among carers of boys, and -14% among carers of girls, with no significant effects on boys.

Table 7.10. LON2 model average marginal effects.

Attribute	General			Primary school boy			Secondary school boy			Primary school girl			Secondary school girl		
	CI [LL] ¹	mean	CI [UL] ²	CI [LL]	mean	CI [UL]	CI [LL]	mean	CI [UL]	CI [LL]	mean	CI [UL]	CI [LL]	mean	CI [UL]
A1 - Medium density houses	-2.4%	7.3%	11.2%	-3.6%	3.1%	7.2%	-3.6%	3.1%	7.2%	-3.6%	3.1%	7.2%	-3.6%	3.1%	7.2%
C1 - Trees and grass	1.0%	10.0%	22.2%	-2.6%	6.1%	18.2%	-2.6%	6.1%	18.2%	-2.6%	6.1%	18.2%	-2.6%	6.1%	18.2%
C2 - Trees	-4.0%	6.2%	18.3%	-8.6%	2.1%	14.3%	-8.6%	2.1%	14.3%	-8.6%	2.1%	14.3%	-8.6%	2.1%	14.3%
C3 - Grass	4.7%	12.2%	23.9%	0.4%	8.5%	19.6%	0.4%	8.5%	19.6%	0.4%	8.5%	19.6%	0.4%	8.5%	19.6%
F1 - Chattingt	-2.1%	4.6%	11.6%	-7.4%	-0.4%	8.1%	-7.4%	-0.4%	8.1%	-7.4%	-0.4%	8.1%	-7.4%	-0.4%	8.1%
F2 - Walking	-0.4%	7.6%	12.5%	-3.7%	2.5%	8.7%	-3.7%	2.5%	8.7%	-3.7%	2.5%	8.7%	-3.7%	2.5%	8.7%
F3 - Drinking alcohol	-24.1%	-14.1%	-4.9%	-27.1%	-17.0%	-6.0%	-27.1%	-17.0%	-6.0%	-27.1%	-17.0%	-6.0%	-27.1%	-17.0%	-6.0%
G1 - Children	-14.6%	3.3%	12.4%	-10.2%	-4.8%	-0.9%	-10.2%	-4.8%	-0.9%	-10.2%	-4.8%	-0.9%	-10.2%	-4.8%	-0.9%
G2 - Teenegers	-14.4%	-5.9%	-1.1%	-31.4%	-9.9%	-0.04%	-31.4%	-9.9%	-0.04%	-31.4%	-9.9%	-0.04%	-31.4%	-9.9%	-0.04%
G3 - Adults	-19.0%	-4.1%	5.2%	-12.5%	-7.9%	-2.7%	-12.5%	-7.9%	-2.7%	-12.5%	-7.9%	-2.7%	-12.5%	-7.9%	-2.7%
I1 - Crowded footpath	-16.5%	-11.3%	-1.7%	-20.5%	-15.0%	-3.2%	-20.5%	-15.0%	-3.2%	-20.5%	-15.0%	-3.2%	-20.5%	-15.0%	-3.2%

Attribute	Primary school boy (carers' views)			Secondary school boy (carers' views)			Primary school girl (carers' views)			Secondary school girl (carers' views)		
	CI [LL]	mean	CI [UL]	CI [LL]	mean	CI [UL]	CI [LL]	mean	CI [UL]	CI [LL]	mean	CI [UL]
A1 - Medium density houses	-3.1%	2.2%	6.7%	-3.1%	2.2%	6.7%	-3.1%	2.2%	6.7%	-3.1%	2.2%	6.7%
C1 - Trees and grass	-2.0%	6.5%	19.0%	-2.0%	6.5%	19.0%	-2.0%	6.5%	19.0%	-2.0%	6.5%	19.0%
C2 - Trees	-8.3%	1.1%	15.0%	-8.3%	1.1%	15.0%	-8.3%	1.1%	15.0%	-8.3%	1.1%	15.0%
C3 - Grass	0.0%	7.6%	19.7%	0.0%	7.6%	19.7%	0.0%	7.6%	19.7%	0.0%	7.6%	19.7%
F1 - Chattingt	-7.0%	-0.7%	11.7%	-7.0%	-0.7%	11.7%	-7.0%	-0.7%	11.7%	-7.0%	-0.7%	11.7%
F2 - Walking	-4.3%	1.8%	10.2%	-4.3%	1.8%	10.2%	-4.3%	1.8%	10.2%	-4.3%	1.8%	10.2%
F3 - Drinking alcohol	-29.2%	-20.0%	-6.1%	-29.2%	-20.0%	-6.1%	-29.2%	-20.0%	-6.1%	-29.2%	-20.0%	-6.1%
G1 - Children	-11.7%	-5.9%	-0.4%	-11.7%	-5.9%	-0.4%	-11.7%	-5.9%	-0.4%	-11.7%	-5.9%	-0.4%
G2 - Teenegers	-30.9%	-11.2%	-1.9%	-30.9%	-11.2%	-1.9%	-30.9%	-11.2%	-1.9%	-30.9%	-11.2%	-1.9%
G3 - Adults	-13.9%	-8.8%	-2.5%	-13.9%	-8.8%	-2.5%	-13.9%	-8.8%	-2.5%	-13.9%	-8.8%	-2.5%
I1 - Crowded footpath	-20.8%	-15.5%	-1.1%	-20.8%	-15.5%	-1.1%	-20.8%	-15.5%	-1.1%	-20.8%	-15.5%	-1.1%

Note: not significant attributes
(95% confidence) are in grey.
¹ Confidence interval lower limit
² Confidence interval upper limit

Source: author's own

Table 7.10. LON2 model average marginal effects (continued).

Attribute	Primary school boy (carers' views)			Secondary school boy (carers' views)			Primary school girl (carers' views)			Secondary school girl (carers' views)		
	CI [LL]	mean	CI [UL]	CI [LL]	mean	CI [UL]	CI [LL]	mean	CI [UL]	CI [LL]	mean	CI [UL]
A1 - Medium density houses	-3.6%	3.1%	7.2%	-3.6%	3.1%	7.2%	-3.1%	2.2%	6.7%	-3.1%	2.2%	6.7%
C1 - Trees and grass	-2.6%	6.1%	18.2%	-2.6%	6.1%	18.2%	-2.0%	6.5%	19.0%	-2.0%	6.5%	19.0%
C2 - Trees	-8.6%	2.1%	14.3%	-8.6%	2.1%	14.3%	-8.3%	1.1%	15.0%	-8.3%	1.1%	15.0%
C3 - Grass	0.4%	8.5%	19.6%	0.4%	8.5%	19.6%	0.0%	7.6%	19.7%	0.0%	7.6%	19.7%
F1 - Chattingt	-7.4%	-0.4%	8.1%	-7.4%	-0.4%	8.1%	-7.0%	-0.7%	11.7%	-7.0%	-0.7%	11.7%
F2 - Walking	-3.7%	2.5%	8.7%	-3.7%	2.5%	8.7%	-4.3%	1.8%	10.2%	-4.3%	1.8%	10.2%
F3 - Drinking alcohol	-27.1%	-17.0%	-6.0%	-27.1%	-17.0%	-6.0%	-29.2%	-20.0%	-6.1%	-29.2%	-20.0%	-6.1%
G1 - Children	-10.2%	-4.8%	-0.9%	-10.2%	-4.8%	-0.9%	-11.7%	-5.9%	-0.4%	-11.7%	-5.9%	-0.4%
G2 - Teenegers	-31.4%	-9.9%	-0.04%	-31.4%	-9.9%	-0.04%	-30.9%	-11.2%	-1.9%	-30.9%	-11.2%	-1.9%
G3 - Adults	-12.5%	-7.9%	-2.7%	-12.5%	-7.9%	-2.7%	-21.1%	-8.7%	-0.1%	-21.1%	-8.7%	-0.1%
I1 - Crowded footpath	-20.5%	-15.0%	-3.2%	-20.5%	-15.0%	-3.2%	-20.8%	-15.5%	-1.1%	-20.8%	-15.5%	-1.1%

Source: author's own

Table 7.11. SCL1 model average marginal effects.

Attribute	General			Primary school boy			Secondary school boy			Primary school girl			Secondary school girl		
	CI [LL] ¹	mean	CI [UL] ²	CI [LL]	mean	CI [UL]	CI [LL]	mean	CI [UL]	CI [LL]	mean	CI [UL]	CI [LL]	mean	CI [UL]
A1 - Permeable Fences	4.3%	8.7%	12.7%	1.1%	8.3%	13.3%	6.1%	11.5%	16.1%	-4.5%	3.4%	10.1%	3.1%	9.3%	14.0%
B1 - Well-kept footpaths	18.4%	24.7%	28.4%	17.0%	23.8%	28.8%	19.6%	27.2%	32.1%	13.8%	20.2%	25.4%	18.0%	24.7%	29.1%
B3 - Neglect footpaths	7.4%	13.5%	19.1%	4.4%	10.8%	16.2%	10.2%	16.0%	21.2%	0.8%	7.6%	13.4%	7.6%	13.8%	19.1%
B4 - Dirty and neglected footpaths	-7.7%	-2.0%	5.6%	-11.5%	-6.0%	-0.1%	-4.9%	0.8%	7.5%	-15.0%	-9.1%	-2.5%	-7.3%	-1.5%	6.0%
D1 - Playground	8.9%	16.6%	22.4%	2.8%	12.8%	20.2%	15.3%	22.2%	28.7%	0.0%	9.9%	17.6%	13.5%	20.4%	26.8%
D2 - Bus stop	1.2%	7.0%	13.4%	-6.6%	0.7%	8.2%	5.6%	13.7%	20.6%	-10.7%	-2.7%	5.0%	3.1%	11.5%	19.0%
D3 - Bus stop and playground	10.3%	15.9%	21.9%	9.1%	18.1%	25.9%	13.5%	22.0%	29.1%	1.8%	8.9%	15.0%	8.5%	14.4%	20.2%
E1 - School	0.4%	6.0%	11.6%	-13.8%	-3.4%	4.8%	4.9%	13.5%	20.7%	-17.1%	-8.6%	-1.7%	1.9%	11.3%	19.1%
E2 - Local shops	0.4%	7.4%	13.7%	-2.9%	6.3%	13.9%	0.4%	10.4%	17.4%	-6.1%	2.4%	9.94%	-2.3%	7.7%	14.4%
E3 - Off-licence	-22.4%	-14.0%	-5.5%	-22.4%	-13.4%	-6.8%	-18.4%	-8.8%	-1.2%	-29.6%	-22.4%	-15.2%	-24.3%	-17.3%	-9.5%
H1 - Vehicles Parked on Footpath	-18.1%	-13.4%	-8.1%	-19.2%	-12.3%	-5.8%	-12.1%	-7.1%	-1.9%	-26.1%	-20.2%	-12.9%	-19.0%	-14.3%	-7.4%

Attribute	Primary school boy (carers' views)			Secondary school boy (carers' views)			Primary school girl (carers' views)			Secondary school girl (carers' views)		
	CI [LL]	mean	CI [UL]	CI [LL]	mean	CI [UL]	CI [LL]	mean	CI [UL]	CI [LL]	mean	CI [UL]
A1 - Permeable Fences	-8.2%	-0.4%	7.5%	3.1%	8.8%	13.5%	-15.2%	-8.2%	-2.1%	0.3%	5.2%	10.5%
B1 - Well-kept footpaths	9.6%	16.6%	23.1%	17.0%	23.3%	28.2%	5.2%	12.5%	18.8%	13.7%	19.8%	24.0%
B3 - Neglect footpaths	2.8%	8.9%	15.6%	7.5%	14.1%	20.8%	-6.9%	0.7%	7.3%	4.1%	10.3%	16.8%
B4 - Dirty and neglected footpaths	-18.8%	-11.0%	-4.2%	-8.9%	-1.7%	6.2%	-21.5%	-14.5%	-5.8%	-11.0%	-6.2%	-0.9%
D1 - Playground	-14.6%	0.8%	13.7%	12.1%	20.5%	26.9%	-17.7%	-2.5%	10.0%	7.8%	16.6%	22.4%
D2 - Bus stop	-25.7%	-14.9%	-2.7%	4.8%	11.8%	19.2%	-30.0%	-18.6%	-6.1%	1.2%	8.1%	16.0%
D3 - Bus stop and playground	1.2%	8.4%	16.9%	10.6%	16.4%	23.0%	-6.3%	1.6%	8.9%	5.9%	10.5%	16.5%
E1 - School	-20.9%	-10.6%	-2.1%	2.4%	9.2%	17.5%	-23.1%	-14.0%	-6.4%	2.0%	9.0%	16.6%
E2 - Local shops	-10.0%	-0.3%	8.7%	1.1%	11.2%	18.7%	-16.9%	-8.5%	-2.3%	-4.0%	3.9%	10.0%
E3 - Off-licence	-25.6%	-14.8%	-4.3%	-16.1%	-6.2%	3.2%	-36.3%	-29.1%	-21.9%	-28.9%	-21.1%	-13.7%
H1 - Vehicles Parked on Footpath	-29.6%	-21.6%	-13.7%	-18.5%	-12.3%	-7.4%	-34.8%	-27.3%	-18.6%	-23.8%	-18.3%	-11.7%

Note: not significant attributes
(95% confidence) are in grey.

¹ Confidence interval lower limit

² Confidence interval upper limit

Source: author's own

Table 7.11. SCL1 model average marginal effects (continued).

Attribute	Primary school			Secondary school			Primary school (carers' views)			Secondary school (carers' views)		
	CI [LL]	mean	CI [UL]	CI [LL]	mean	CI [UL]	CI [LL]	mean	CI [UL]	CI [LL]	mean	CI [UL]
A1 - Permeable Fences	-2.5%	4.7%	10.9%	4.5%	10.1%	14.8%	-13.2%	-6.8%	-0.8%	2.0%	7.3%	11.9%
B1 - Well-kept footpaths	15.1%	21.7%	26.7%	18.7%	25.5%	29.9%	7.2%	14.0%	20.2%	15.3%	21.2%	25.8%
B3 - Neglect footpaths	2.2%	8.9%	14.2%	8.6%	14.5%	19.6%	0.0%	6.1%	12.7%	5.9%	12.5%	19.0%
B4 - Dirty and neglected footpaths	-13.2%	-7.7%	-1.9%	-6.1%	-0.6%	6.0%	-20.4%	-12.9%	-4.6%	-9.9%	-3.1%	4.5%
D1 - Playground	0.8%	11.0%	18.5%	14.0%	20.9%	27.4%	-16.7%	-1.1%	11.4%	10.6%	18.9%	24.9%
D2 - Bus stop	-9.0%	-1.3%	6.5%	3.7%	12.2%	19.7%	-27.8%	-16.9%	-4.7%	3.6%	10.2%	18.1%
D3 - Bus stop and playground	6.4%	13.6%	20.8%	12.2%	18.3%	24.0%	2.6%	9.6%	17.1%	9.1%	14.3%	19.8%
E1 - School	-15.1%	-7.1%	-0.3%	3.1%	12.0%	19.6%	-22.6%	-12.4%	-4.4%	0.5%	7.6%	15.6%
E2 - Local shops	-5.0%	4.0%	11.5%	-1.2%	8.7%	15.2%	-14.1%	-7.0%	-0.3%	0.7%	8.6%	15.4%
E3 - Off-licence	-24.6%	-17.2%	-10.8%	-20.2%	-12.3%	-5.0%	-30.2%	-21.7%	-13.9%	-20.9%	-13.0%	-5.0%
H1 - Vehicles Parked on Footpath	-22.2%	-16.4%	-10.0%	-15.0%	-10.9%	-5.8%	-30.8%	-23.7%	-15.9%	-20.0%	-14.1%	-8.8%

Source: author's own

By contrast, the attribute increases the probabilities of secondary school children (11.3%-13.5%) and their carers (9%-9.2%). Results are similar for the attribute *local shops* as it increases the probabilities of carers of primary school girls (8.5%), secondary school boys (10.4%) and the carers of boys (11.2%). The attribute has no significant effects for the rest of the children and carers. The last facilities attribute, an *off-licence*, has a negative effect on all the groups. The smallest decrease in probabilities is observed among secondary school boys (-8.8%); while the greatest change emerged among carers of primary school girls (-29.1%). The attribute is not significant for secondary school boys.

Lastly, for the SCL1 average marginal effects results, the attribute *vehicles parked on the footpath* decrease the probabilities for all children and carers. The attribute influences less primary school (-7.1%) and secondary school (-12.3%) boys, and it has a greater effect on carers of primary school boys (-21.6%) and of primary school girls (-27.3%).

The average marginal effects results for the model **SCL2** are shown in Table 7.12. When considering all the groups, the attributes that mostly increase the probabilities are *grass*, by 12%, and other *children*, by 9.6%. The attributes with the largest negative effect on the probabilities are *strangers drinking alcohol* (-32.2%) and a *male* stranger (-16%). The rest of the attributes that have a positive effect range between 6.4% and 8.8% and, those with a negative effect between -3.3% and -8.5%. The only attributes with a not significant effect in the probabilities are *trees* and *strangers walking*.

The results for the facades attribute are similar to SCL1 AME. *Permeable fences* increase the probabilities of primary school children (9.1% for boys and 5.3% for girls) choosing that street, but decreases the probabilities of carers of girls (-6.4%). This attribute has no significant effect on the probabilities of carers of primary school boys. In the case of secondary school children, the attribute *permeable fences* increases the probabilities of boys (12.5%) and their carers (11.7%), and for girls (10.2%) and their carers (10%).

In the case of greenery attributes, *trees and grass* increase the probabilities of primary school boys by 7.3%, but decreases the probability of carers of primary school girls by -7.9%. The attribute is not significant for primary school girls and carers of boys. The effect of *trees and grass* on secondary school children is positive in all cases, with a greater effect on boys (8.7%) and their carers (10.5%). A smaller increase also is observed among girls (7.2%) and their carers (8.2%). The attribute *trees* is significant only for secondary school boys, increasing the probabilities by 6.7%. Lastly, the attribute *grass* is positive for all groups, ranging between 7.7% and 11.7% among primary

school girls and boys, respectively, and between 15.8% and 17.9%, among secondary school children and their carers. Results for that attribute are no significant for carers of primary school children.

The strangers' activities attribute *chatting* has a positive effect on secondary school children (7.5% - 11.2%), a negative effect on carers of primary school girls (-7.5%) and a no significant effect on primary school children and carers of primary school boys. The attribute also increases the probabilities of secondary school children and their carers, by between 7.5% and 11.2%. The attribute strangers *walking* has a negative effect on primary school girls (-4.7%) and their carers (-12.2%); but this attribute has no significant effect on boys and their carers. Strangers *walking* does not have a significant effect on secondary school girls and their carers. The attribute increases the probabilities of secondary school boys (6.4%) and their carers (11.8%). The last attribute in this group, strangers *drinking alcohol*, decreases the probabilities in all cases by between -26.6% and -35.6%. It has the smallest impact on carers of secondary school boys and the greatest impact on carers of primary school girls.

The attribute other *children* increases the probabilities for primary school boys by 8%, and decreases the probabilities for primary school girls and their carers, by -4.2% and -8.8%, respectively. No significant effect is observed on carers of primary school boys. In the case of secondary school children and their carers, other *children* have a positive effect on the probabilities (between 12% and 13.4%). The attribute *teenagers* decreases the probabilities for children and carers; it has a smaller impact on secondary school children and their carers (between -6.5% and -8.6%), and a greater impact on primary school children and their carers (between -9.4% and -18.4%). The attribute *adults* also has a negative effect on the probabilities, but only on primary school girls and carers of primary school children (between -8.9% and -13.4%). This attribute is not significant for the rest of the groups.

The presence of a *male* stranger reduces the probability of choosing a street for all groups. Its impacts the probabilities by -25.1% and -30.2% for primary school girls and their carers, respectively, and between -19.9% and -19.6% for secondary school girls and their carers, respectively. The impact of this attribute on boys is smaller, decreasing the probabilities of choosing a street by -11.1% and -17% for primary school boys and their carers, respectively, and -9.3% and -11.3% for secondary school boys and their carers, respectively. In the models, the influence of the attribute *male* stranger is analysed independently of other aspects such as clothing or general appearance of strangers in Santiago. Nevertheless, male individuals may have a greater

Table 7.12. SCL2 model average marginal effects.

Attribute	General			Primary school boy			Secondary school boy			Primary school girl			Secondary school girl		
	CI [LL] ¹	mean	CI [UL] ²	CI [LL]	mean	CI [UL]	CI [LL]	mean	CI [UL]	CI [LL]	mean	CI [UL]	CI [LL]	mean	CI [UL]
A1 - Permeable Fences	4.0%	8.8%	11.9%	4.0%	9.1%	13.0%	6.9%	12.5%	16.4%	0.1%	5.3%	9.1%	5.7%	10.2%	14.3%
C1 - Trees and grass	2.3%	8.1%	13.6%	0.9%	7.3%	14.5%	3.3%	8.7%	14.6%	-2.1%	3.9%	10.6%	1.7%	7.2%	12.4%
C2 - Trees	-1.1%	5.0%	12.6%	-2.4%	4.5%	14.2%	0.1%	6.7%	13.4%	-5.1%	0.9%	11.5%	-0.8%	5.0%	12.5%
C3 - Grass	6.1%	12.0%	18.0%	4.5%	11.7%	18.7%	12.3%	17.9%	23.5%	0.9%	7.7%	15.1%	10.7%	15.8%	20.9%
F1 - Chatting	2.1%	6.4%	11.9%	-6.1%	1.2%	11.6%	1.0%	7.5%	16.3%	-1.5%	3.9%	11.3%	5.7%	11.2%	19.1%
F2 - Walking	-3.9%	1.2%	8.7%	-4.8%	1.4%	11.0%	0.5%	6.4%	16.4%	-7.9%	-4.7%	-0.1%	-3.7%	2.7%	11.8%
F3 - Drinking alcohol	-39.5%	-32.2%	-13.1%	-39.2%	-32.8%	-13.7%	-37.4%	-30.0%	-10.8%	-40.6%	-34.8%	-16.3%	-38.5%	-31.4%	-11.5%
G1 - Children	2.9%	9.6%	14.9%	1.7%	8.0%	14.5%	6.2%	13.4%	20.4%	-8.2%	-4.2%	-0.6%	4.8%	12.0%	18.5%
G2 - Teenegers	-13.1%	-8.5%	-3.2%	-15.8%	-9.4%	-3.45%	-11.9%	-6.5%	-1.40%	-17.8%	-12.3%	-5.64%	-11.5%	-7.6%	-2.61%
G3 - Adults	-8.0%	-3.3%	-0.1%	-16.9%	-5.6%	3.1%	-13.9%	-3.3%	4.5%	-19.1%	-9.1%	-1.1%	-14.7%	-4.7%	2.4%
I1 - Male (stranger)	-20.0%	-16.0%	-12.6%	-18.2%	-11.1%	-5.5%	-15.5%	-9.3%	-5.0%	-28.8%	-25.1%	-19.4%	-23.9%	-19.9%	-16.0%

Attribute	Primary school boy (carers' views)			Secondary school boy (carers' views)			Primary school girl (carers' views)			Secondary school girl (carers' views)		
	CI [LL]	mean	CI [UL]	CI [LL]	mean	CI [UL]	CI [LL]	mean	CI [UL]	CI [LL]	mean	CI [UL]
A1 - Permeable Fences	-2.2%	4.0%	9.1%	5.2%	11.7%	16.9%	-12.4%	-6.4%	-2.6%	3.4%	10.0%	15.1%
C1 - Trees and grass	-5.4%	2.9%	10.8%	3.7%	10.5%	16.4%	-14.2%	-7.9%	-2.3%	2.0%	8.2%	13.4%
C2 - Trees	-11.0%	-1.8%	9.3%	-5.0%	3.5%	10.9%	-13.9%	-6.1%	6.2%	-6.2%	2.4%	10.0%
C3 - Grass	-4.7%	4.2%	13.5%	11.7%	17.9%	23.5%	-9.8%	0.0%	10.5%	10.9%	17.1%	22.6%
F1 - Chatting	-10.4%	-3.3%	6.3%	4.4%	9.5%	15.8%	-12.7%	-7.5%	-1.1%	5.4%	11.1%	17.4%
F2 - Walking	-11.5%	-2.5%	7.5%	2.1%	11.8%	23.2%	-19.2%	-12.2%	-3.8%	-3.6%	3.0%	14.4%
F3 - Drinking alcohol	-39.7%	-32.8%	-15.8%	-35.2%	-26.6%	-9.0%	-42.2%	-35.6%	-20.2%	-37.3%	-28.6%	-10.1%
G1 - Children	-5.8%	1.3%	10.7%	5.0%	12.9%	18.9%	-14.6%	-8.8%	-2.6%	2.6%	12.0%	18.1%
G2 - Teenegers	-22.4%	-14.5%	-8.0%	-14.3%	-7.5%	-3.1%	-24.7%	-18.4%	-12.3%	-15.3%	-8.6%	-4.3%
G3 - Adults	-19.1%	-8.9%	-0.2%	-13.1%	-3.1%	4.1%	-24.2%	-13.4%	-4.2%	-16.2%	-4.4%	2.9%
I1 - Male (stranger)	-24.6%	-17.0%	-11.0%	-17.9%	-11.3%	-6.9%	-35.3%	-30.2%	-24.2%	-24.7%	-19.6%	-16.0%

Note: not significant attributes
(95% confidence) are in grey.
¹ Confidence interval lower limit
² Confidence interval upper limit

Source: author's own

Table 7.12. SCL2 model average marginal effects (continued).

Attribute	Primary school			Secondary school			Primary school (carers' views)			Secondary school (carers' views)		
	CI [LL]	mean	CI [UL]	CI [LL]	mean	CI [UL]	CI [LL]	mean	CI [UL]	CI [LL]	mean	CI [UL]
A1 - Permeable Fences	4.0%	9.1%	13.0%	6.9%	12.5%	16.4%	-2.2%	4.0%	9.1%	5.2%	11.7%	16.9%
C1 - Trees and grass	0.9%	7.3%	14.5%	3.3%	8.7%	14.6%	-5.4%	2.9%	10.8%	3.7%	10.5%	16.4%
C2 - Trees	-2.4%	4.5%	14.2%	0.1%	6.7%	13.4%	-11.0%	-1.8%	9.3%	-5.0%	3.5%	10.9%
C3 - Grass	4.5%	11.7%	18.7%	12.3%	17.9%	23.5%	-4.7%	4.2%	13.5%	11.7%	17.9%	23.5%
F1 - Chatting	-6.1%	1.2%	11.6%	1.0%	7.5%	16.3%	-10.4%	-3.3%	6.3%	4.4%	9.5%	15.8%
F2 - Walking	-4.8%	1.4%	11.0%	0.5%	6.4%	16.4%	-11.5%	-2.5%	7.5%	2.1%	11.8%	23.2%
F3 - Drinking alcohol	-39.2%	-32.8%	-13.7%	-37.4%	-30.0%	-10.8%	-39.7%	-32.8%	-15.8%	-35.2%	-26.6%	-9.0%
G1 - Children	1.7%	8.0%	14.5%	6.2%	13.4%	20.4%	-5.8%	1.3%	10.7%	5.0%	12.9%	18.9%
G2 - Teenegers	-15.8%	-9.4%	-3.5%	-11.9%	-6.5%	-1.4%	-22.4%	-14.5%	-8.0%	-14.3%	-7.5%	-3.1%
G3 - Adults	-16.9%	-5.6%	3.1%	-13.9%	-3.3%	4.5%	-19.1%	-8.9%	-0.2%	-13.1%	-3.1%	4.1%
I1 - Male (stranger)	-18.2%	-11.1%	-5.5%	-15.5%	-9.3%	-5.0%	-24.6%	-17.0%	-11.0%	-17.9%	-11.3%	-6.9%

Source: author's own

negative effect on children's unaccompanied walking trips if they also wear sag trousers and a cap as described in Chapter 5.

GC-Link average marginal effects

The average marginal effects results for the model **GL-Link** are shown in Table 7.13, and are divided into the London (LON) database in Table 7.14 and the Santiago (SCL) database in Table 7.15. This division helps to uncover the particular effects of the attributes on the groups living in those cities.

Considering all groups, the attribute with the greatest positive effect on selecting a street is *well-kept footpaths* as it increases the probabilities by 27% (29.7% in London and 26.5% in Santiago). The attributes that also have positive effects are a *bus stop and a playground*, increasing the probabilities by 10.3% (10.7% in London and 9% in Santiago), and the attribute *trees* by 7.8% (8.7% in London and 5.7% in Santiago). The effect of the attribute *trees* in Santiago is less relevant than the impacts of *trees and grass* (6.6%). The rest of the attributes (*grass*, *a playground*, *a bus stop*, and *strangers chatting or walking*) also increase the probabilities, but to a smaller extent.

In contrast, *strangers drinking alcohol* is the attribute that decreases the probabilities the most: -26.9% for both cities, -24.3% for London and -26.5% for Santiago. The attribute *teenagers* also reduce the probabilities, but in a smaller proportion (-4.2% for both cities, -3.5 for London); this attribute has a not significant effect in Santiago. Other attributes with a negative effect include *adults* (-2.3% for both cities, -4.7% for Santiago) and *other children* on the street (-2.2% for both cities, -4.4 for Santiago). The attribute *other children* has a positive effect for London (4.2%). The attributes *a bus stop* and *strangers chatting* do not have a significant effect on the probabilities when considering all groups. Similarly, the attributes *adults* in London and *teenagers* in Santiago are not significant.

Considering street characteristics, the attribute *well-kept footpaths* has the greatest positive impact, increasing the probabilities between 23% and 30.7%. The attribute also increases the probabilities between 24.7% and 32.5% for London and between 21.6% and 33% for Santiago. In both cities, the smallest impact is observed among carers of primary school girls and the greatest among secondary school boys.

The greenery attribute *trees and grass* increases the probabilities of all groups. The smallest effects are observed among carers of primary school girls (4%) and carers of secondary school girls (5.3%). The attribute has the greatest positive impacts on the probabilities of primary school (11.3%)

and secondary school (10.5%) children. In London, the smallest effect also is observed among carers of primary school girls (5.2%) and carers of secondary school girls (4.5%). The highest increase in probabilities of the attribute *trees and grass* is observed among primary school boys, by 11.7%, and secondary school boys, by 11.2%. The results from Santiago diverge from the London results, as the attribute *trees and grass* increases in the probabilities only for boys and their carers (between 4.6% and 10.6%) and decreases the probabilities of girls (between -4.7% and -6.5%).

The attribute *trees* increase the probabilities of choosing a street in all cases, the smallest for carers of primary and secondary school girls, by between 5.9% and 5.1% respectively, and the greatest for primary and secondary school boys by between 10% and 9.2%, respectively. This pattern is mirrored in the London data, as the attribute increases the probabilities among carers of girls (6.4% - 7.2%) and among boys (10% - 10.5%). In Santiago, *trees* increase probabilities in a similar fashion but in a smaller proportion, between 4.2% and 4.7% for primary and secondary girls, respectively, and between 7.6% and 8.1% for primary and secondary school boys, respectively.

Grass increases the probabilities for primary school children (4.1% for girls, 5% for boys), secondary school boys (4.1%) and carers of primary school boys (4.8%), and decreases the probabilities of carers of secondary school girls (-2.6%). The results indicate that the attribute is not significant for secondary school girls and the carers of primary and secondary school girls. In London, *grass* has a positive effect in all cases, between 3.4% and 6%. In addition, the attribute is not significant for carers of girls. In Santiago, the attribute *grass* increases the probabilities between 3.3% and 8.6%. It also decreases the probabilities of carers of primary school girls by -4.7 and carers of secondary school girls by -4.6%.

Among the urban facilities group of attributes, the attribute a *playground* increases the probabilities between 3.2% and 5.7%. This attribute has the smallest impact on carers of secondary school boys and the greatest on primary school boys. It also has a negative impact on carers of secondary school girls (-2.3%). The only not significant effect of this attribute is observed among carers of primary school girls. In London, the attribute a *playground* increases the probabilities for all the groups, by between 3.2% and 6.2%, the smallest impact appears among secondary school girls and the greatest among primary school boys. In Santiago, the attribute has the least relevant impact on girls in secondary school (3.6%) and the greatest on carers of boys in primary school (6.3%). A *playground* decreases the probabilities of carers of primary and secondary school girls between -4% and -4.1%, respectively.

Table 7.13. GC-Link model average marginal effects.

Attribute	General			Primary school boy			Secondary school boy			Primary school girl			Secondary school girl		
	CI [LL] ¹	mean	CI [UL] ²	CI [LL]	mean	CI [UL]	CI [LL]	mean	CI [UL]	CI [LL]	mean	CI [UL]	CI [LL]	mean	CI [UL]
B1 - Well-kept footpaths	24.6%	27.0%	29.7%	27.6%	30.7%	33.6%	27.6%	30.7%	33.8%	22.9%	25.2%	27.8%	22.9%	25.3%	28.1%
C1 - Trees and grass	4.1%	7.0%	10.1%	7.4%	11.3%	14.8%	6.6%	10.5%	14.2%	2.6%	5.9%	8.9%	1.6%	5.1%	8.0%
C2 - Trees	5.2%	7.8%	10.4%	7.3%	10.0%	12.6%	5.9%	9.2%	11.9%	4.9%	7.7%	10.2%	3.9%	6.9%	9.9%
C3 - Grass	0.1%	2.7%	5.3%	1.7%	5.0%	7.5%	1.0%	4.1%	6.6%	1.3%	4.7%	7.1%	-1.1%	1.8%	4.5%
D1 - Playground	0.6%	3.6%	6.3%	2.4%	5.7%	8.5%	2.2%	5.3%	8.2%	0.4%	3.4%	6.1%	0.8%	3.8%	6.4%
D2 - Bus stop	-0.04%	2.7%	5.1%	2.0%	5.0%	8.3%	2.2%	5.4%	8.3%	-2.8%	0.1%	3.7%	1.0%	4.2%	6.7%
D3 - Bus stop and playground	7.6%	10.3%	13.2%	11.1%	14.8%	19.0%	10.6%	14.4%	18.2%	7.0%	9.6%	12.4%	6.8%	9.2%	12.2%
F1 - Chatting	-1.1%	1.4%	3.6%	0.9%	3.8%	6.5%	1.3%	4.3%	7.1%	0.7%	3.3%	5.9%	-2.3%	0.4%	3.0%
F2 - Walking	1.4%	3.9%	6.5%	4.0%	6.6%	9.6%	2.8%	5.5%	8.6%	1.6%	4.2%	7.0%	0.2%	3.1%	5.9%
F3 - Drinking alcohol	-30.7%	-26.9%	-23.6%	-25.4%	-21.0%	-16.9%	-26.0%	-22.1%	-18.3%	-27.9%	-23.4%	-19.0%	-28.9%	-24.5%	-20.4%
G1 - Children	-3.7%	-2.2%	-0.5%	1.0%	3.8%	6.7%	2.0%	5.0%	8.0%	-4.1%	-2.4%	-0.5%	-5.2%	-3.4%	-1.5%
G2 - Teenagers	-6.4%	-4.2%	-2.2%	1.2%	4.0%	7.3%	-6.0%	-3.4%	-0.8%	-4.1%	-2.0%	-0.1%	-9.8%	-7.7%	-4.7%
G3 - Adults	-4.0%	-2.3%	-0.9%	1.1%	2.9%	4.4%	-2.6%	0.0%	2.8%	-5.0%	-2.8%	-0.9%	-7.9%	-4.2%	-1.0%
Attribute	Primary school boy (carers' views)			Secondary school boy (carers' views)			Primary school girl (carers' views)			Secondary school girl (carers' views)					
	CI [LL]	mean	CI [UL]	CI [LL]	mean	CI [UL]	CI [LL]	mean	CI [UL]	CI [LL]	mean	CI [UL]			
B1 - Well-kept footpaths	24.0%	27.0%	29.9%	24.6%	27.6%	30.8%	20.2%	23.0%	25.8%	20.9%	23.6%	26.7%			
C1 - Trees and grass	5.0%	8.0%	11.5%	4.1%	7.3%	10.6%	0.7%	4.0%	7.2%	1.3%	5.3%	8.6%			
C2 - Trees	5.6%	8.4%	11.2%	4.7%	7.6%	10.3%	3.1%	5.9%	8.8%	2.2%	5.1%	8.0%			
C3 - Grass	1.4%	4.8%	7.8%	-1.0%	2.0%	4.6%	-2.7%	0.4%	3.2%	-4.8%	-2.6%	-1.0%			
D1 - Playground	1.0%	4.0%	6.9%	0.1%	3.2%	5.7%	-1.3%	1.5%	4.4%	-3.8%	-2.3%	-0.8%			
D2 - Bus stop	1.0%	4.0%	7.0%	1.3%	4.2%	7.4%	-3.7%	-1.8%	-0.2%	-4.1%	-2.3%	-0.7%			
D3 - Bus stop and playground	8.0%	11.3%	14.8%	7.4%	10.6%	14.0%	4.5%	7.4%	10.9%	3.8%	6.6%	10.1%			
F1 - Chatting	2.1%	5.2%	8.3%	0.6%	3.7%	6.7%	-2.6%	0.5%	3.4%	-3.6%	-2.0%	-0.6%			
F2 - Walking	2.0%	4.6%	7.2%	1.1%	3.6%	6.1%	1.0%	3.3%	5.7%	-4.2%	-2.5%	-1.1%			
F3 - Drinking alcohol	-26.9%	-23.5%	-20.1%	-27.9%	-24.5%	-20.9%	-28.8%	-25.4%	-21.8%	-29.9%	-26.4%	-22.8%			
G1 - Children	1.7%	5.0%	9.4%	0.4%	3.7%	7.8%	-7.1%	-4.6%	-1.9%	-8.1%	-5.6%	-2.9%			
G2 - Teenagers	-2.9%	-0.3%	2.9%	-3.0%	-1.5%	-0.1%	-10.3%	-7.1%	-3.5%	-12.8%	-9.6%	-6.4%			
G3 - Adults	-3.4%	-0.1%	3.4%	-3.5%	-1.9%	-0.3%	-10.9%	-6.4%	-2.3%	-11.7%	-7.4%	-3.3%			

Note: not significant attributes
(95% confidence) are in grey.
¹ Confidence interval lower limit
² Confidence interval upper limit

Table 7.13. GC-Link model average marginal effects (continued).

Attribute	Primary school			Secondary school			Primary school (carers' views)			Secondary school (carers' views)		
	CI [LL]	mean	CI [UL]	CI [LL]	mean	CI [UL]	CI [LL]	mean	CI [UL]	CI [LL]	mean	CI [UL]
B1 - Well-kept footpaths	24.9%	27.4%	29.9%	25.1%	27.5%	30.2%	22.4%	25.3%	28.0%	23.0%	26.0%	29.0%
C1 - Trees and grass	5.0%	8.1%	11.2%	4.4%	7.4%	10.6%	2.7%	5.7%	8.9%	1.9%	5.2%	8.3%
C2 - Trees	5.6%	8.3%	10.9%	4.6%	7.6%	10.5%	3.8%	6.6%	9.4%	3.2%	6.1%	8.9%
C3 - Grass	0.3%	3.3%	5.8%	0.7%	3.7%	6.3%	-1.8%	1.1%	3.8%	-2.3%	0.5%	3.2%
D1 - Playground	1.0%	4.0%	6.7%	0.7%	3.7%	6.6%	0.3%	3.5%	6.1%	-1.5%	1.6%	4.3%
D2 - Bus stop	0.0%	2.9%	6.4%	0.8%	3.9%	6.6%	-2.9%	0.4%	3.0%	-2.1%	1.3%	4.3%
D3 - Bus stop and playground	8.7%	11.7%	14.7%	8.6%	11.4%	14.2%	6.1%	9.1%	12.2%	5.5%	8.5%	11.7%
F1 - Chatting	1.6%	4.2%	6.9%	-1.5%	1.2%	3.9%	0.2%	3.1%	6.2%	-2.3%	0.5%	3.3%
F2 - Walking	2.3%	4.8%	7.7%	1.1%	3.9%	6.8%	0.3%	2.8%	5.5%	0.4%	2.9%	5.2%
F3 - Drinking alcohol	-27.3%	-22.8%	-18.7%	-27.9%	-23.8%	-20.0%	-28.3%	-25.0%	-21.5%	-29.1%	-25.8%	-22.3%
G1 - Children	1.1%	4.3%	7.0%	-3.9%	-2.2%	-0.6%	-5.2%	-3.2%	-1.3%	-5.8%	-4.0%	-2.2%
G2 - Teenagers	-3.1%	-0.2%	2.9%	-8.1%	-5.5%	-2.9%	-6.4%	-4.1%	-1.6%	-9.1%	-6.4%	-4.0%
G3 - Adults	-3.1%	-1.4%	0.0%	-3.7%	-2.2%	-1.0%	-7.6%	-3.8%	-0.7%	-8.4%	-4.6%	-1.5%

Source: Author's own

Table 7.14. GC-Link model average marginal effects for London data.

Attribute	General			Primary school boy			Secondary school boy			Primary school girl			Secondary school girl		
	CI [LL] ¹	mean	CI [UL] ²	CI [LL]	mean	CI [UL]	CI [LL]	mean	CI [UL]	CI [LL]	mean	CI [UL]	CI [LL]	mean	CI [UL]
B1 - Well-kept footpaths	27.3%	29.7%	32.6%	29.0%	32.2%	35.0%	29.4%	32.5%	35.6%	24.7%	27.4%	30.3%	24.8%	27.4%	30.2%
C1 - Trees and grass	4.7%	7.6%	10.6%	8.0%	11.7%	15.2%	7.5%	11.2%	14.9%	3.2%	6.9%	9.9%	2.3%	6.0%	8.8%
C2 - Trees	5.9%	8.7%	11.3%	7.6%	10.5%	13.4%	6.9%	10.0%	12.9%	5.4%	8.8%	11.6%	5.0%	8.1%	11.2%
C3 - Grass	0.4%	3.4%	6.0%	1.9%	5.4%	8.0%	1.4%	4.8%	7.4%	0.1%	3.4%	6.1%	1.5%	4.8%	7.6%
D1 - Playground	1.5%	4.4%	7.2%	3.1%	6.2%	8.9%	3.0%	6.0%	9.0%	1.2%	4.3%	7.2%	0.9%	3.9%	6.6%
D2 - Bus stop	0.3%	3.3%	5.8%	0.3%	5.0%	10.7%	2.8%	6.2%	9.0%	-7.0%	-1.9%	4.0%	0.7%	4.2%	6.6%
D3 - Bus stop and playground	8.2%	10.7%	13.5%	11.4%	15.2%	19.4%	11.3%	15.1%	18.9%	7.6%	10.5%	13.3%	7.7%	10.1%	13.3%
F1 - Chatting	1.6%	4.2%	7.0%	1.6%	4.5%	7.6%	0.8%	3.7%	6.5%	3.5%	6.2%	9.2%	1.0%	3.7%	6.6%
F2 - Walking	2.4%	4.8%	7.5%	4.6%	7.3%	10.3%	3.9%	6.4%	9.4%	2.3%	5.3%	8.3%	1.5%	4.2%	7.2%
F3 - Drinking alcohol	-28.1%	-24.3%	-20.3%	-20.5%	-14.8%	-8.9%	-21.6%	-16.1%	-10.5%	-23.3%	-17.2%	-11.2%	-24.5%	-18.5%	-12.8%
G1 - Children	1.0%	4.2%	6.8%	1.6%	4.5%	7.5%	0.4%	3.4%	6.4%	1.1%	5.1%	7.9%	-4.4%	-2.5%	-0.6%
G2 - Teenegers	-5.6%	-3.5%	-1.3%	1.9%	6.4%	11.1%	-5.4%	-2.8%	-0.2%	0.1%	5.2%	11.0%	-9.4%	-7.0%	-4.3%
G3 - Adults	-3.5%	0.7%	3.2%	0.5%	3.7%	6.5%	1.6%	5.2%	8.0%	-4.7%	-0.2%	3.4%	-3.9%	-1.8%	-0.1%

Attribute	Primary school boy (carers' views)			Secondary school boy (carers' views)			Primary school girl (carers' views)			Secondary school girl (carers' views)		
	CI [LL]	mean	CI [UL]	CI [LL]	mean	CI [UL]	CI [LL]	mean	CI [UL]	CI [LL]	mean	CI [UL]
B1 - Well-kept footpaths	25.0%	28.1%	31.0%	25.7%	28.8%	32.0%	21.7%	24.7%	27.8%	22.3%	25.3%	28.5%
C1 - Trees and grass	5.9%	8.8%	12.0%	5.0%	8.1%	11.2%	2.0%	5.2%	8.6%	0.9%	4.5%	7.5%
C2 - Trees	6.4%	9.1%	11.9%	5.3%	8.4%	11.2%	4.3%	7.2%	10.3%	3.3%	6.4%	9.4%
C3 - Grass	2.5%	6.0%	9.4%	0.9%	4.3%	7.6%	-2.7%	0.7%	3.9%	-3.6%	-0.2%	2.9%
D1 - Playground	1.7%	4.8%	7.7%	0.9%	4.0%	6.5%	1.6%	4.8%	7.7%	0.1%	3.2%	6.1%
D2 - Bus stop	1.1%	4.9%	8.6%	0.1%	3.7%	6.5%	-4.1%	-0.5%	3.0%	-1.9%	1.6%	4.1%
D3 - Bus stop and playground	8.6%	11.8%	15.1%	7.9%	11.2%	14.5%	5.6%	8.4%	12.1%	4.7%	7.6%	11.2%
F1 - Chatting	0.9%	3.8%	6.9%	0.2%	3.1%	5.9%	1.4%	4.4%	7.5%	-2.1%	1.0%	4.2%
F2 - Walking	2.7%	5.5%	8.2%	1.9%	4.5%	7.2%	0.7%	3.4%	6.0%	1.3%	4.1%	6.7%
F3 - Drinking alcohol	-24.1%	-20.1%	-16.2%	-25.1%	-21.2%	-17.5%	-26.1%	-22.2%	-18.0%	-27.2%	-23.2%	-19.3%
G1 - Children	0.6%	3.6%	7.4%	2.2%	5.6%	10.0%	-6.0%	-3.5%	-0.9%	-7.0%	-4.4%	-2.1%
G2 - Teenegers	2.2%	5.0%	8.8%	-4.2%	-1.2%	1.8%	-6.8%	-3.2%	0.8%	-10.9%	-7.7%	-4.2%
G3 - Adults	0.1%	4.7%	8.5%	0.2%	5.5%	9.8%	-7.5%	-1.3%	3.3%	-7.0%	-3.4%	-0.6%

Note: not significant attributes (95% confidence) are in grey.
¹ Confidence interval lower limit
² Confidence interval upper limit

Table 7.15. GC-Link model average marginal effects for Santiago data.

Attribute	General			Primary school boy			Secondary school boy			Primary school girl			Secondary school girl		
	CI [LL] ¹	mean	CI [UL] ²	CI [LL]	mean	CI [UL]	CI [LL]	mean	CI [UL]	CI [LL]	mean	CI [UL]	CI [LL]	mean	CI [UL]
B1 - Well-kept footpaths	23.6%	26.5%	29.5%	28.1%	32.4%	36.4%	28.7%	33.0%	37.2%	19.8%	22.9%	25.6%	20.2%	23.2%	26.3%
C1 - Trees and grass	2.7%	6.6%	11.5%	2.4%	8.6%	14.3%	2.8%	9.3%	15.5%	-7.6%	-4.8%	-1.4%	-7.6%	-4.7%	-1.2%
C2 - Trees	2.8%	5.7%	8.9%	4.9%	7.6%	10.5%	5.3%	8.1%	11.1%	1.2%	4.2%	7.5%	1.5%	4.7%	8.0%
C3 - Grass	0.8%	3.6%	7.0%	5.6%	8.6%	11.7%	5.1%	8.1%	11.3%	0.0%	3.3%	6.7%	-3.5%	-0.4%	2.8%
D1 - Playground	1.8%	4.6%	7.7%	1.3%	4.1%	6.8%	1.7%	4.6%	7.4%	1.2%	4.2%	7.2%	0.5%	3.6%	7.1%
D2 - Bus stop	1.6%	4.3%	6.9%	4.2%	7.3%	10.8%	1.1%	4.6%	7.6%	-5.1%	-3.2%	-0.4%	1.2%	4.2%	7.2%
D3 - Bus stop and playground	6.2%	9.0%	12.5%	9.7%	14.8%	19.8%	10.6%	16.1%	21.0%	3.5%	6.2%	9.5%	4.2%	7.1%	10.3%
F1 - Chatting	0.9%	3.9%	7.2%	5.8%	8.5%	11.6%	0.2%	3.2%	6.4%	0.2%	3.3%	6.4%	-4.4%	-2.3%	-0.2%
F2 - Walking	2.2%	5.1%	7.9%	1.9%	5.2%	8.1%	2.4%	5.8%	8.8%	2.2%	5.5%	8.9%	1.6%	5.0%	8.2%
F3 - Drinking alcohol	-29.8%	-26.5%	-22.8%	-23.9%	-20.8%	-17.5%	-24.0%	-20.8%	-17.3%	-29.4%	-24.8%	-20.9%	-29.5%	-24.9%	-20.7%
G1 - Children	-7.0%	-4.4%	-1.9%	4.9%	7.9%	12.1%	4.4%	7.5%	12.0%	-8.7%	-5.9%	-2.9%	-9.0%	-6.0%	-3.0%
G2 - Teenegers	-2.6%	0.8%	4.1%	2.7%	6.5%	10.3%	0.4%	3.6%	6.9%	-5.8%	-3.2%	-0.9%	-8.1%	-4.1%	-0.4%
G3 - Adults	-7.0%	-4.7%	-1.9%	2.6%	5.8%	8.9%	1.6%	5.4%	8.6%	-10.8%	-5.9%	-1.1%	-10.8%	-6.0%	-0.9%

Attribute	Primary school boy (carers' views)			Secondary school boy (carers' views)			Primary school girl (carers' views)			Secondary school girl (carers' views)		
	CI [LL]	mean	CI [UL]	CI [LL]	mean	CI [UL]	CI [LL]	mean	CI [UL]	CI [LL]	mean	CI [UL]
B1 - Well-kept footpaths	24.7%	28.3%	32.0%	25.0%	28.7%	32.4%	18.3%	21.6%	25.4%	18.4%	21.8%	25.5%
C1 - Trees and grass	6.1%	10.6%	16.2%	0.2%	4.6%	10.0%	-9.9%	-6.5%	-2.4%	-9.9%	-6.4%	-2.3%
C2 - Trees	3.1%	6.4%	9.9%	3.3%	6.7%	10.2%	1.7%	5.3%	9.0%	1.2%	4.9%	8.7%
C3 - Grass	2.5%	5.8%	9.3%	2.2%	5.6%	9.2%	-8.0%	-4.7%	-1.4%	-7.9%	-4.6%	-1.2%
D1 - Playground	3.1%	6.3%	9.6%	2.9%	6.1%	9.5%	-6.4%	-4.1%	-1.2%	-6.4%	-4.0%	-1.0%
D2 - Bus stop	2.0%	5.3%	8.3%	3.4%	6.4%	10.0%	-7.1%	-4.7%	-1.9%	-6.5%	-4.0%	-1.3%
D3 - Bus stop and playground	6.2%	10.1%	14.2%	6.9%	10.8%	15.0%	0.7%	3.9%	7.7%	1.2%	4.4%	8.2%
F1 - Chatting	0.9%	4.6%	8.0%	1.1%	5.0%	8.4%	-5.3%	-3.0%	-0.2%	-5.2%	-2.8%	-0.1%
F2 - Walking	4.5%	7.6%	10.0%	0.3%	3.3%	5.9%	-7.1%	-4.6%	-2.3%	-7.0%	-4.4%	-2.0%
F3 - Drinking alcohol	-24.7%	-21.3%	-17.1%	-24.6%	-21.2%	-16.9%	-29.3%	-24.6%	-20.0%	-29.3%	-24.5%	-19.8%
G1 - Children	-5.2%	0.3%	7.1%	-5.3%	0.4%	7.5%	-15.0%	-9.2%	-1.2%	-15.2%	-9.3%	-1.2%
G2 - Teenegers	0.9%	6.0%	10.8%	-1.7%	2.8%	7.2%	-14.1%	-8.2%	-2.9%	-15.9%	-10.1%	-4.5%
G3 - Adults	-5.8%	-2.9%	-0.1%	-6.8%	-1.6%	3.2%	-20.4%	-13.5%	-6.4%	-20.6%	-13.7%	-6.5%

Note: not significant attributes (95% confidence) are in grey.
¹ Confidence interval lower limit
² Confidence interval upper limit

The attribute a *bus stop* has a positive effect that ranges between 4% and 5.2% for boys, carers of boys and secondary school girls. It has a negative effect for carers of primary and secondary school girls by -1.8% and -2.3%, respectively. The impact of this attribute on school girls is not significant. In London, the results follow a similar trend. The attribute increases the probabilities of boys, carers of boys and secondary school girls between 3.7% and 6.2%. The presence of a *bus stop* is not significant for carers of girls and primary school girls. In the case of Santiago, the attribute a *bus stop* increases the probabilities between 4.2% and 7.3% among boys, carers of boys, and secondary school girls. However, the probabilities decrease by -3.2% for primary school girls and between -4.7% and -4% for carers of primary and secondary school girls, respectively.

The last urban facilities attribute, *a bus stop and a playground*, increase the probabilities of choosing a street for all groups. The smallest increase is observed among girls and carers of girls (6.6% - 9.6%), and the greatest increases emerge among boys and carers of boys (10.6% - 14.8%). The effects of this attribute follow a similar pattern for Santiago and London. In London, the increase in the probability for girls and carers of girls range from 7.6% to 10.5%, and from 11.2% to 15.2% for boys and carers of boys. In Santiago, the effect of *a bus stop and a playground* on the probabilities of girls and carers of girls is smaller than in London (between 3.9% and 7.1%). The impacts of the attribute also show a wider range among boys and carers of boys (between 10.1% and 16.1%).

The attribute that describes strangers' activities *chatting* increases the probabilities between 3.3% and 4.3% for primary school children and carers of secondary school boys. This attribute has a greater effect on carers of primary school boys (5.2%). The only negative effect is observed among carers of secondary school girls (-2%). This attribute is not significant for carers of primary school girls and secondary school girls. In London, the effect of this attribute on all groups is positive and ranges between 3.1% and 6.2%. The least relevant effect is observed among carers of secondary school boys, and the greatest among primary school girls. The impact of strangers chatting on carers of secondary school girls is not significant. In contrast, in Santiago, this attribute increases the probabilities by between 3.2% and 8.5%. *Chatting* has the smallest impact on primary school boys, and the greatest on primary school boys. The negative effect of the attribute decreases the probabilities for secondary school girls (-2.3%) and carers of girls in primary (-3%) and secondary school (-2.8%).

The attribute *strangers walking* increases the probabilities between 3.1% and 6.6%, the smallest increase is observed among carers of primary school girls and secondary school girls (3.1%-3.3%), and the greatest among boys in primary and secondary school (5.5%-6.6%). The only negative effect (-2.5%) is observed among carers of secondary school girls. In London, this attribute increases the probabilities among all groups; having the smallest impact on carers of girls (3.4%-4.1%) and the greatest on boys (6.4%-7.3%). Results in Santiago for *strangers walking* are mixed. The increase in probabilities ranges between 3.3% and 7.6%, having the smallest effect on carers of secondary school boys, and greatest on carers of primary school boys. By contrast, the attribute decreases the probabilities among carers of girls in primary (-4.6%) and secondary school (-4.4%).

The attribute *strangers drinking alcohol* decreases the probabilities for all groups by between -21% and -26.4%; having the most significant negative effect on carers of girls. Similarly, in London, this attribute decreases the probabilities of all groups but in different proportions. Between -14.8% and -18.5 among children and between -20.1% and -23.2% among carers. In Santiago, the changes in the probabilities caused by the attribute *strangers drinking alcohol* exhibits clear gendered patterns. It decreases the probabilities of boys and their carers between -20.8% and -21.3% and the probabilities of girls and their carers between -24.6% and -24.9%.

The impacts of the attribute *other children* on the footpath increases the probabilities of boys and their carers, between 3.7% and 5%, and decreases the probabilities of girls and their carers, between -2.4% and -5.6%. In London, the impacts of this attribute range between 3.4% and 5.6% among boys and their carers, and between -2.5% and -4.4% among girls and their carers. The only exception are primary school girls; among them the attribute increases the probabilities by 5.1%. In Santiago, the results follow a similar pattern as the attribute *other children* increase the probability of boys in primary school by 7.9% and those in secondary school by 7.5%. This attribute is not significant for carers of boys; yet it decreases the probabilities between -5.9% and -9.3% for girls and their carers.

The attribute *teenagers* causes a decrease in the probabilities of all groups with the exception of primary school boys (4%). The smallest negative impact appears among primary school girls (-2%) and carers of secondary school boys (-1.5%). The greatest decrease in the probabilities is observed among secondary school girls (-7.7%) and their carers (-9.6%). In London, the attribute *teenagers* increase the probabilities between 5% and 6.4% for primary school children and their carers, and decreases the probabilities

between -2.8% and -7.7% for secondary school children and their carers. The results are not significant for carers of primary school girls and carers of secondary school boys. In the case of Santiago, results show gender-related differences. The attribute *teenagers* increases the probability of boys and their carers between 3.6% and 6.5%, but it decreases the probabilities of girls and their carers between -3.2% and -10.1%. Results for carers of secondary school boys are not significant.

The last attribute in this group, *adults*, has a negative effect on the probabilities of all groups. The only exception are primary school boys as their probabilities increase by 2.9%. *Adults* decrease the probabilities of all the rest of the groups between -1.9% and -7.4%. The least significant decrease is observed among carers of secondary school boys and the greatest among carers of secondary school girls. The results indicate that this attribute is not significant for secondary school boys and carers of primary school boys. In London, *adults* have different impacts when the gender of the child is considered. It increases the probabilities for boys and their carers (between 3.7% and 5.5%) and reduces the probabilities of secondary school girls (-1.8%) and their carers (-3.4%).

The attribute is not significant for primary school girls and their carers. In Santiago, the attribute *adults* has a negative effect on the probabilities of most groups, but increases the probabilities of primary and secondary school boys by 5.8% and 5.4%, respectively. This attribute causes the smallest decrease in the probabilities of carers of primary school boys (-2.9%) and has the most significant negative effect on carers of girls in primary (-13.5%) and secondary school (-13.7%). The results show that the attribute is not significant for carers of secondary school boys.

GC-Junction average marginal effects

The overall results for the model **GC-Junction** are shown in Table 7.16. The average marginal effect results are further divided into the London (LON) database in Table 7.17 and the Santiago (SCL) database in Table 7.18, to cover the particular effects of the attributes on the groups living in those cities.

The average marginal effects results do not show differences according to the gender of the child. However, when considering the child's age, the data show differences between primary and secondary school children.

Zebra crossings is the attribute that increases the probability of a crossing the most, by 45.8% for both cities, 41.5% for London and 42.5% for Santiago.

The attribute *one-way traffic* increases the chances of choosing a crossing by 14.9% for both cities, 13.2% for London and 14.6% for Santiago. The last attribute, *car traffic only*, also increases the probabilities, but in a smaller proportion; 10.8% for both cities, 7.5% for London and 9.2% for Santiago.

In more detail, the attribute *zebra crossings* increases the probabilities of all groups. It has the smallest impact on carers of primary school children (39.5%), and the greatest on carers of secondary school children (46.7%). London displays a similar pattern; this attribute has the least significant impact on the probability of carers of primary school children (33.3%) and the greatest on carers of secondary school children (44.2%). In Santiago, *zebra crossings* have the smallest impact on carers of primary school children (31.3%) and the greatest on secondary school children (44.7%).

The attribute *one-way traffic* decreases the probabilities of carers of primary school children (-3.8%), and increases the probabilities of secondary school children (19.7%) and their carers (20.1%). The impact of this attribute on primary school children is not significant. London exhibits similar results as this attribute causes a decrease in the probabilities of -5% among carers of primary school children. However, in this case, the impact of the attribute for primary school children is positive and increases the probabilities by 7.7%. The attribute *one-way traffic* increases the probabilities for secondary school children and their carers by 18% and 18.6%, respectively. In Santiago, results diverge when the age of the child is considered. The impacts of this attribute on primary school children and their carers is negative, decreasing the probabilities by -5% and -5.7% respectively, yet it affects positively secondary school children and their carers, increasing the probabilities by 19.8% and 19.6%, respectively.

The last attribute, *car traffic only*, has a negative effect (-4.8%) on carers of primary school children, and a positive effect on secondary school children (14.9%) and their carers (15.6%). This attribute is not significant for primary school children. In London, *car traffic only* has a negative impact on carers of primary school children (-5.1%) and positive for the rest; it has the smallest increase in the probability for primary school children (4.8%). It also causes an increase in the probabilities of secondary school children (12.7%) and their carers (12.9%). In Santiago, differences emerge when the child's age is considered. The attribute decreases the probabilities of primary school children and increase the probabilities of older ones. *Car traffic only* also decreases the probabilities of young children (-5.2%) and their carers (-7.3%). Conversely, the attribute increases the probabilities of secondary school children (11.9%) and their carers (12.9%).

Table 7.16. GC-Junction model average marginal effects.

Attribute	General			Primary school boy			Secondary school boy			Primary school girl			Secondary school girl		
	CI [LL] ¹	mean	CI [UL] ²	CI [LL]	mean	CI [UL]	CI [LL]	mean	CI [UL]	CI [LL]	mean	CI [UL]	CI [LL]	mean	CI [UL]
J1 - Zebra crossing	41.0%	45.8%	49.9%	36.6%	41.5%	46.5%	41.6%	46.5%	50.8%	36.6%	41.5%	46.5%	41.6%	46.5%	50.8%
L1 - One-way traffic	10.8%	14.9%	18.3%	-0.2%	1.7%	3.4%	14.5%	19.7%	24.1%	-0.2%	1.7%	3.4%	14.5%	19.7%	24.1%
M1 - Car traffic only	7.2%	10.8%	13.9%	-5.7%	-1.5%	2.1%	10.8%	14.9%	18.2%	-5.7%	-1.5%	2.1%	10.8%	14.9%	18.2%

Attribute	Primary school boy (carers' views)			Secondary school boy (carers' views)			Primary school girl (carers' views)			Secondary school girl (carers' views)		
	CI [LL]	mean	CI [UL]	CI [LL]	mean	CI [UL]	CI [LL]	mean	CI [UL]	CI [LL]	mean	CI [UL]
J1 - Zebra crossing	34.5%	39.5%	43.9%	41.6%	46.7%	50.8%	34.5%	39.5%	43.9%	41.6%	46.7%	50.8%
L1 - One-way traffic	-8.4%	-3.8%	0.0%	15.0%	20.1%	24.7%	-8.4%	-3.8%	0.0%	15.0%	20.1%	24.7%
M1 - Car traffic only	-8.6%	-4.8%	-0.8%	11.2%	15.6%	18.8%	-8.6%	-4.8%	-0.8%	11.2%	15.6%	18.8%

Attribute	Primary school			Secondary school			Primary school (carers' views)			Secondary school (carers' views)		
	CI [LL]	mean	CI [UL]	CI [LL]	mean	CI [UL]	CI [LL]	mean	CI [UL]	CI [LL]	mean	CI [UL]
J1 - Zebra crossing	36.6%	41.5%	46.5%	41.6%	46.5%	50.8%	34.5%	39.5%	43.9%	41.6%	46.7%	50.8%
L1 - One-way traffic	-0.2%	1.7%	3.4%	14.5%	19.7%	24.1%	-8.4%	-3.8%	0.0%	15.0%	20.1%	24.7%
M1 - Car traffic only	-5.7%	-1.5%	2.1%	10.8%	14.9%	18.2%	-8.6%	-4.8%	-0.8%	11.2%	15.6%	18.8%

Source: author's own

Table 7.17. GC-Junction model average marginal effects for London data.

Attribute	General			Primary school boy			Secondary school boy			Primary school girl			Secondary school girl		
	CI [LL] ¹	mean	CI [UL] ²	CI [LL]	mean	CI [UL]	CI [LL]	mean	CI [UL]	CI [LL]	mean	CI [UL]	CI [LL]	mean	CI [UL]
J1 - Zebra crossing	38.5%	41.5%	45.1%	33.0%	37.0%	41.5%	40.8%	43.8%	47.3%	33.0%	37.0%	41.5%	40.8%	43.8%	47.3%
L1 - One-way traffic	9.7%	13.2%	16.1%	3.7%	7.7%	12.2%	14.8%	18.6%	22.0%	3.7%	7.7%	12.2%	14.8%	18.6%	22.0%
M1 - Car traffic only	4.9%	7.5%	10.0%	1.7%	4.8%	8.4%	9.0%	12.7%	16.0%	1.7%	4.8%	8.4%	9.0%	12.7%	16.0%

Attribute	Primary school boy (carers' views)			Secondary school boy (carers' views)			Primary school girl (carers' views)			Secondary school girl (carers' views)		
	CI [LL]	mean	CI [UL]	CI [LL]	mean	CI [UL]	CI [LL]	mean	CI [UL]	CI [LL]	mean	CI [UL]
J1 - Zebra crossing	28.4%	33.3%	38.2%	40.7%	44.2%	47.6%	28.4%	33.3%	38.2%	40.7%	44.2%	47.6%
L1 - One-way traffic	-8.4%	-5.0%	-0.8%	14.3%	18.0%	21.3%	-8.4%	-5.0%	-0.8%	14.3%	18.0%	21.3%
M1 - Car traffic only	-8.0%	-5.1%	-1.2%	9.2%	12.9%	16.7%	-8.0%	-5.1%	-1.2%	9.2%	12.9%	16.7%

Table 7.18. GC-Junction model average marginal effects for Santiago data.

Attribute	General			Primary school boy			Secondary school boy			Primary school girl			Secondary school girl		
	CI [LL] ¹	mean	CI [UL] ²	CI [LL]	mean	CI [UL]	CI [LL]	mean	CI [UL]	CI [LL]	mean	CI [UL]	CI [LL]	mean	CI [UL]
J1 - Zebra crossing	38.9%	42.5%	45.5%	28.9%	35.1%	40.4%	41.0%	44.7%	48.0%	28.9%	35.1%	40.4%	41.0%	44.7%	48.0%
L1 - One-way traffic	11.2%	14.6%	17.5%	-8.0%	-5.0%	-1.8%	16.2%	19.8%	23.8%	-8.0%	-5.0%	-1.8%	16.2%	19.8%	23.8%
M1 - Car traffic only	6.4%	9.2%	12.3%	-9.0%	-5.2%	-1.2%	8.4%	11.9%	15.6%	-9.0%	-5.2%	-1.2%	8.4%	11.9%	15.6%

Attribute	Primary school boy (carers' views)			Secondary school boy (carers' views)			Primary school girl (carers' views)			Secondary school girl (carers' views)		
	CI [LL]	mean	CI [UL]	CI [LL]	mean	CI [UL]	CI [LL]	mean	CI [UL]	CI [LL]	mean	CI [UL]
J1 - Zebra crossing	25.5%	31.3%	37.0%	40.8%	44.6%	48.0%	25.5%	31.3%	37.0%	40.8%	44.6%	48.0%
L1 - One-way traffic	-9.7%	-5.7%	-1.9%	15.9%	19.6%	23.5%	-9.7%	-5.7%	-1.9%	15.9%	19.6%	23.5%
M1 - Car traffic only	-11.5%	-7.3%	-2.6%	9.2%	12.9%	16.5%	-11.5%	-7.3%	-2.6%	9.2%	12.9%	16.5%

Source: author's own

Model predictions

Using the above results, it is possible to reproduce the choice tasks shown to respondents and estimate the choice probabilities that they faced (see Chapter 4.2.1). For instance, in the generic city link choice task depicted in Figure 7.1, for a secondary school girl from London, she will have an estimated probability of $P_{StA} = 23.1\%$ of choosing street A, $P_{StB} = 72.0\%$ of choosing street B, and $P_N = 4.9\%$ of not choosing any street to walk unaccompanied. In comparison, the probabilities for the same alternatives averaged for the whole sample are $E(P_{StA}) = 25.7\%$, $E(P_{StB}) = 66.2\%$ and $E(P_N) = 8.1\%$. Those probabilities were obtained from the MMNL GC-Link of model after 100 simulation runs of the random error structure to obtain the estimated probabilities which are later averaged.

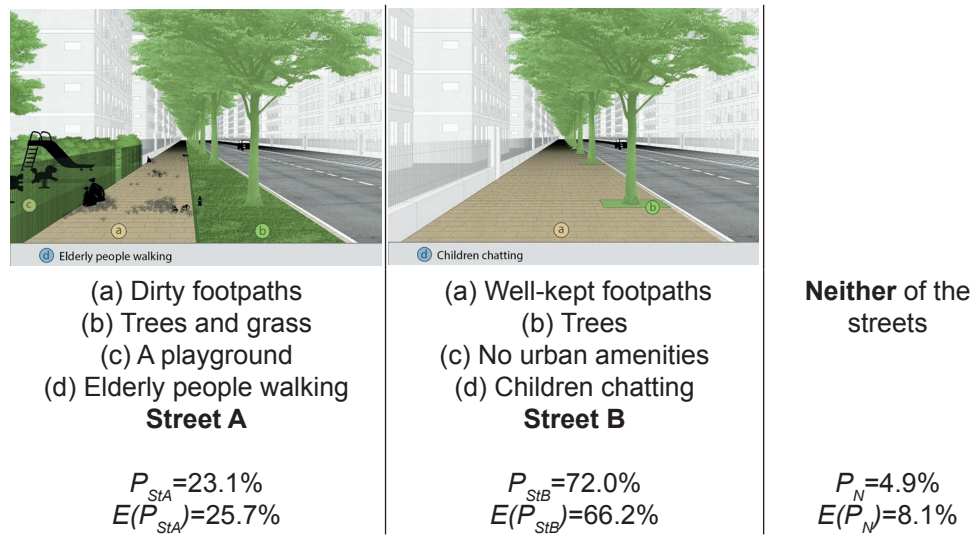


Figure 7.1. Probabilities for choosing a street while unaccompanied for a secondary school girl in London using the GC-Link model.

Source: author's own

In the case of the MMNL GC-Junction model, the participant of the previous example has an estimated probability of $P_{CxA} = 56.4\%$ of crossing A, $P_{CxB} = 43.1\%$ of crossing B, and $P_N = 0.5\%$ of not choosing any alternative to cross unaccompanied. The previous probabilities for Crossings A and B are different to the averaged probabilities for the whole sample and are $E(P_{CxA}) = 71.6\%$, $E(P_{CxB}) = 20\%$ and $E(P_N) = 8.4\%$. This scenario is shown in Figure 7.2 and also required the simulation of the probabilities (100 runs). As described earlier, those probabilities were later averaged.

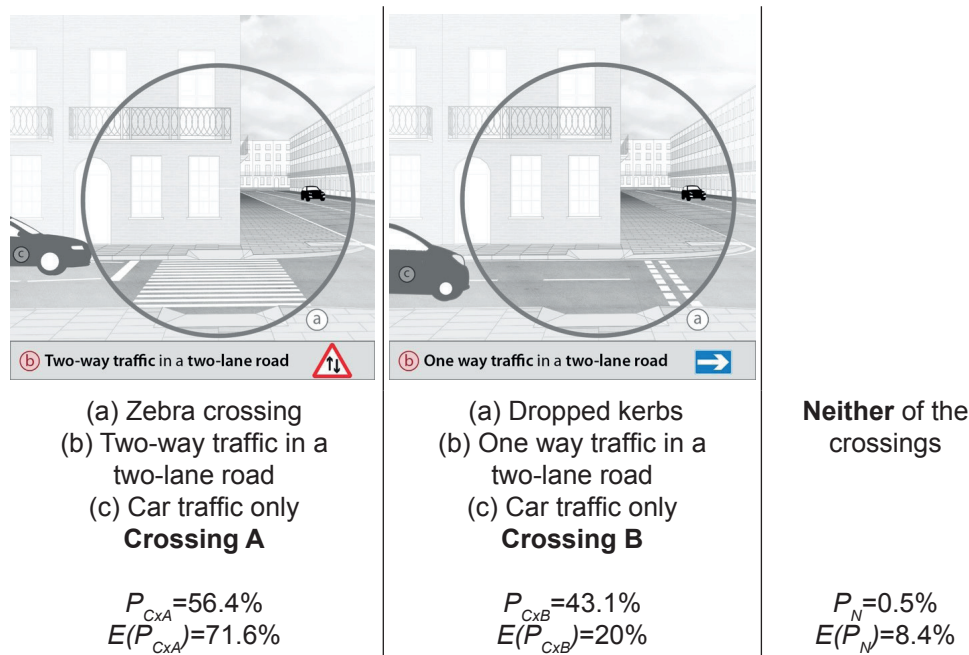


Figure 7.2. Probabilities for choosing a crossing while unaccompanied for a secondary school girl in London using the GC-Junction model.

Source: author's own

The first preference recovery (FPR) is the number of times the model correctly predicted the alternative chosen by an individual in the sample. It is compared with the CR (chance recovery or the probabilities obtained "by chance") and $E(FPR)$ (the expected first preference recovery), which is the sum of the average highest alternatives of each individual (see Chapter 4.2.1).

The FPR, CR and $E(FPR)$ for all models is shown in Table 7.19. For instance, the GC-Link model has FPR of 0.620, the model correctly predicted 62% of the choices in the sample. The CR for the model is 0.333 and the recovery $E(FPR)$ is 0.622, meaning that the model is *reasonable and informative*. As all other models have a $FPR \approx E(FPR)$, which are also larger than CR, all models are *reasonable and informative*.

Table 7.19. FPR, CR and $E(FPR)$ values for LON1, LON2, SCL1, SCL2, GC-Link and GC-Junction models.

Model	FPR	CR	E(FPR)
LON1	0.740	0.333	0.723
LON2	0.615	0.333	0.595
SCL1	0.638	0.333	0.644
SCL2	0.706	0.333	0.697
GC-Link	0.620	0.333	0.622
GC-Junction	0.691	0.333	0.687

Source: author's own

7. 2. Verification task

The verification stage of the questionnaire asked participants about their willingness to choose between: (i) a hypothetical scenario that combines a street link and a street junction as part of a travel route, or (ii) not choosing that route (see Chapter 4.2.2, questionnaire section F3). The hypothetical routes are generated based on the participant's choices of street links and street junction scenarios in the stated preference tasks (see Chapter 4.2.2, questionnaire section F1 and F2). The results of this exercise, divided by city, are shown in Table 7.20.

Table 7.20. Summary of the preferences of choosing a route.

Participant	Child gender	School level	Yes - will use that route	No - will not use that route	Don't know
London					
Carer	boy	Primary	68.1%	28.6%	3.3%
		Secondary	82.4%	14.8%	2.8%
	girl	Primary	60.0%	32.0%	8.0%
		Secondary	68.1%	18.7%	13.2%
	prefer not to say	Primary	25.0%	75.0%	0.0%
Average			71.2%	22.6%	6.2%
Child	boy	Primary	73.9%	20.5%	5.7%
		Secondary	86.0%	9.8%	4.2%
	girl	Primary	65.9%	26.8%	7.3%
		Secondary	79.6%	11.8%	8.6%
	prefer not to say	Primary	100.0%	0.0%	0.0%
Average			77.9%	15.9%	6.1%
Santiago					
Carer	boy	Primary	54.8%	35.7%	9.5%
		Secondary	75.2%	17.1%	7.6%
	girl	Primary	48.4%	37.1%	14.5%
		Secondary	66.3%	20.0%	13.7%
Average			63.0%	26.0%	11.0%
Child	boy	Primary	64.9%	24.5%	10.6%
		Secondary	90.4%	1.9%	7.7%
	girl	Primary	65.8%	20.3%	13.9%
		Secondary	84.4%	4.2%	11.5%
Average			77.2%	12.1%	10.7%

Source: author's own

Among the total participants, 77.9% and 77.2% of child participants in London and Santiago, respectively, and 71.2% and 63% of their carers in each city, stated that they will use the route illustrated in the exercise.

In London, carers of boys were more likely to accept the offered route (68.1% for primary school ages and 82.4% for secondary school ages) than carers of girls (60% and 68.1%). Likewise, more boys (73.9% and 86% at primary and secondary levels, respectively) were more willing to select the shown route than their female peers (65.9% and 79.6%). The analysis in Santiago shows similar results, as carers of boys were willing to let them use the route 54.8% of the time for primary school ages and by 75.2% for secondary school ages, versus 48.4% and 66.3%, respectively for girls. Despite these differences, the boys and girls themselves have a similar willingness to use the offered route (at 64.9% and 65.8% for primary school children, 90.4% and 84.4% for secondary school children).

Like the model prediction analyses (Chapter 7.1.3), it is possible to estimate the probabilities of a particular type of participant choosing the offered route (link plus junction). Using the models detailed in section 7.1, the probabilities of choosing a street link were obtained from model GC-Link and the probabilities of choosing a street junction were obtained from GC-Junction model.

A secondary school girl from London, the example employed earlier, will have an estimated probability of choosing the offered route of $P_{Route} = 72.3\%$ (see Figure 7.3). This probability is obtained by simplifying the route choice⁴ and assuming it is obtained by multiplying the probabilities of choosing the street $P_{St} = 85.9\%$ and junction $P_{Cx} = 84.2\%$ offered in the route. The results for the girl are equivalent to the average route probability obtained for the sampled participants, which is $E(P_{Route}) = 65.6\%$ for the route, $E(P_{St}) = 82.1\%$ for the street, and $E(P_{Cx}) = 79.8\%$ for the crossing.

A summary of the observed probabilities of choosing a (not) acceptable route for all child and carer participants according are shown in Table 7.21. Using the Mann-Whitney U test it is possible to determine if the distribution and mean probability of (i) participants selecting a route are statistically different from (ii) participants not selecting the route. The null hypothesis of the test $H0: P_{Acceptable} = P_{Not Acceptable}$ suggests that the distribution of acceptable and not acceptable probabilities are similar. For instance, the mean estimated probability of choosing the offered route for carers of a secondary school girl in London is $E(P_{LON-Acceptable}) = 62.0\%$, and $E(P_{LON-Not Acceptable}) = 52.9\%$ for carers not choosing it. The Mann-Whitney U test resulted in $p = 0.045$, therefore, $H0$ is rejected, and the probability distributions of the participants that consider the route is acceptable are statistically significantly different

⁴ As discussed in Chapter 2, a route choice often includes other variables, such as family composition and travel distance, among others.

from participants to whom the route is not acceptable. Consequently, in all the cases where $p < 0.05$ (95% confidence level), the route probability may be used to differentiate individuals willing to use a route from the rest.

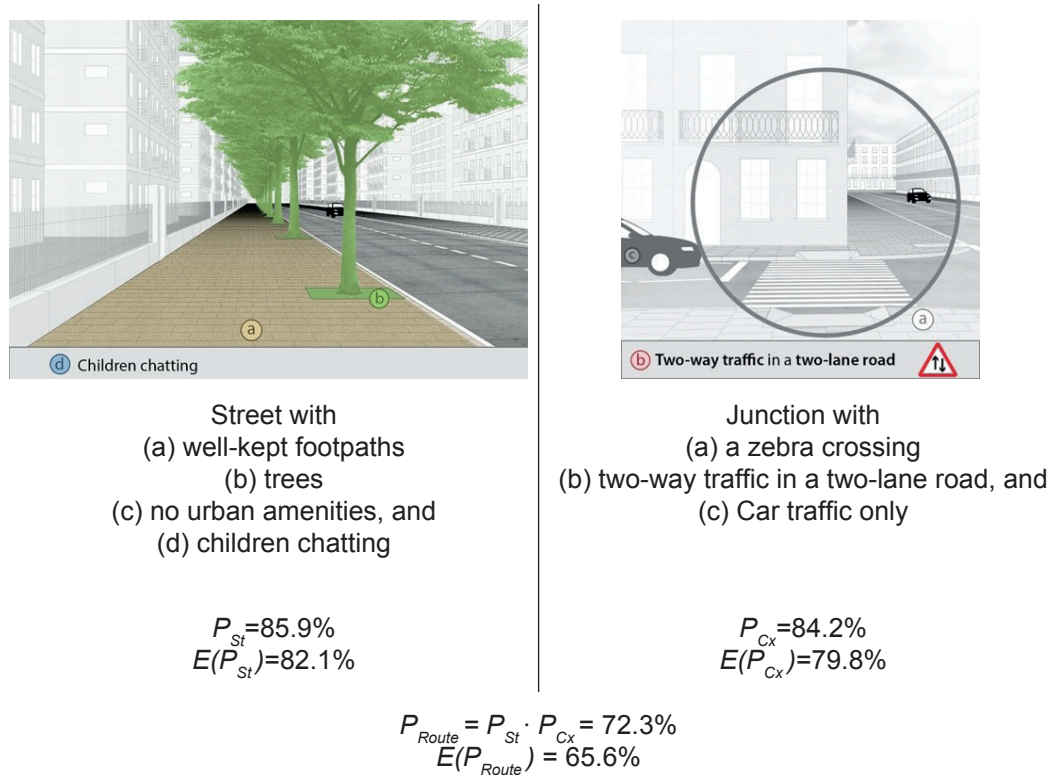


Figure 7.3. Probabilities for walking down a route unaccompanied for a secondary school girl in London.

Source: author's own

In London and Santiago, the results of the Mann-Whitney U test show statistically different distributions between carers and children that found the offered route acceptable and individuals that did not find it acceptable (see Table 7.21). In London, girls and carers of secondary school children show differences between individuals (not) accepting a route. In Santiago, the results of primary school girls, carers of primary school boys and secondary school children have differences for individuals (not) accepting the route. For the rest of the individuals, the Mann-Whitney U test cannot reject the null hypothesis, meaning that there is no statistically significant difference between individuals accepting and not accepting the route.

Table 7.21. Summary of the observed probabilities of choosing a (not) acceptable route.

			Probability if the route is acceptable				Probability if the route is not acceptable				Mann-Whitney U test
			Mean	Std Dev	Min	Max	Mean	Std Dev	Min	Max	p-value
London	Carers		57.8%	18.9%	11.2%	89.1%	51.8%	17.0%	14.0%	85.4%	0.002 *
	<i>Child gender</i>	<i>School level</i>									
	boy	Primary	53.6%	17.1%	11.2%	83.0%	53.0%	19.9%	14.0%	85.4%	0.949
		Secondary	59.5%	20.9%	12.8%	88.1%	50.0%	15.4%	19.8%	69.9%	0.007 *
	girl	Primary	53.6%	20.1%	16.4%	85.5%	50.9%	14.8%	17.5%	71.8%	0.262
		Secondary	62.0%	14.5%	26.1%	89.1%	52.9%	16.9%	21.1%	82.4%	0.045 *
	Children		59.4%	18.4%	7.8%	92.7%	48.3%	19.5%	9.8%	80.1%	0.000 *
	<i>Child gender</i>	<i>School level</i>									
	boy	Primary	58.0%	16.9%	12.6%	84.7%	49.2%	20.9%	9.8%	78.0%	0.104
		Secondary	58.3%	21.5%	7.8%	92.7%	54.3%	13.8%	37.3%	76.1%	0.201
	girl	Primary	60.5%	16.9%	17.0%	90.4%	46.2%	20.7%	13.3%	80.1%	0.002 *
		Secondary	61.5%	15.3%	21.4%	84.9%	43.3%	21.6%	13.3%	72.2%	0.010 *
Santiago	Carers		61.2%	18.6%	11.4%	92.6%	44.9%	18.2%	1.8%	87.5%	0.000 *
	<i>Child gender</i>	<i>School level</i>									
	boy	Primary	57.3%	11.8%	26.1%	81.5%	43.4%	15.9%	12.1%	63.5%	0.000 *
		Secondary	69.3%	16.6%	15.0%	92.4%	52.8%	18.2%	25.7%	87.5%	0.000 *
	girl	Primary	41.3%	17.7%	11.4%	81.0%	38.1%	21.1%	1.8%	67.2%	0.720
		Secondary	63.3%	18.2%	21.9%	92.6%	47.8%	15.2%	11.8%	73.7%	0.002 *
	Children		64.3%	19.1%	8.7%	98.0%	48.5%	19.2%	12.9%	86.4%	0.000 *
	<i>Child gender</i>	<i>School level</i>									
	boy	Primary	52.5%	18.8%	8.7%	85.3%	52.4%	17.1%	21.1%	86.4%	0.620
		Secondary	73.8%	19.1%	18.7%	98.0%	65.8%	19.2%	52.2%	79.3%	0.507
	girl	Primary	56.9%	10.8%	20.4%	81.3%	39.8%	17.7%	13.5%	76.1%	0.000 *
		Secondary	66.9%	16.9%	13.3%	94.6%	51.8%	28.6%	12.9%	74.2%	0.288

* 95% confidence

Source: author's own

7. 3. Ranking task

The survey instrument included a task (Chapter 4.2.2, questionnaire section E) asking participants to rank the importance of the attributes in a street environment for a child's unaccompanied walking trip. The responses to the ranking task were analysed independently for Santiago and London participants, estimating by using an exploded logit model for each city. This method is preferred due to its easiness to model the numerous implicit choices (i.e., the number of ranking elements, Louviere *et al.*, 2000), thus facilitating the estimation and interpretation of the relevance of the studied attributes. The best MNL models were estimated following the stepwise backward process applied previously, discarding non-policy and not significant parameters. The loglikelihood, likelihood ratio index and estimated parameters of the best-estimated models are shown in Table 7.22. These versions of the models have a superior log-likelihood, with all non-policy parameters being statistically significant at 95% confidence. Excepting four policy parameters left in the model as suggested by Ortúzar and Willumsen (2011), all are statistically significant.

Each model parameter estimate was converted into rankings for each set of socio-demographic characteristics (i.e., carer or child participant, child age and child gender), and contrasted with the averages and the standard deviation of each group (see Table 7.23).

Considering the LON 1 modelled ranking, the first preference for primary school children is *urban amenities*, and for secondary school children is *crossings*. In descending order of importance, the rest of the attributes are the *quality of footpaths* (2nd preference), *crossings* (3rd) and *facades* (4th) for younger children and *urban amenities* (2nd), *quality of footpaths* (3rd) and *facades* (4th) for *older children*. The attribute with the lowest preference is *facilities*. There are no differences in the preferences for the street environment attributes if the child gender is considered. Carers have the same order of preference of attributes when the gender of the child is considered, but in a different proportion. The most relevant attribute is *crossings*. In decreasing order, the rest of the attributes are *quality of footpaths* (2nd preference), *urban amenities* (3rd) and *facades* (4th). The attribute *facilities* has the lowest preference of carers of boys and girls. Results show that there no differences among carers considering the child's school level. The attributes with the highest average ranking for children and carers match the 1st preference of the ranking obtained from the exploded logit MNL. In the case of girls, the attribute with the highest average ranking is the 2nd preference of the model. Additionally, the top tier average ranked attributes for all groups are the same

as the top three attributes that emerged from the model. The attributes with the lower average ranking also are the same in the exploded logit MNL's ranking.

In the case of LON 2 modelled ranking, the attributes with the highest preference are *strangers' activities* for primary school children and *strangers' age* for secondary school children. The rest of the attributes are also different considering children's age. In decreasing order, results show that primary school children's preferences are *greenery* (2nd preference), *strangers' age* (3rd), *density of people* (4th) and *facades* (5th). In contrast, secondary school children's preferences are *density of people* (2nd), *strangers' activities* (3rd), *facades* (4th) and *greenery* (5th). Likewise, the most relevant attribute for carers of primary school children is *strangers' activities*. Meanwhile, for carers of secondary school children the most relevant attribute is *strangers' age*. The rest of preferences of carers of primary school children are, in decreasing order, *strangers' age* (2nd), the *density of people* (3rd), *facades* (4th) and *greenery* (5th). In decreasing order, the preferences of carers of secondary school children are *density of people* (2nd), for *strangers' activities* (3rd), *facades* (4th) and *greenery* (5th). No differences are observed among children and carers when the gender of the child is considered. The attribute with the highest average ranking for children and carers is the same attribute that ranked 1st in the exploded logit MNL. For secondary school girls and their carers that highest attribute occupies the 2nd position of the ranking obtained from the model. The average higher three and lower two ranked attributes match the top three and bottom two modelled attributes. For secondary school boys and carers of primary and secondary school boys, the two attributes with the highest average ranking match the top two modelled attributes. Likewise, the three attributes with the lowest average ranking match the bottom three modelled attributes.

In Santiago, the SCL1 modelled ranking results show that the attribute *quality of footpaths* is the most relevant attribute for primary school boys and girls. In descending order of importance, the rest of the attributes are *urban amenities* (2nd preference), *facilities* (3rd), and *parked vehicles* (4th). Secondary school children also show contrasting results as the most relevant attribute for boys is *quality of footpaths* and *facilities* for girls. In decreasing order, the rest of the attribute preferences of secondary school boys are *urban amenities* (2nd), *facilities* (3rd) and *parked vehicles* (4th). For secondary school girls, the attributes rank as follows: *quality of footpaths* (2nd), *urban amenities* (3rd) and *parked vehicles* (4th). Although there are significant differences according to the child's age and gender, *facades* has the lowest preferences in all cases. Carers have different perceptions in comparison with children. The

Table 7.22. Exploded logit MNL models.

	LON1		LON2		SCL1		SCL2	
LL(final)	-995.435		-1019.953		-832.77		-884.368	
Estimated parameters	22		11		16		15	
ρ^2 ρ^2 adj.	0.092 0.072		0.032 0.021		0.089 0.072		0.116 0.101	
Number of observations	229		220		191		209	
Main attributes	Estimate	t-ratio	Estimate	t-ratio	Estimate	t-ratio	Estimate	t-ratio
A - Facades	0.000	-	0.000	-	0.000	-	0.000	-
B - Quality of footpaths	0.968	4.269 **	-	-	1.412	5.215 **	-	-
C - Greenery	-	-	-0.064	-0.613	-	-	0.634	2.648 **
D - Urban amenities	0.222	1.370	-	-	0.931	4.637 **	-	-
E - Facilities	-0.824	-3.836 **	-	-	2.798	4.868 **	-	-
F - Strangers' activities	-	-	0.067	0.530	-	-	1.783	6.525 **
G - Strangers' age	-	-	0.420	2.810 **	-	-	1.602	6.741 **
H - Crossings (LON)	2.112	6.974 **	-	-	-	-	-	-
H - Parked vehicles (SCL)	-	-	-	-	-0.225	-1.024	-	-
I - Density of people (LON)	-	-	0.309	2.198 **	-	-	-	-
I - Strangers' gender (SCL)	-	-	-	-	-	-	1.527	5.733 **
Taste variations (in italics)	Estimate	t-ratio	Estimate	t-ratio	Estimate	t-ratio	Estimate	t-ratio
B - Quality of footpaths * <i>boy (carer views)</i>	-	-	-	-	1.077	2.802 **	-	-
B - Quality of footpaths * <i>carer</i>	-	-	-	-	-1.040	-2.953 **	-	-
B - Quality of footpaths * <i>child age 8-10</i>	-	-	-	-	0.776	2.663 **	-	-
B - Quality of footpaths * <i>non-school trip</i>	-0.832	-2.844 **	-	-	-	-	-	-
B - Quality of footpaths * <i>IMD living environment decile (carer views)</i>	-0.703	-2.640 **	-	-	-	-	-	-
C - Greenery * <i>child age 8-10</i>	-	-	0.511	2.076 **	-	-	-	-
C - Greenery * <i>non-school trip (carer views)</i>	-	-	-	-	-	-	-0.820	-2.618 **
D - Urban amenities * <i>child age 8-10</i>	0.859	3.059 **	-	-	-	-	-	-
D - Urban amenities * <i>last trip with a child and an adult (child view)</i>	-	-	-	-	1.307	1.952 *	-	-
D - Urban amenities * <i>IMD crime decile (child views)</i>	0.732	2.374 **	-	-	-	-	-	-
D - Urban amenities * <i>participant directly recruited</i>	0.819	2.514 **	-	-	-	-	-	-
E - Facilities * <i>carer</i>	-	-	-	-	-2.268	-3.876 **	-	-
E - Facilities * <i>child age 8-12</i>	-	-	-	-	-0.890	-2.146 **	-	-
E - Facilities * <i>boy</i>	-	-	-	-	-1.036	-2.615 **	-	-
E - Facilities * <i>boy (carer views)</i>	0.633	2.352 **	-	-	-	-	-	-

Source: author's own

Table 7.22. Exploded logit MNL models (continued).

	LON1		LON2		SCL1		SCL2	
LL(final)	-995.435		-1019.953		-832.77		-884.368	
Estimated parameters	22		11		16		15	
ρ^2 ρ^2 adj.	0.092 0.072		0.032 0.021		0.089 0.072		0.116 0.101	
Number of observations	229		220		191		209	
Main attributes	Estimate	t-ratio	Estimate	t-ratio	Estimate	t-ratio	Estimate	t-ratio
E - Facilities * <i>IMD crime decile (child views)</i>	1.000	3.104 **	-	-	-	-	-	-
E - Facilities * <i>participant directly recruited</i>	1.271	3.652 **	-	-	-	-	-	-
E - Facilities * <i>last trip unaccompanied (child views)</i>	0.645	2.090 **	-	-	-	-	-	-
E - Facilities * <i>non-school trip</i>	-	-	-	-	-1.038	-1.966 **	-	-
F - Strangers' activities * <i>boy (carer views)</i>	-	-	-	-	-	-	-1.232	-3.746 **
F - Strangers' activities * <i>child age 8-10</i>	-	-	0.552	2.180 **	-	-	-	-
F - Strangers' activities * <i>child age 8-10 (carer views)</i>	-	-	0.601	2.364 **	-	-	-	-
F - Strangers' activities * <i>last trip unaccompanied (carer views)</i>	-	-	-	-	-	-	0.921	2.429 **
F - Strangers' activities * <i>wealthy area (carer views)</i>	-	-	-	-	-	-	1.132	2.938 **
G - Strangers' age * <i>boy</i>	-	-	-	-	-	-	-0.741	-2.542 **
G - Strangers' age * <i>last trip with another child (child views)</i>	-	-	0.927	1.963 **	-	-	-	-
H - Parked vehicles * <i>boy (carer views)</i>	-	-	-	-	-1.330	-2.650 **	-	-
H - Parked vehicles * <i>last trip with another child (child views)</i>	-	-	-	-	1.988	3.327 **	-	-
H - Crossings * <i>non-school trip (carer views)</i>	-0.875	-3.061 **	-	-	-	-	-	-
H - Crossings * <i>non-school trip</i>	-1.295	-4.049 **	-	-	-	-	-	-
H - Crossings * <i>IMD crime decile (child views)</i>	0.715	2.115 **	-	-	-	-	-	-
H - Crossings * <i>IMD living environment decile (child views)</i>	-0.855	-2.731 **	-	-	-	-	-	-
H - Crossings * <i>IMD living environment decile (carer views)</i>	-0.975	-3.296 **	-	-	-	-	-	-
I - Strangers' gender * <i>boy</i>	-	-	-	-	-	-	-1.383	-3.958 **
I - Strangers' gender * <i>boy (carer views)</i>	-	-	-	-	-	-	-0.813	-2.484 **
I - Strangers' gender * <i>carer age 18-30</i>	-	-	-	-	-	-	-0.958	-2.184 **
Scale parameters	Estimate	t-ratio	Estimate	t-ratio	Estimate	t-ratio	Estimate	t-ratio
scale 2	0.892	5.151 **	1.436	2.683 **	0.322	2.805 **	0.746	5.075 **
scale 3	0.769	4.380 **	1.775	2.526 **	0.738	4.431 **	0.978	5.508 **
scale 4	0.964	3.961 **	1.176	1.631	0.729	3.693 **	0.288	1.631

* Significant at 90% confidence | ** Significant at 95% confidence

Source: author's own

Table 7.23. Rankings of the attributes derived from the exploded logit MNL model and the database averages.

LON 1								
Participant	Child							
Child gender	boy				girl			
Child age	Primary		Secondary		Primary		Secondary	
Attributes	Modelled rank	Mean rank (std. dev.)	Modelled rank	Mean rank (std. dev.)	Modelled rank	Mean rank (std. dev.)	Modelled rank	Mean rank (std. dev.)
A - Facades	4	3.6 (1.4)	4	3.6 (1.5)	4	3.9 (1.2)	4	3.8 (1.1)
B - Quality of footpaths	2	2.9 (1.3)	3	2.8 (1.3)	2	2.1 (1.1)	3	3.1 (1.3)
D - Urban amenities	1	2.4 (1.3)	2	2.8 (1.3)	1	2.3 (1)	2	2.6 (1.5)
E - Facilities	5	3.2 (1.3)	5	3.7 (1.2)	5	4.2 (1.2)	5	3.1 (1.6)
H - Crossings	3	2.9 (1.6)	1	2.2 (1.1)	3	2.4 (1.2)	1	2.3 (1.3)

LON 1								
Participant	Carer							
Child gender	boy				girl			
Child age	Primary		Secondary		Primary		Secondary	
Attributes	Modelled rank	Mean rank (std. dev.)	Modelled rank	Mean rank (std. dev.)	Modelled rank	Mean rank (std. dev.)	Modelled rank	Mean rank (std. dev.)
A - Facades	4	3.3 (1.2)	4	3.3 (1.3)	4	3.3 (1.4)	4	3.1 (1)
B - Quality of footpaths	2	2.9 (1.4)	2	2.9 (1.5)	2	2.7 (1.4)	2	2.9 (1.5)
D - Urban amenities	3	3.2 (1.5)	3	3.1 (1.3)	3	2.8 (1.2)	3	3.1 (1.5)
E - Facilities	5	3.5 (1.3)	5	3.5 (1.2)	5	4.3 (1.2)	5	3.1 (1.7)
H - Crossings	1	2.1 (1.4)	1	2.3 (1.5)	1	2 (0.9)	1	2.8 (1.5)

LON 2								
Participant	Child							
Child gender	boy				girl			
Child age	Primary		Secondary		Primary		Secondary	
Attributes	Modelled rank	Mean rank (std. dev.)	Modelled rank	Mean rank (std. dev.)	Modelled rank	Mean rank (std. dev.)	Modelled rank	Mean rank (std. dev.)
A - Facades	5	3.6 (1.5)	4	3.3 (1.3)	5	3.8 (1.1)	4	3.5 (1.3)
C - Greenery	2	2.9 (1.5)	5	3.1 (1.4)	2	2.6 (1.4)	5	3.9 (1.3)
F - Strangers' activities	1	2.6 (1.4)	3	3.2 (1.6)	1	2.3 (1.4)	3	2.8 (1.5)
G - Strangers' age	3	2.8 (1.1)	1	2.6 (1.3)	3	3.1 (1.4)	1	2.6 (1.1)
I - Density of people	4	3.1 (1.4)	2	2.8 (1.4)	4	3.2 (1.5)	2	2.1 (1.3)

LON 2								
Participant	Carer							
Child gender	boy				girl			
Child age	Primary		Secondary		Primary		Secondary	
Attributes	Modelled rank	Mean rank (std. dev.)	Modelled rank	Mean rank (std. dev.)	Modelled rank	Mean rank (std. dev.)	Modelled rank	Mean rank (std. dev.)
A - Facades	4	3.5 (1.4)	4	3.3 (1.4)	4	3.8 (1)	4	3 (1.5)
C - Greenery	5	3.3 (1.4)	5	3 (1.6)	5	3.1 (1.7)	5	3.5 (1.5)
F - Strangers' activities	1	2.3 (1.3)	3	3.2 (1.6)	1	2.4 (1.4)	3	3 (1.5)
G - Strangers' age	2	2.6 (1.2)	1	2.6 (1.4)	2	2.9 (1.4)	1	2.8 (1.3)
I - Density of people	3	3.4 (1.4)	2	2.9 (1.1)	3	2.8 (1.4)	2	2.7 (1.2)

Source: author's own

Table 7.23. Rankings of the attributes derived from the exploded logit MNL model and the database averages (continued).

SCL 1								
Participant	Child							
Child gender	boy				girl			
Child age	Primary		Secondary		Primary		Secondary	
Attributes	Modelled rank	Mean rank (std. dev.)	Modelled rank	Mean rank (std. dev.)	Modelled rank	Mean rank (std. dev.)	Modelled rank	Mean rank (std. dev.)
A - Facades	5	3.3 (1.4)	5	4 (1.3)	5	3.4 (1.3)	5	4.1 (1.1)
B - Quality of footpaths	1	2.1 (1.1)	1	2.3 (1.2)	1	2.7 (1.5)	2	2.6 (1.5)
D - Urban amenities	2	2.7 (1.3)	2	2.6 (1.3)	2	2.8 (1.3)	3	2.8 (1.1)
E - Facilities	3	3.4 (1.5)	3	2.6 (1.4)	3	2.6 (1.4)	1	2.1 (1.3)
H - Parked vehicles	4	3.6 (1.3)	4	3.5 (1.2)	4	3.5 (1.5)	4	3.5 (1.3)

SCL 1								
Participant	Carer							
Child gender	boy				girl			
Child age	Primary		Secondary		Primary		Secondary	
Attributes	Modelled rank	Mean rank (std. dev.)	Modelled rank	Mean rank (std. dev.)	Modelled rank	Mean rank (std. dev.)	Modelled rank	Mean rank (std. dev.)
A - Facades	4	3.1 (1.4)	4	3.1 (1.3)	5	3.1 (1.3)	5	3.1 (1.4)
B - Quality of footpaths	1	1.8 (1.2)	1	2.3 (1.3)	3	2.7 (1.5)	3	3 (1.6)
D - Urban amenities	2	2.9 (1.2)	2	2.1 (1.1)	1	2.6 (1.3)	1	2.8 (1.4)
E - Facilities	3	3.2 (1.2)	3	3 (1.2)	2	2.4 (1.4)	2	2.7 (1.3)
H - Parked vehicles	5	4 (1.4)	5	4.3 (1.1)	4	4.2 (1)	4	3.5 (1.4)

SCL 2								
Participant	Child							
Child gender	boy				girl			
Child age	Primary		Secondary		Primary		Secondary	
Attributes	Modelled rank	Mean rank (std. dev.)	Modelled rank	Mean rank (std. dev.)	Modelled rank	Mean rank (std. dev.)	Modelled rank	Mean rank (std. dev.)
A - Facades	5	3.5 (1.2)	5	3.7 (1.2)	5	3.9 (1.1)	5	4 (1.3)
C - Greenery	3	2.7 (1.2)	3	3.1 (1.4)	4	3.2 (1.6)	4	3.7 (1.4)
F - Strangers' activities	1	2.4 (1.6)	1	1.7 (1)	1	2.2 (1.3)	1	2.2 (1)
G - Strangers' age	2	3 (1.3)	2	2.7 (1.2)	2	2.6 (1.1)	2	2.6 (1.2)
I - Strangers' gender	4	3.4 (1.6)	4	3.8 (1.1)	3	2.9 (1.4)	3	2.5 (1.3)

SCL 2								
Participant	Carer							
Child gender	boy				girl			
Child age	Primary		Secondary		Primary		Secondary	
Attributes	Modelled rank	Mean rank (std. dev.)	Modelled rank	Mean rank (std. dev.)	Modelled rank	Mean rank (std. dev.)	Modelled rank	Mean rank (std. dev.)
A - Facades	4	3.7 (1.2)	4	3.5 (1)	4	3.7 (1.4)	4	4 (1)
C - Greenery	5	3.6 (1.3)	5	3.6 (1.3)	5	3.8 (1.3)	5	4.5 (0.6)
F - Strangers' activities	2	2.8 (1.7)	2	2.2 (1.5)	1	2.2 (1.3)	1	1.8 (1.1)
G - Strangers' age	1	1.9 (0.9)	1	2.3 (1.3)	2	2.3 (1.1)	2	2.4 (0.9)
I - Strangers' gender	3	3 (1.1)	3	3.3 (1.5)	3	3 (1.3)	3	2.2 (1)

Source: author's own

most relevant attribute for carers of boys is *quality of footpaths*; whereas for carers of girls the most relevant attribute is *urban amenities*. Following these attributes, carers of boys preferred, in descending order, *urban amenities* (2nd), *facilities* (3rd), *facades* (4th) and *parked vehicles* (5th). Carers of girls preferred *facilities* (2nd), *quality of footpaths* (3rd), *parked vehicles* (4th) and *facades* (5th). The average rankings of the top attribute for boys and carers of primary school boys match the results obtained from the exploded logit MNL. The highest ranked attribute for carers of girls and secondary school boys and primary school girls were 2nd and 3rd in the model respectively. For the same groups, the three attributes with the highest average ranking match the top three modelled attributes; meanwhile the two attributes in the lowest average rank are the same as the bottom two modelled attributes. For primary school boys and their carers, the top two average attributes match the 1st and 2nd modelled attributes and the bottom three average attributes are the same as the lower three modelled attributes.

Lastly, SCL2 modelled ranking results show that children of both genders share the most and the least preferred attributes: *strangers' activities* (1st preference), and *facades* (5th preference). There are differences in the rest of the rankings as boys prefer *strangers' age* (2nd), *greenery* (3rd) and *strangers' gender* (4th) and girls prefer *strangers' age* (2nd), *strangers' gender* (3rd) and *greenery* (4th). Similarly, carers show differences when considering the gender of the child. Carers of boys prefer *strangers' age* (1st), *strangers' activities* (2nd), *strangers' gender* (3rd), *facades* (4th) and *greenery* (5th). In contrast, carers of girls preferred *strangers' activities* (1st), followed by *strangers' age* (2nd), *strangers' gender* (3rd), *facades* (4th) and *greenery* (5th). No differences are observed when the age of the child is considered. The average ranking of the top attribute coincides with the exploded logit MNL for children and carers. For secondary school boys, the highest attribute in the ranking is the 2nd most relevant in the model. Additionally, the three highest attributes in the ranking and the lowest two match the top three and bottom two modelled attributes, respectively.

7. 4. Conclusions and discussion

Like the findings of Evenson *et al.* (2006), Iglesias *et al.* (2013) and De Meester *et al.* (2014), the attributes of the built environment *well-kept footpaths* and *greenery* encourage children and young people's unaccompanied walking trips in both cities. The attribute *dirty footpaths*, as expected, negatively influences unaccompanied walking trips in both cities. This is consistent with the findings of other scholars (Day and Wager, 2010). The influence of *greenery* attributes on children and young people's unaccompanied

walking trips was positive, which is similar to the findings of Kamargianni and Polydoropoulou, (2014). These attributes also seem to be the most relevant aspects of the built environment, and should receive more attention in order to ease children and young people's unaccompanied walking trips.

More in detail, the influence of *well-kept footpaths* and *greenery* on unaccompanied walking trips is also more significant among boys and young people. Likewise, *dirty and neglected footpaths* have a greater negative influence among children from Santiago, which may reflect the relevance that cleanliness has in Chilean culture as a sign of healthy communities (Figueroa *et al.*, 2019). Differences were also observed between children, young people and carers. The influence of *well-kept footpaths* and *greenery* is more relevant for children and young people and less relevant among carers. Carers tended to replicate gendered and age-related patterns as *well-kept footpaths* is more relevant among carers of boys and male young people than carers of children and girls, reflecting well-known gendered patterns (Valentine, 1997a; Brown *et al.*, 2008; Carver *et al.*, 2014b; Saraví, 2014).

In Santiago, and like the findings of Iglesias *et al.* (2013) suggest, the facades attribute *permeable fences* has a positive influence on children and young people's unaccompanied walking trips. In contrast, the influence of the facades attributes *medium density houses* and *low density houses* is unclear in London. The feature of the built environment related to alcohol consumption (*off-licence*) is a strong barrier to walk unaccompanied for children and young people from Santiago. The negative influence is stronger than the positive influence of other facilities like *shops*. The negative influence of alcohol consumption-related facilities is even stronger among girls and female young people and their carers. Wolfe and McDonald (2016) identified an equivalent pattern in the United States and reached similar conclusions. In London, however, *pubs* seem to be part of the culture and life of the city and neither encourage nor discourage young people's unaccompanied walking trips.

Other attributes of the built environment have a smaller or mixed influence on children and young people's unaccompanied walking trips. As also observed by other authors (Panter *et al.*, 2010a; Elshater, 2018; Singh and Vasudevan, 2018; Eisenlohr *et al.*, 2023), urban amenities and facilities like *playgrounds*, *bus stops* and *schools* positively influence children and young people's unaccompanied walking trips. The influence of a variety of *shops* is neither positive nor negative for children from London, differing again with the findings of Wolfe and McDonald (2016) who argue that grocery and retail stores have a positive impact. Spaces of enjoyment and busy areas (*playground*, *shops*,

bus stops) seem to be more relevant for children than carers, which support the conclusions reached by works that investigate children's views and not only carers' perspectives (Horton *et al.*, 2014; Alderson, 2016; Marzi and Reimers, 2018; Murray and Cortés-Morales, 2019; Porter *et al.*, 2020).

The results indicated that crossing facilities (*signalised* and *zebra crossings*), *one-way traffic* and *car traffic only* can influence young people unaccompanied walking trips, especially in London. The importance of these attributes is consistent with the findings of several works (Panter *et al.*, 2010a; Villanueva *et al.*, 2012; Carver *et al.*, 2013; Ahern *et al.*, 2017; Webb Jamme, 2018; Smith *et al.*, 2019). In Santiago, the attribute *vehicles parked on the footpath* has a negative influence on children and young people's unaccompanied walking trips, coinciding with well-known concerns about how limited the pedestrian space is in some cities (Lin and Chang, 2010; Sharmin and Kamruzzaman, 2017; Waygood *et al.*, 2017).

The strangers' activities also influence children and young people's unaccompanied walking trips. In Santiago, the influence of strangers *chatting* facilitate children and young people's unaccompanied walking trips and the influence of strangers *walking* is unclear. In London, strangers *chatting* nor support neither discourage children and young people's unaccompanied walking trips. Strangers *drinking alcohol*, on the other side, is a relevant barrier for children, girls and their carers. In the data, strangers' activities were one of the most relevant groups of attributes, yet, in the literature, those matters have been reduced to the umbrella concept of "stranger danger" (Valentine, 1997a; O'Brien *et al.*, 2000; Gough and Franch, 2005; Francis *et al.*, 2017; Suess *et al.*, 2020).

The social attributes *teenagers*, *adults* and *male* strangers (in Santiago) have a negative influence on children and young people's unaccompanied walking trips. Several authors have reported similar findings of the attribute *teenagers* on children and young people's trips (Valentine, 2008; Mine, 2009; Francis *et al.*, 2017). The influence of *adults*, *teenagers* and *male* strangers tended to be more significant among girls, which is consistent with the gendered patterns observed by Valentine (1997b) and Saraví (2014). Meanwhile, other *children* may encourage unaccompanied walking trips among children of both cities and young people of Santiago, being consistent with the findings of several other works (Prezza *et al.*, 2001; Brown *et al.*, 2008; Wolfe and McDonald, 2016). Lastly, and as the findings of Francis *et al.* (2017) suggest, *crowded footpaths* in London have a negative influence on children and young people's unaccompanied walking trips which seem to be related to the difficulties that they could have to navigate and remain safe (see Chapter 5).

Chapter 8. Conclusions

8. 1. Overview (objective 1)

This research sought to investigate how and why the built and the social environments influence children and young people's unaccompanied trips in London and Santiago.

As the literature demonstrates (Moran *et al.*, 2016), walking is the most accessible form of unaccompanied trips for children and young people from both cities that occurs within the limits and restrictions imposed by the carers. Those restrictions are understood and commonly accepted by children and young people and, as Horton *et al.* (2014) indicate, are not an usual point of conflict between them and their carers. The analysis of the data supported the findings of several authors who demonstrate that children gain more licenses as they grow and acquire skills to negotiate the spaces through which they travel (Valentine, 1997a; Shaw *et al.*, 2012), and provided evidence that suggested that this process is accompanied by a constant transmission of fears.

The results also provide further knowledge on the influence of the built and social environment on children and young people's unaccompanied trips. The existing body of literature has tended to understand the influence of the built and social environments according to children's age and gender (Panter *et al.*, 2008; Sharmin and Kamruzzaman, 2017; Smith *et al.*, 2019). The data gathered for this research corroborated the varied influences that the environments have on girls and boys of different ages and provided evidence about how the socio-cultural context multiplies the differences. Moreover, the built and social environments are deeply related to the local setting and its social dynamics. For instance, greenery has a positive influence on children and young people's travel experience in wealthy neighbourhoods of Santiago but is secondary for carers, children and young people living in deprived areas of the city. For them, the deterioration, neglect and vandalism of the public space are more relevant because those are cues to infer the health of a community and the support that a child in need could receive. Different perceptions were also identified at a country level. For instance, strangers consuming alcohol is sign of busy streets and diverse communities in London, but a sign of danger for children from Santiago.

The qualitative data (i.e., interviews with children, young people and carers) of both cities indicated that the built and the social environments influence children's trips in a number of ways. The presence of landmarks and singular buildings can provide sense of direction to children and young people travelling. Inadequate traffic-related infrastructure can increase carers' apprehensions, cause detours or make some children less mobile. The level of maintenance of the public space and the presence of greenery, urban amenities and facilities can enrich children and young people's travel experience and can be also cues from which carers, children and young people infer the social qualities and the potential risks of the places. Likewise, commerce and services are believed to induce movement, attract neighbours and "not dangerous" strangers to the public spaces. The constant association between physical features and the social aspects of the places provided strong evidence that the interactions between both environments shape perceptions and, by doing so, influence the decisions that can lead to an unaccompanied trip and the children and young people's attitudes and behaviours when travelling. Social aspects of the environment, such as the presence of the community in the public space, can encourage children and young people's unaccompanied mobility. Other social aspects, like decaying communities or dangerous strangers, can even lead to the suppression of trips. The evidence, however, also indicated that the apprehensions that carers, children and young people had with the individuals that are present in the public space are partially rooted in stereotypes and stigmas.

The quantitative data (i.e., rankings, ratings and discrete choice models) further confirmed some of the findings that emerged from the interviews. The data indicated that pleasant (e.g., presence of greenery), clean (e.g., well-kept footpaths), safe (e.g., streets with traffic calming measures) and enjoyable (e.g., playgrounds) environments facilitate unaccompanied trips. Safety-related attributes are also relevant but especially among carers. The rankings, ratings and discrete choice models showed that carers and young people's preferences tended to coincide, empirically demonstrating how the transmission of fears and apprehensions described earlier shape children's preferences as they grow. The data also suggested that young people, and particularly boys, prefer pleasant and vibrant environment. Meanwhile, features that provide safety were preferred by children and girls of all ages, and influence more their trips. Those clear differences between genders support the qualitative findings and conclusions of several authors (Valentine, 1997a; Foster *et al.*, 2014; Saraví, 2014) who have indicated that girls travel among fears that are often strengthened by their acquaintances and relatives, including carers.

With the exception of objective 1, addressed in Chapter 2 and throughout the thesis, the sections of this chapter cover the objectives of the thesis and summarise the main findings. Section 8.2 covers objective 2, analyse children's patterns of unaccompanied trips in London and Santiago, and explores the findings reported in chapter 5. Section 8.3 and 8.4 covers objectives 3, 4 and 5, explore qualitatively and quantitatively the impacts of the built and social environments on children's unaccompanied trips in London and Santiago, and summarises the findings reported in chapter 5, 6 and 7. Section 8.5 summarises the findings, Section 8.6 contains policy recommendations, Section 8.7 covers the methodological contribution and Section 8.8 covers the limitations of the research. The final section (8.9) contains questions and matters that were not explored in depth.

8.2. On children's unaccompanied trips in London and Santiago (objective 2)

Chapter 5 explored how children's unaccompanied trips occur in London and Santiago. The literature and the collected data indicated that children's mobilities are constrained by the permissions and apprehensions of their carers (Hillman *et al.*, 1990; Valentine, 1997a; Shaw *et al.*, 2012). As also observed by Horton *et al.* (2014), the evidence confirmed that children respect the limits imposed by carers, especially in neighbourhoods threatened by urban violence. Additionally, walking emerged as the most frequent and relevant transport mode for unaccompanied trips and, unlike other places where it is more uncommon (Ermagun and Samimi, 2015), was represented as a regular activity that needs to be protected. Walking, however, happens in very different conditions in the studied cities. Walking occurred in well-kept and relatively safe environments in London and wealthy areas of Santiago. Meanwhile, in the deprived areas of Santiago, children travel in fear and through highly deteriorated environments.

Key finding: children need to learn norms, strategies and skills to travel unaccompanied

The evidence gathered indicated that carers restrict children because they lack the necessary skills and maturity to travel unaccompanied (Chapter 5). As found by Crawford *et al.* (2017), the data suggested that when children learn what is needed to travel in the city, they gain more permissions to travel unaccompanied. Children are taught norms of behaviour and are encouraged to develop skills and strategies to negotiate and share the space with traffic (e.g., observe traffic rules, walk away from the road limits) and others (e.g.,

polite interactions with strangers), avoid conflicts (e.g., modify the route) and manage risky situations (e.g., ask for help, contact their carers). Those findings are consistent with the literature that has described similar learning processes (Matthews, 2003; Milne, 2009).

In London, the data gathered seems to suggest that technology is transforming the forms in which children learn and help carers instruct them on matters like navigating an unknown area, yet more research is needed to understand the phenomenon. In Santiago, clear gendered roles emerged as female carers were the primary educators of children. This is consistent with several authors who detected this gendered role in Chile (Staab and Gerhard, 2010) and other parts of the world (Murray and Cortés-Morales, 2019). Furthermore, children's apprehensions tended to converge with those of their carers as they grow older, providing evidence of the carers-to-children transmission of fears that other scholars have described (Valentine, 1997b; Crawford *et al.*, 2017).

Key finding: children travel among restrictions and within well-defined territories

Similar to the findings of other authors (Kytä *et al.*, 2012), the territorial range available for a child to travel unaccompanied is often defined by natural or artificial features, such as landmarks, roads and canals. In London, unaccompanied mobility is also limited by rules that do not let younger children travel alone (school norms) or leave a child unsupervised "if it places them at risk" (UK Government, n.d.). In deprived areas of Santiago, crime (e.g., shootings) and sociocultural issues (e.g., fragmented communities) strengthen carers' apprehensions and further restrict children's unaccompanied mobility. In contrast, children living in wealthy areas of Santiago face fewer restrictions and can travel unaccompanied within the limits of larger areas.

Some scholars (Valentine, 1997b; Visser, 2019) argued that children break carers' limits and restrictions to test their skills, but, as also observed by Horton *et al.* (2014), this behaviour was uncommon in both cities and absent in the deprived areas of Santiago. Children from those areas were well-aware of the many threats that are present in the neighbourhoods where they travel and accepted without hesitation the boundaries set by their carers. Moreover, the qualitative data indicated that children find ways to enjoy the streets despite the many restrictions that limit their actions. For instance, they play on footpaths while travelling or enjoy local parks and other amenities while been supervised by adults.

Key finding: younger children and girls have more restrictions to travel alone

In general, younger children and girls have more restrictions than boys and older children (Chapter 5). Like the findings of other authors suggest (Valentine, 1997a; Shaw *et al.*, 2012), the data collected showed that younger children are seen as immature individuals who gain more freedom as they grow and master the skills needed to travel with peers or alone. For girls, however, this process seems to be more complex as carers from both cities indicated that they are more vulnerable than boys to the threats (e.g., strangers) that are present in the public space. Girls gain freedom as they become older, but, as Saraví (2014) asserts, they do so in social-cultural contexts that tell them from a very young age that they are “fragile”.

Key finding: walking is the most common form of unaccompanied mobility in London and Santiago deprived areas

In London, walking was often described as a the most common form of unaccompanied mobility that occurs in diverse (e.g., homogeneous residential areas, busy commercial streets) and well-equipped settings (i.e., adequate footpaths, crossings). Walking is much more frequent in deprived areas of Santiago despite the adverse conditions children face in the streets. Having few options, children living in deprived areas walk through homogeneous and neglected environments and challenging social conditions that feature drug-related crime and antisocial behaviour. Contrastingly, wealthy areas of Santiago have adequate pedestrian infrastructure, urban amenities, abundant greenery and well-designed traffic crossings, yet children and young people living in these areas walk less than those living in other parts of the city.

Key finding: the individual probabilities of a street link and a street junction can predict the chances of a children’s unaccompanied trip.

The willingness to walk down a route unaccompanied can be inferred from the individual probabilities of choosing a street link and a street junction (Chapter 7). The probabilities of choosing a route can be predicted for primary school girls and carers of secondary school children in both cities, secondary school girls in London, and carers of primary school boys in Santiago. Those results emphasise the potential of the models as means to estimate the influence of different route configurations on children’s travel patterns.

8. 3. On the features of the built environment that influence children's unaccompanied trips (objectives 3, 4 and 5)

Chapter 5 reported and discussed the aspects of the built environment considered relevant for trips completed by children according to interviews. In general, the relevant features of the built environment that emerged as relevant are similar among children and young people but have different meanings and impacts according to personal characteristics (i.e., gender and age) and the socio-cultural settings (e.g, wealthy/deprived, Santiago/London). The qualitative data indicated that the attributes of the built environment influence children's trips in various ways and can (i) help them to navigate in the cities, (ii) enrich their travel experiences, (iii) be cues to infer the social qualities of the places and (iv) influence fears (e.g., fear of being involved in a traffic accident).

The quantitative analyses in Chapter 6 and 7 provided evidence of the diverse impacts of the built aspects of the environment on children's unaccompanied trips. The attributes associated with children's travel experience are rated high (e.g., greenery), but are eclipsed in complex environments that feature attributes (e.g., strangers drinking alcohol) that could jeopardise children. Furthermore, young people and boys tend to share preferences and are more influenced by attributes that enrich their travelling experience. Carers, children and girls also tend to share their preferences and are influenced more by attributes that affect their perception of safety. Those findings, in general, provided evidence of well-known gendered patterns (Porter *et al.*, 2020) that have tended to affect girls.

Key finding: the built environment influences children's unaccompanied trips in numerous forms

Landmarks, novelty and sense of direction

The qualitative data indicated that landmarks bring novelty to an area (e.g., urban furniture, transport infrastructure, recreational amenities, facilities, greenery), are references to larger systems (e.g., street network, type of street), are used to characterise a neighbourhood (e.g., cluster of tall buildings, style of the facades) and ease children and young people's navigation in the streets of London and Santiago. Like the findings of Matthews (1992), the analysis suggested that younger children interpret the landmarks from an egocentric view (with them in the centre of the reference system) and young people do so from an aerial perspective (representing movement in a broader system of singularities and landmarks).

Greenery, urban amenities, facilities and children's travelling experience

Rubbish, debris, deterioration, vandalism and neglect in both cities and steep footpaths in London negatively affect children and young people's experience. These attributes of the built environment evoke negative feelings (e.g., disgust), are aesthetically unpleasant and can be obstacles for walking and cycling. Open spaces, natural elements (e.g., trees), urban furniture, permeable fences, and beautifully ornamented facades enrich children and young people's travelling experience. Well-cared streets (e.g., footpaths) and physical features (e.g., greenery, urban furniture), recreational facilities (e.g. parks, playground, football court) and aesthetically pleasant infrastructure (e.g., colourful facades, car-free roads, shopping streets) in both cities and large infrastructure (rail bridges, canals) in London prompt children's imagination, stimulate their creativity and senses and provide opportunities to play and relax. These findings are consistent with the conclusions reached by Evenson *et al.* (2006) and Smith *et al.* (2019). In London, service facilities (e.g., hospitals, community centres, shops), traffic infrastructure (e.g., bus stops, roundabouts, bridges, highways) and homogeneous facades without distinctive characteristics were neither positive nor negative for children and young people's travel experience.

Key finding: the attributes of the built environment can be cues to deduce the social qualities of the places

London, built environment and the presence of people in the streets

Facilities, facades, urban amenities, neighbourhood landmarks, transport infrastructures and their level of maintenance were often described as environment cues from which children, young people and carers deduce the social qualities of the places. According to the findings, the presence of certain facilities is linked to specific "users" such as adults shopping at retail stores and supermarkets or drinking at pubs, teenagers close to fast-food restaurants, secluded streets or alleys, and families in parks or walking close to schools. Likewise, carers from London associated the street type (e.g., highstreets), its relevance in the broader system and the facilities located in it with certain strangers and levels of traffic. For some carers, relevant roads with wide footpaths are signs of busy public spaces that, as suggested by Nansen *et al.* (2015) and Francis *et al.* (2017), naturally survey children and young people. For other carers, a potentially busy road can be risky as children require further skills to navigate in the crowd. A quiet street is believed to be easier to navigate for children.

The model of parked vehicles and the maintenance of streets and facades are cues to infer the people who live in the neighbourhoods of London. Clean, ornamented and stylish facades and expensive parked cars are signs of wealthy, refined and “good” people. Dirty streets and deteriorated or neglected facades are believed to be populated by socially vulnerable citizens and potentially threatening strangers. Although facades serve as a shortcut to infer who lives in a given area, the analysis indicated that the social mix of London can transform the built environment into a form of stigmatisation and multiply the apprehensions that carers have over those neighbourhoods that do not reach the expected standards.

Santiago, built environment and fear of crime

Facades have contrasting meanings in Santiago. The analysis indicated that tall, closed fences and walls protect children and young people inside the property, yet are signs of communities that have abandoned the public space, increasing fears. Permeable fences permit the natural surveillance of the public space and are signs of communities not threatened by wrongdoers and trafficking, decreasing fears. Similar to the findings of Figueroa *et al.* (2019), the deterioration, the neglect, the vandalism and the low maintenance of the public space are signs of weak communities and socially deteriorated neighbourhoods, crowded with wrongdoers and dangerous incidents (e.g., shootings, attacks from drug addicts) that hinder and can suppress children and young people’s trips. Places with those qualities are common in deprived areas and do not exist in the wealthy Santiago. Lastly, and in wealthy areas of the city, transport infrastructure and open public spaces are believed to attract outsiders who can represent a risk for children.

Key finding: streets designed for vehicles hinder children’s trips

London and traffic-related anxieties

The analysis indicated that streets designed for fast movement of vehicles increase children, young people and carers’ fears of road accidents. These results are similar to those reported by Waygood *et al.* (2017) and others (Timperio *et al.*, 2006; Panter *et al.*, 2010a; Palma *et al.*, 2020). In London, wide and busy streets (i.e., three or more vehicle lanes) and junctions with more traffic volume and higher vehicle speeds that can accommodate large vehicles increase carers’ fears and concerns. Like Evenson *et al.* (2006) report, the data indicate that streets with such features are also linked to congested, polluted and noisy spaces which are hostile and distracting to children. Strategies to deal with traffic-related anxieties include detours and the creation of routes that link less busy streets.

Quiet and calm roads that have one or two vehicle lanes and permit parking on the road reduce traffic-related fears, but are also associated with a higher risk of being assaulted or harmed and fewer possibilities of finding people that can assist a child or young person in need. Those streets may have physical modal filters (e.g., bollards, speed bumps) or local regulations that deter drivers from using local roads, further decreasing carers' concerns. Moreover, carers also indicated that traffic light crossings are more reliable and easier for children requiring fewer skills and maturity compared to other crossing solutions (e.g., dropped kerbs, zebra crossings).

Santiago, lack of pedestrian space and reckless behaviours

Due to the disproportionate space dedicated to car lanes in the streets of Santiago (Herrmann-Lunecke *et al.*, 2021), travelling in the streets of the city occurs many times in narrow footpaths which, in deprived areas, are often occupied by parked cars. This issue consistently emerged in the data and forced children to occupy car lanes despite the risks it entails. Furthermore, participants from deprived and well-off areas indicated that children and young people's mobility is limited by stray cars. Stray cars in wealthy areas of Santiago reflect reckless driving behaviour, increasing carers' anxieties. Meanwhile, in deprived areas, this behaviour is related to drug trafficking and unsafe driving, further strengthening carers' fears.

Key finding: “pleasant” physical features in street environment are preferred for a child to walk unaccompanied and positively influence their trips

Like the findings of Evenson *et al.* (2006) and De Meester *et al.* (2014), the attribute of the built environment *well-kept footpaths* was preferred in the ratings and positively influences children and young people's unaccompanied walking trips in both cities according to the discrete choice models. *Greenery* attributes were also preferred according to the ratings, yet their influences on children and young people's unaccompanied trips were unclear in some models. This ambivalence may suggest that those attributes are somewhat desirable in isolation, but are less appreciated in environments where other more significant determinants (e.g., *off-licenses*, presence of individuals *drinking alcohol*) are present. The *quality of footpaths* in Santiago emerged as one of the most relevant attributes of a street environment in the rankings, indicating that pedestrian infrastructure is still an unresolved issue. As expected, the attributes *dirty footpaths* (both cities) and *no greenery* (Santiago) negatively influence children and young people's unaccompanied walking trips in the models.

Key finding: young people and boys prefer attributes of the built environment that enrich their travelling experience

For children, the influence (discrete choice models) of well-kept footpaths, greenery attributes and urban amenities featuring a playground in both cities on their unaccompanied trips is positive and more relevant than it is for carers (Chapter 7). The relevance, preference and influence of those attributes, however, vary according to children's gender and age. In detail, *well-kept footpaths*, greenery and urban amenities featuring *a playground* influence more boys than girls. Likewise, boys tended to prefer more those attributes than girls. In both cities, young people prefer more than children the attributes *well-kept footpaths* and urban amenities featuring *a playground*. The influence of those attributes on unaccompanied trips is also more significant among young people. In Santiago, the quality of the footpaths ranked high among boys and carers of boys. Carers tended to replicate those patterns as the influence of *well-kept footpaths*, greenery and urban amenities attributes is more significant among carers of boys or young people than carers of girls or children.

Key finding: the conditions of the footpaths are more relevant among girls, children and their carers

In London, the preference in the ratings of the attribute *dirty footpaths* is more negative among carers of girls than carers of boys. In Santiago, the influence of *vehicles parked on the footpath* for is more negative for girls than it is for boys. In the same city, *dirty and neglected footpaths* and *vehicles parked on the footpath* are disliked and have a greater negative influence on children.

Key finding: the attributes of the built environment that attract a diversity of people or that can be enjoyed by children are preferred for children's unaccompanied walking trips

The attributes of the built environment *a playground* and *a bus stop* (both cities), *a pub* (only in London), *permeable fences*, *a school* and *local shops* (only in Santiago) have a positive influence on children and young people's unaccompanied walking trips according to the models. Street environments with urban amenities (London) and facilities (Santiago) were among the most relevant attributes in the ratings of the cities.

The attributes *medium density houses*, *low density houses* or *a variety of shops* are preferred in the ratings of London, whereas *a variety of shops and a pub* and *no presence of facilities* are neither positive nor negative. Moreover, the influence of all those attributes on children and young people's unaccompanied trips is unclear in the models. In the ratings of Santiago, the attributes *permeable fences* are neither positive nor negative; yet the

influence of the attribute *permeable fences* on children and young people's unaccompanied is positive in the models. This may suggest that natural surveillance may encourage unaccompanied trips, yet depending on other aspects of the environment. Lastly, the attributes *an off-licence* and *vehicles parked on the footpath* have a negative influence on children and young people's unaccompanied walking in the models of Santiago. Conversely, the attribute *no vehicles parked on the footpath* is frequently preferred in the ratings of Santiago as it may indicate that the footpaths are available for children.

Key finding: facades are relevant for children, but only in Santiago

The facades attributes *permeable fences* (Santiago) are preferred in the ratings and influence more children than carers. Those are significant in Santiago and were consistently represented as part of a repertoire of features that children and carers employed to infer the health of the communities and the risks that could be present in the public space.

Key findings: young people and boys like attributes that provide connectivity

The attribute *a bus stop* influenced more young people and boys than carers and girls. The mismatch between children and carers' views may indicate different interpretations of the impacts of the attribute. For carers, *a bus stop* can be linked with the presence of strangers. Meanwhile, for young people and boys, this feature can represent an opportunity to travel and reach distant places.

Key finding: the attributes associated with safe and slow traffic are preferred for children and young people to walk unaccompanied

The ratings and models from both cities indicated that the attributes *zebra crossings* (compared to *dropped kerbs*), *one-way traffic* and *car traffic only* positive influence unaccompanied walking trips, suggesting that those features are priorities for carers and children. Additionally, crossing facilities (*signalised* and *zebra crossings*) emerged as one of the most relevant attributes in the rankings of London.

Key finding: lighter traffic and crossing facilities are preferred by carers and young people

Crossings in a street environment in London are among the most relevant attributes (ranking) for carers of children of any age range. The evidence also shows that the street junction attributes *one-way traffic*, *car-traffic only* and *zebra crossings* (both cities) and *signalised crossings* (London) are preferred in the ratings and positively influence young people and the carers of young

people. Likewise, the attributes *one-way traffic* and *car-traffic only* negatively influence children and carers of children.

8. 4. On the features of the social environment that influence children's unaccompanied trips (objectives 3, 4 and 5)

Chapter 5 reported and discussed the aspects of the social environment considered relevant for trips completed by children according to interviews. The data indicated that the aspects of the social environment tended to influence the perception of safety and, therefore, emerged as matters that can (i) determine the permissions and licences granted to children and (ii) shape their travel behaviour.

In chapters 6 and 7, the quantitative analyses provided evidence of the diverse impacts of the social aspects of the environment on children and young people's unaccompanied trips. The rating and ranking analyses showed the preference and relevance of each attribute of the social environments. Meanwhile, the discrete choice models revealed the importance of a given feature in a complex street environment.

Key finding: the presence of deviant strangers affects carers, young people and children's perceptions of safety

The main threat to children and young people's unaccompanied mobility that emerged in the analysis of the qualitative data is "the stranger" that can try to engage in unwanted interactions (e.g., offer candies), purposely cause harm (e.g., assault) or trigger an incident (e.g., shootings) that can put the life of the child and young person at risk. In line with the "stranger danger" identified by other scholars (Moran *et al.*, 1997; O'Brien *et al.*, 2000; Gough and Franch, 2005; Suess *et al.*, 2020), the potentially dangerous individuals were consistently characterised as those whose behaviour and appearance do not fit in the expected normality.

London and intimidating behaviours

In London, strangers' behaviours that disturb passers-by (e.g., loitering, screaming, begging, talking to oneself) are signs of danger. Other frequent activities such as drinking alcohol are regarded as potentially dangerous if combined with actions like staring at passers-by. As many scholars have demonstrated (Valentine, 2008; Day and Wager, 2010; Horton *et al.*, 2014), teenagers are a group of concern for carers, young people and children because they can intimidate (e.g., bullying) or harm (e.g., assault with knives) an unaccompanied person. Strategies to prevent undesirable encounters

include an adult accompanying a child and detours to avoid streets where “gangs of teenagers” gather. The presence of other children, older women and families in the public space and adults wearing uniforms provide safety as they can support a child or and young person in distress. In fact, carers advise children and young people to look for help preferably from women reproducing the belief that females are less threatening and more sensitive than men concerning a child in trouble. This has been also observed by Milne (2009).

Deprived areas of Santiago and social decay

As observed in the data and the available literature (Figueroa *et al.*, 2019), deprived areas in Santiago are experiencing a process of social decay (e.g., weakening of the local community, presence of hostile strangers) that diminishes the support that a child and young person could have when travelling alone. For carers, young people and children, this social decay is part of their normality and features drug consumption, street fights, shootings, stray bullets, other conflicts related to trafficking and suspicious behaviours like lingering in the public space “for no reason.” Children and young people avoid places where “deviant” individuals are believed to gather by making detours, travelling accompanied by adults, or suppressing trips. The presence of acquaintances in the public space (e.g., close relatives, recurrent visitors, shopkeepers, customers) can secure the places for children and young people and somewhat counteract the impacts of drug trafficking and other social issues.

Wealthy areas of Santiago and outsiders

The analysis of the data indicated that the clear patterns of segregation from which Santiago suffers (Sabatini, 2000; Hidalgo, 2007) have created “wealthy bubbles” where the strangers that limit children and young people’s outdoor activities are those who come from other parts of the city. Those “outsiders” raise concerns and are considered potentially dangerous if their actions are deviant (e.g., wait at a bus stop). To secure and control the public and private spaces, carers from wealthy areas rely on direct (e.g., nannies, guards) and indirect (e.g., CCTV) surveillance services. Like in London, the presence of children, women, older persons and individuals wearing uniforms increase carers’ and children’ perception of safety.

Key finding: carers, young people and children profile strangers according to their looks

Clothes and physical aspects are interpreted as signs of potential threats. In London, people wearing “generic” clothes (e.g., jeans) and accessories

are categorised as “normal”, those dressed in colourful clothes are more likely to be wealthy and not represent a threat, and those wearing dirty or damaged clothes may represent a risk. In wealthy areas of Santiago, body modifications and dark skin tones fit the stereotype of an outsider, raising apprehensions. Fears decrease if the strangers are wearing uniforms (e.g., guard, nanny), formal or sports outfits. In deprived areas of Santiago, potentially dangerous strangers wear clothes linked to drug trafficking and consumption (e.g., expensive shoes from popular brands, sportive trousers, tops, and T-shirts, big earrings, caps).

Key finding: a cohesive and visible community can encourage unaccompanied trips

As numerous works have reported (Prezza *et al.*, 2001; Mikkelsen and Christensen, 2009; Wolfe and McDonald, 2016; Crawford *et al.*, 2017), the analysis showed that a well-known and cohesive community can facilitate unaccompanied trips in multiple forms. A community that is present in the public space secures the places for children and young people (“eyes on the street”) and, through social interactions and encounters, provides them opportunities to build self-confidence and assimilate social norms and codes (respect others’ personal space). Likewise, the data indicated that strangers who have predictable behaviours can secure a place for children if it is also under the surveillance of members of the community.

Key finding: the attributes associated with “nice” strangers and activities on the streets are preferred for children and young people’s unaccompanied walking trips

Strangers’ age and activities in both cities are among the most relevant attributes in the ratings of both cities. The social attribute other *children* was largely preferred by carers, children and young people from London and also has a positive influence on children and young people’s unaccompanied walking trips in the models of the same city. However, in Santiago, the attribute other *children* has a negative influence on unaccompanied trips. The social attribute *elderly people* is preferred in the ratings of London and is neutral in Santiago. Likewise, the attribute strangers *chatting* influence on walking unaccompanied is positive in Santiago’s models, yet is not frequently preferred in the ratings. Although the qualitative data do not provide enough evidence to understand these results of Santiago, some authors (Figueroa *et al.*, 2019) suggests it may be related to people not expecting to find others in the streets of residential neighbourhoods of the city because “hard-working” people stay inside their houses. In the words of those authors, those who linger outside have bad habits or engage in illicit activities like trafficking.

The influence of *strangers chatting* in London and *strangers walking* in both cities on children's unaccompanied trips is unclear in the models. In the ratings of London, those attributes are frequently preferred by carers and children. In the ratings of Santiago, the attribute *strangers walking* is neutral.

Key finding: young people and boys prefer attributes that create lively environments

The influence of the attributes (discrete choice models) other *children* and *strangers walking* (both cities) and *strangers chatting* (London) on the streets is more positive among children and young people than carers. Those attributes also have a stronger positive influence on boys and carers of boys than girls and carers of girls. In Santiago, the influence of the attributes other *children* and *strangers chatting* is also positive and more significant among male young people. In both cities, the positive influence and preference of the facilities attributes featuring *shops* is greater among boys and carers of boys than it is among girls and their carers. Likewise, the positive influence of the attributes *a variety of shops* (London) and *a school* (Santiago) is more relevant among and young people than carers.

Key finding: hostile strangers and related activities negatively influence children and young people's unaccompanied trips

The models indicated that the social attribute *strangers drinking alcohol* in the streets has a negative influence on children and young people's unaccompanied walking trips. This activity and others were among the most relevant attributes in the rankings. The social attributes *teenagers* in London, *adults* and *male* strangers in Santiago also have a negative influence on unaccompanied trips according to the models. Furthermore, when evaluated in the ratings, *teenagers* and *adults* in London were considered positive attributes in a street environment. Meanwhile, *teenagers*, *adults* and *male* stranger in Santiago were considered neither positive nor negative. The apparent contradiction may suggest the influences of those groups are highly contextual and, according to the environment, can be either "passive" guardians of the public space or individuals who can intimidate or harm children, as also suggested by Mikkelsen and Christensen (2009) regarding teenagers.

On the contrary, the social attribute *a female stranger* was preferred in the ratings of Santiago, supporting the findings of several authors (Milne, 2009; Francis *et al.*, 2017).

Key finding: carers and girls dislike individuals and features that can create hostile environments

The influence (discrete choice models) of the attributes *teenagers* (both cities), *adults* and *strangers drinking alcohol* (Santiago) on the streets is negative for carers and more significant than it is for children and young people. Facilities associated with alcohol consumption, such as *a pub* (London) and *an off-licence* (Santiago), also influenced more negatively the preferences of carers than those of children and young people.

The influence of the attributes mentioned above (i.e., *adults* and *strangers drinking alcohol* for both cities; *teenagers* and *male* strangers for Santiago) is also more negative among girls and carers of girls than it is among boys and carers of boys. The attributes *a pub* (London) and *an off-licence* (Santiago) follow an equivalent pattern and affect more girls and carers of girls. In addition, strangers' activities emerged as one of the most relevant groups of attributes in the ranking of girls from Santiago. Moreover, the convergence between girls and carers' preferences may support the conclusions reached by Saraví (2014). This author indicates that the transmission of fears from carers to children tends to be a phenomenon more present in girls' development.

The attributes of *a pub* and *strangers drinking alcohol* (both cities) and *teenagers*, *adults* and *male* strangers (Santiago) have a more negative influence on children and their carers than young people and carers of young people. Interestingly, the influence of *teenagers* in London is positive among children. Children may see teenagers as "examples", suggesting that the dangers posed by teenagers are fears that emerged in late childhood.

Key finding: the impacts of the attributes associated with busy areas on children and young people's unaccompanied walking trips are unclear

In London, *crowded footpaths* negatively influence children and young people's unaccompanied walking trips in the models, yet the attribute is neutral in the ratings. Moreover, carers, young people and children preferred *uncrowded footpaths* in the ratings, suggesting that the difficulties and risks of travelling among many people are more relevant than the "eyes on the streets" that a crowd could provide.

8. 5. Summary and final remarks

Throughout this final chapter, I have reported the findings of this research which sought to investigate how and why the built and the social environments

influence children's unaccompanied trips in London and Santiago. These findings were obtained from a mix-methods sequential methodology that involved two data collections. First, a qualitative data collection in which children and carers who resided in London (United Kingdom) and Santiago (Chile) were invited to converse in a semi-structured interview with visual prompts. Second, a quantitative questionnaire with a variety of questions (stated preferences, rating scales, ranking) about the environmental features that children and carers think are the best for unaccompanied walking trips.

Like the literature suggests (Valentine, 1997a; Horton *et al.*, 2014), the results of the qualitative data collection indicated that children's trips are constrained by carers' apprehensions and suggested that walking is the most frequent form of travelling unaccompanied. Moreover, the qualitative findings showed that the built environment influences unaccompanied children's trips in at least four ways. Landmarks are navigation aids, several aspects of the urban environment enrich (or worsen) children's travel experience, others are cues from which people infer the social qualities of the places, whereas traffic-related features influenced the fear of being involved in an accident. The quantitative data indicated that the influences of the attributes of the built environment are heterogeneous. Traffic-related attributes influenced more the preferences of carers and older children. Features associated with better travel experiences were more relevant among boys and older children. Meanwhile, features linked to the security of the places were much more relevant for girls and their carers. The social environment influenced carers and children's perception of safety in complex ways and was often represented as one of the most relevant factors in the decision process that could lead to an unaccompanied trip.

The data collected provide strong evidence about the intertwined influences of the built and the social environments on children's trips. Children and carers inferred the social qualities of a place from the features of the built environment and indicated that some attributes are signs of the occurrence of certain activities (e.g., places with impermeable facades are more likely to be taken by wrongdoers). Likewise, carers and children consistently suggested that some activities are more likely to happen in places that have particular physical arrangements (e.g., strangers are more likely to be in streets with bus stops).

The insights of this research demonstrated that children's voices do not necessarily coincide with those of their carers. Differences between their opinions and preferences were observed in both data collection, but tended to be more evident in the questionnaire than in the interviews.

Carers accompanied their children during the interview which may have pressured children to elaborate “acceptable” answers. On the contrary, carers were asked to leave children alone during the online questionnaire. Such differences may suggest that those methods in which the children feel supervised can be seen as “opportunities” to demonstrate that they are aware of the apprehensions of the carers and the risks that are present in the city.

The analysis of the data frequently showed gender differences. Although the study of the transition from childhood to adulthood was not part of the aims of the thesis, this change seems to occur among fears that are systematically (re)produced. Distinctive strategies should be set in place to enrich girls’ travelling experience and multiply the benefits that, in the current context, seem to be benefiting disproportionately more their male peers.

Lastly, the thesis investigated Santiago de Chile, a vastly unexplored setting. The evidence showed that the socio-spatial segregation and the profound disparities that are present in the city and other metropolises of Latin America affect children’s development and seem to be the starting point of further inequalities. It is urgent to “level the field” for children and provide equal access to the available opportunities.

8. 6. Policy recomendations

Although policy is not directly addressed in this research, the findings the findings detailed in Chapter 5, Chapter 6 and Chapter 7 suggest a few relevant lines of work that could encourage and facilitate children and young people’s unaccompanied trips.

In London, the data indicates that policies and programs should care about the conditions of the footpaths. Well-kept footpaths was the aspect of the built environment that had the most significant positive influence on children and young people’s unaccompanied trips. Programs and policies should also put attention to greenery and vegetation in general. Such elements have less significant impacts on unaccompanied trips but greatly improve the experience of travelling alone. The creation of “calm” routes can have a positive influence on young people because the data indicated that busy places and facilities that attract people (e.g., bus stops) can discourage their unaccompanied trips. Those routes, yet also free of services that multiply the uncertainties (e.g, shops and pubs), can also encourage unaccompanied trips among children and reduce the apprehensions of their carers.

In Santiago, programs and policies should also focus on footpaths. The condition of the footpath was consistently the most relevant aspect for children and young people from Santiago; it emerged in positive (e.g., well-kept footpaths) and negative (e.g., dirty and neglected footpaths, footpaths occupied by parked cars) forms. Likewise, the provision of green spaces and playful spaces across the cities and not only in segregated spaces could make children and young people's travels a more enjoyable experience and enrich their development in the long term. Moreover, the data suggested that, for young people from Santiago, the key is being visible. In this regard, policies should ensure that the streets have "eyes" either placing urban and transport facilities (schools, local shops, bus stops) in critical points of the neighbourhoods or promoting the construction of permeable fences. All the measures described above should also prioritise the deprived neighbourhoods of the city and could, to some degree, ameliorate the impacts that the inequality from which the city suffers has on the lives of children and young people.

The data showed, however, that the built environment is not enough to encourage unaccompanied walking trips. Further efforts are needed to strengthen the communities and increase familiarity to create safer spaces are needed to diminish the rampant perception of insecurity.

In London, unaccompanied walking trips are discouraged mostly by strangers drinking alcohol, crowds and teenagers for children and young people and their carers. Other children and adults also can discourage such trips, but their influence is smaller. In Santiago, a similar pattern is observed regarding strangers drinking alcohol, teenagers and male strangers, yet the presence of other children on the street has a positive influence. That evidence suggests that policies and programs in London should build trust between different generations of people and look for measures to deal with the concerns associated with crowded places. In Santiago, strategies should build bridges between the bubbles of wealth and the rest of the city and should break the wicked circle of deterioration and insecurity in which the deprived neighbourhoods seem to be trapped. Lastly, all those strategies should, in both cities, be accompanied by measures to raise awareness of the relevance that society has in the development of children and future generations.

8. 7. Methodological contribution

This research employed a novel approach to investigate children and young people's views about the built and social environments and their unaccompanied trips. It featured an original semi-structured interview with pictorial activities and a questionnaire with a range of tasks that, to the author's knowledge, were tested for the first time in this thesis.

In detail, the pictorial activities were used to enrich both qualitative and quantitative methods. In the semi-structured interviews, cognitive mapping helped young people, and children in particular, to remember the trips they complete in their everyday lives. Photographs were also used during the interview. Those prompts notoriously enriched the conversation with children, young people and their carers—and were especially helpful to talk about the built environment, which was often more difficult to describe for the participants. During the last decades, quantitative methods and stated preference experiments have employed images to help participants to understand the studied built environment attributes and reduce the mental burden. However, to the researcher knowledge, such prompts have not been used to understand the travel preferences of children and young people on complex street environments. The images, in general, worked well but were challenging for children between eight and nine years old who often required the assistance of an adult.

Additional learnings were acquired due to the challenges of gathering data in two different countries. The instruments were adapted to two contexts and were written simultaneously in Spanish and English; languages that have distinctive structures of meaning and a variety of words that seem equivalent but have different connotations. Moreover, the culture of the countries is also different, with Chilean participants being particularly collaborative even during the worst times of the COVID-19 pandemic. Moreover, the instruments also were adapted to children. Most of the questions were phrased in simple forms and were adjusted with the help of teachers from both countries. Meanwhile, several activities (e.g., pictorial activities) were included with the purpose of keeping children interested and entertained.

Lastly, the work presented in this thesis showed that qualitative and quantitative techniques are highly complementary. On the one hand, the qualitative methods provided evidence to explore in deep the children and young people's mobilities and the complex forms in which the built and the social environments shape them. On the other, the quantitative methods provided details and were particularly useful to isolate the impacts of the

features of the environments on the different groups (e.g., children, young people, carers). Both types of methods enriched this research and helped the researcher to acquire a profound understanding of the researched matters.

8. 8. Limitations

This research has several limitations. As mentioned earlier, the presence of carers during the interviews may have altered the children's responses. Likewise, the presence of the researcher could have strengthened the issue. Due to the large amounts of collected data in the qualitative stage (i.e., interviews, children's schedules and drawings, carers' maps) and quantitative stage (i.e., questionnaire data), some topics were not explored in depth despite their potential relevance. Such aspects include the contrasting narratives of the participants living in areas with different levels of deprivation and the differences between the choices, ranking and ratings of people living in wealthy and deprived areas.

The recruitment method was potentially biased. The "snowball" recruitment employed in the qualitative stage was limited to the gatekeepers and the researcher's networks, and some groups could be underrepresented. This issue also may have affected the quantitative stage recruitment as the participants were contacted mainly through a panel and schools that may not represent the overall characteristics of the cities. The questionnaire was also virtual and therefore required abilities and devices that are not accessible to all. Moreover, some tasks of the questionnaire (quantitative stage), particularly those implying hypothetical situations, require further reflection to understand in depth their limitations and implications.

Lastly, the quantitative stage was designed for—and in—a pre-pandemic world. The COVID-19 pandemic restricted the recruitment of participants and transformed the strategy designed beforehand. The pandemic may also have a significative effect on the analysis of some categories. The category "children's last trip" was not explored in depth because that journey, in some cases, occurred six months before the data collection due to the restrictions enforced to control the spread of the disease.

8. 9. Further research

This research aimed to investigate the relationship between the built and the social environment and children's unaccompanied trips. More research is required to understand how the structure of the families and their dynamics

influences children and young people's travel patterns and routines. This issue emerged in the qualitative data but was not explored in depth. The data gathered with the questionnaires could be further analysed to understand the Average Marginal Effects according to the conditions of the neighbourhoods where the participants live (e.g., deprived/affluent). Additionally, other versions of the discrete choice models could be produced by combining the data from all the stated preference tasks or including the rating task data to account for the individual influence of the attributes in the models.

More research is required to translate this research findings into public policy. Those projects should be accompanied by interviews with policy makers that could provide insights to adapt the findings into local strategies to encourage children's unaccompanied trips. Moreover, more research is needed to understand gender differences and the mechanism that could break the vicious cycles that affect them and seem to start in childhood. Likewise, more research is also needed to untangle the umbrella concept of "stranger danger".

Other contexts should be also explored. In this thesis, I studied large metropolises, but the findings may vary greatly in cities of different size and scale. Studies should also focus on other countries in Latin America where children are still an understudied group. Particularly in Santiago, this research focused on two social extremes (wealthy and deprived areas), but it is not clear how children's experiences differ in middle-income neighbourhoods. Lastly, further research is required to understand the short and long-term impacts of the COVID-19 pandemic on children's mobilities.

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Chapter 9. References

- Aarts, M. J., Mathijssen, J. J., van Oers, J. A. & Schuit, A. J. (2013). Associations between environmental characteristics and active commuting to school among children: a cross-sectional study. *International journal of behavioral medicine*, 20(4), 538-555.
- Adkins, A., Makarewicz, C., Scanze, M., Ingram, M. & Luhr, G. (2017). Contextualizing walkability: Do relationships between built environments and walking vary by socioeconomic context?. *Journal of the American Planning Association*, 83(3), 296-314.
- Ahern, S. M., Arnott, B., Chatterton, T., de Nazelle, A., Kellar, I. & McEachan, R. R. (2017). Understanding parents' school travel choices: A qualitative study using the Theoretical Domains Framework. *Journal of Transport and Health*, 4, 278-293.
- Ahlport, K. N., Linnan, L., Vaughn, A., Evenson, K. R., & Ward, D. S. (2008). Barriers to and facilitators of walking and bicycling to school: formative results from the non-motorized travel study. *Health Education & Behavior*, 35(2), 221-244.
- Alderson, P. (2013). *Childhoods, real and imagined. Vol. 1, An introduction to critical realism and childhood studies*. London; New York: Routledge.
- Alderson, P. (2016). *The politics of childhoods real and imagined. Vol. 2, Practical application of critical realism and childhood studies*. London: Routledge.
- Alderson, P., & Morrow, V. (2012). *The ethics of research with children and young people: A practical handbook*. SAGE Publications Ltd.
- Allen, K. & Marotz, L. (2009). *Developmental profiles: Pre-birth through twelve*. Wadsworth, US: Cengage Learning.
- Alonso Plá, F. M., Esteban Martínez, C., Calatayud Miñana, C., Medina Sarmiento, J. E., Montoro González, L., & Egido Portela, Á. (2003). *Formación y educación vial: Una visión a partir de algunas prácticas internacionales*.
- Alton, D., Adab, P., & Roberts, L. (2007). Relationship between walking levels and perceptions of the local neighbourhood environment. *Archives of Disease in Childhood*, 92, 29-33
- Appleyard, D., Gerson, M. & Lintell, M. (1981). *Livable streets, protected neighborhoods*. California: University of California Press.
- Arentze, T., Borgers, A., Timmermans, H., & DelMistro, R. (2003). Transport stated choice responses: effects of task complexity, presentation format and literacy. *Transportation Research Part E: Logistics and Transportation Review*, 39(3), 229-244.
- Ariès, P., and Baldick, R. (1962). *Centuries of childhood: A social history of family life*. New York: Vintage Books.

- Armstrong, N. (1993). Independent mobility and children's physical development. In M. Hillman (Ed.), *Children, transport and the quality of life*, (35-43). London: Policy Studies Institute.
- Ayllón, E., Moyano, N., Aibar-Solana, A., Salamanca, A., & Bañares, L. (2021). Independent mobility to school and Spanish children: go, return, or both?. *Children's Geographies*, 19(1), 59-73.
- Banerjee, T., & Lynch, K. (1977). *Growing up in cities: studies of the spatial environment of adolescence in Cracow, Melbourne, Mexico City, Salta, Toluca, and Warszawa*. Cambridge, Mass.: MIT Press; Paris: UNESCO.
- Banerjee, U. & Hine, J. (2014). Identifying the underlying constructs linking urban form and travel behaviour using a grounded theory approach. *International Journal of Environmental Science and Technology*, 11(8), 2217-2232
- Barker, J. (2009). 'Driven to distraction?': Children's experiences of car travel. *Mobilities*, 4(1), 59-76.
- Barker, J. (2011). 'Manic Mums' and 'Distant Dads'? Gendered geographies of care and the journey to school. *Health & place*, 17(2), 413-421.
- Barker, J., Kraftl, P., Horton, J., & Tucker, F. (2009). The road less travelled—new directions in children's and young people's mobility. *Mobilities*, 4(1), 1-10.
- Barnett, E., & Casper, M. (2001). A definition of "social environment". *American journal of public health*, 91(3), 465-470.
- Baslington, H. (2008). Travel socialization: A social theory of travel mode behavior. *International journal of sustainable transportation*, 2(2), 91-114.
- BBC (2022, May 3). *Covid: What is the guidance across the UK now?* <https://www.bbc.com/news/explainers-52530518>
- Ben-Akiva, M. & Lerman, S.. (1985). *Discrete choice analysis: theory and application to travel demand*. Cambridge, Massachusetts; London, England :MIT press.
- Benediktsson, M. O. (2018). Where Inequality Takes Place: A Programmatic Argument for Urban Sociology. *City & Community*, 17(2), 394-417.
- Benwell, M. (2013). Rethinking conceptualisations of adult-imposed restriction and children's experiences of autonomy in outdoor space. *Children's Geographies*, 11(1), 28-43.
- Berends, L. & Johnston, J. (2005). Using multiple coders to enhance qualitative analysis: The case of interviews with consumers of drug treatment. *Addiction Research & Theory*, 13(4): 373-381.
- Bostock, L. (2001). Pathways of disadvantage? Walking as a mode of transport among low income mothers. *Health & social care in the community*, 9(1), 11-18.
- Bourke, J. (2017). Children's experiences of their everyday walks through a complex urban landscape of belonging. *Children's geographies*, 15(1), 93-106.
- Boynton-Jarrett, R., Ryan, L., Berkman, L., & Wright, R. (2008). Cumulative violence exposure and self-rated health: longitudinal study of adolescents in the United States. *Pediatrics*, 122(5), 961-970.

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- Brace, I. (2008). *Questionnaire design: How to plan, structure and write survey material for effective market research*. London; Kogan Page Publishers.
- Bradley, M., & Daly, A. (1994). Use of the logit scaling approach to test for rank-order and fatigue effects in stated preference data. *Transportation*, 21(2), 167-184.
- Braun, V. & Clarke, V. (2006). Using thematic analysis in psychology. *Qualitative research in psychology*, 3(2), 77-101.
- Brighton Analytics Limited (2022). *Greater London Crime Statistics. CrimeRate*.
- Brown, B., Mackett, R., Gong, Y., Kitazawa, K. & Paskins, J. (2008). Gender differences in children's pathways to independent mobility. *Children's Geographies*, 6(4), 385-401.
- Browne, K. (2005). Snowball sampling: using social networks to research non-heterosexual women. *International journal of social research methodology*, 8(1), 47-60.
- Bwire, H. (2011). Children's independent mobility and perceptions of outdoor environments in Dar Es Salaam City, Tanzania. *Global Studies of Childhood*, 1(3), 185-206.
- Carroll, P., Witten, K., Kearns, R., & Donovan, P. (2015). Kids in the City: children's use and experiences of urban neighbourhoods in Auckland, New Zealand. *Journal of urban design*, 20(4), 417-436.
- Carroll, P., Witten, K., Smith, M., Egli, V., Mavoa, S., & Kytta, M. (2021). Conducting Research with Children, Ethically and Effectively, to Inform Public Policy. In *Ethics and Integrity in Research with Children and Young People*. Emerald Publishing Limited.
- Carver, A., Panter, J. R., Jones, A. P., & van Sluijs, E. M. (2014). Independent mobility on the journey to school: A joint cross-sectional and prospective exploration of social and physical environmental influences. *Journal of Transport & Health*, 1(1), 25-32.
- Carver, A., Timperio, A., & Crawford, D. (2008). Playing it safe: The influence of neighbourhood safety on children's physical activity—A review. *Health & place*, 14(2), 217-227.
- Carver, A., Timperio, A., & Crawford, D. (2012). Young and free? A study of independent mobility among urban and rural dwelling Australian children. *Journal of science and medicine in sport*, 15(6), 505-510.
- Carver, A., Timperio, A., & Crawford, D. (2013). Parental chauffeurs: what drives their transport choice? *Journal of Transport Geography*, 26, 72-77.
- Carver, A., Timperio, A., Hesketh, K., & Crawford, D. (2010). Are children and adolescents less active if parents restrict their physical activity and active transport due to perceived risk?. *Social science & medicine*, 70(11), 1799-1805.
- Carver, A., Veitch, J., Sahlqvist, S., Crawford, D. & Hume, C. (2014). Active transport, independent mobility and territorial range among children residing in disadvantaged areas. *Journal of Transport and Health*, 1(4), 267-273.

- Caussade, S., de Dios Ortúzar, J., Rizzi, L. I. & Hensher, D. A. (2005). Assessing the influence of design dimensions on stated choice experiment estimates. *Transportation research part B: Methodological*, 39(7), 621-640
- CChC & PUC (2019). *Índice de Calidad de Vida urbana 2019*.
- Cervero, R., & Kockelman, K. (1997). Travel demand and the 3Ds: Density, diversity, and design. *Transportation Research Part D: Transport and Environment*, 2(3), 199-219.
- Cervesato, A., & Waygood, O. (2019). Children's independent trips on weekdays and weekends: case study of Québec City. *Transportation research record*, 2673(4), 907-916.
- Children's commissioner (2020). *School return: Covid-19 and school attendance*.
- ChoiceMetrics (2018). *Ngene 1.2: User Manual & reference guide*.
- Christensen, P., & Cortés-Morales, S. (2017). Children's mobilities: Methodologies, theories, and scales. *Movement, Mobilities and Journeys*, 6, 13-4.
- Christensen, P., Hadfield-Hill, S., Horton, J., & Kraftl, P. (2017). *Children living in sustainable built environments: new urbanisms, new citizens*. Routledge.
- Christensen, P., & Mikkelsen, M. R. (2013). 'There is Nothing Here for Us..!' How Girls Create Meaningful Places of Their Own Through Movement. *Children & Society*, 27(3), 197-207
- Christensen, P., & O'Brien, M. (2003). *Children in the city: Home neighbourhood and community*. London: Routledge Falmer.
- Christian, H. E., Klinker, C. D., Villanueva, K., Knuiman, M. W., Foster, S. A., Zubrick, S. R., ... & Giles-Corti, B. (2015). The effect of the social and physical environment on children's independent mobility to neighborhood destinations. *Journal of physical activity and health*, 12(s1), S84-S93.
- Cooper, A. R., Wedderkopp, N., Wang, H. A. N., Andersen, L. B., Froberg, K. & Page, A. S. (2006). Active travel to school and cardiovascular fitness in Danish children and adolescents. *Medicine and science in sports and exercise*, 38(10), 1724-1731.
- Corporate Research Unit (2018). *Household Income 2018*.
- Correa (n.d.). *Grupos socioeconómicos predominantes por manzana 2012. Área Metropolitana de Santiago*. Fundación Vivienda
- Cortés-Morales, S. (2021). Bracelets around their wrists, bracelets around their worlds: materialities and mobilities in (researching) young children's lives. *Children's Geographies*, 19(3), 364-376.
- Cosco, N. & Moore, R. (2002). Our neighbourhood is like that!. In L. Chawla (Ed.), *Growing up in an urbanising world*, (35-56). London: Earthscan.
- Costa, F. F., Silva, K. S., Schmoelz, C. P., Campos, V. C., & de Assis, M. A. (2012). Longitudinal and cross-sectional changes in active commuting to school among Brazilian schoolchildren. *Preventive Medicine*, 55(3), 212-214.
- Crawford, S. B., Bennetts, S. K., Hackworth, N. J., Green, J., Graesser, H., Cooklin, A. R., Matthews, J., Strazdins, L., Zubrick, S. R., D'Esposito, F., & Nicholson,

- J. M. (2017). Worries, 'weirdos', neighborhoods and knowing people: a qualitative study with children and parents regarding children's independent mobility. *Health & place*, 45, 131-139.
- Creswell, J. (2014). *Research design: Qualitative, quantitative, and mixed methods approaches* (4th ed.). London: SAGE.
- Dammert, L., & Malone, M. F. T. (2003). Fear of crime or fear of life? Public insecurities in Chile. *Bulletin of Latin American Research*, 22(1), 79-101.
- Dávila, J. G., & de Aguiar Arantes, R. (2015). El imaginario urbano del miedo en Latinoamérica: evidencias de estudios en Salvador de Bahía, Brasil, y Monterrey, México. *Temas sociológicos*, (19), 41-69.
- Davison, K. K. & Lawson, C. T. (2006). Do attributes in the physical environment influence children's physical activity? A review of the literature. *International journal of behavioral nutrition and physical activity*, 3(1), 19.
- Davison, K. K., Werder, J. L. & Lawson, C. T. (2008). Peer reviewed: Children's active commuting to school: Current knowledge and future directions. *Preventing chronic disease*, 5(3).
- Day, R., & Wager, F. (2010). Parks, streets and "just empty space": The local environmental experiences of children and young people in a Scottish study. *Local Environment*, 15(6), 509-523.
- De Meester, F., Van Dyck, D., De Bourdeaudhuij, I., & Cardon, G. (2014). Parental perceived neighborhood attributes: associations with active transport and physical activity among 10–12 year old children and the mediating role of independent mobility. *BMC public health*, 14(1), 1-14.
- de Sá, T. H., Garcia, L. M. T., Mielke, G. I., Rabacow, F. M., & de Rezende, L. F. M. (2015). Changes in travel to school patterns among children and adolescents in the São Paulo Metropolitan Area, Brazil, 1997–2007. *Journal of Transport and Health*, 2(2), 143-150.
- Department for Transport. (2021). *National Travel Survey, 2002-2020*. [data collection]. 15th Edition. UK Data Service. SN: 5340, DOI: 10.5255/UKDA-SN-5340-11
- Department for Work and Pensions (2019). *Poverty*.
- Department for Transport (2015). *National Travel Survey 2014: Travel to school*. "
- Directorio de Transporte Público Metropolitano (2020). *Informe de Gestión 2020*. Ministerio de Transporte y Telecomunicaciones.
- Domencich, T. A., & McFadden, D. (1975). *Urban travel demand-a behavioral analysis* (No. Monograph).
- Duarte, A., Garcia, C., Giannarakis, G., Limão, S., Polydoropoulou, A., & Litinas, N. (2010). New approaches in transportation planning: happiness and transport economics. *NETNOMICS: Economic Research and Electronic Networking*, 11(1), 5-32.

- Egli, V., Ikeda, E., Stewart, T. & Smith, M. (2018). Interpersonal correlates of active transport to school. In: Larouche R editors. *Children's active transportation*. Oxford England: Elsevier. p. 115–25.
- Egli, V., Mackay, L., Jelleyman, C., Ikeda, E., Hopkins, S., & Smith, M. (2020). Social relationships, nature, and traffic: Findings from a child-centred approach to measuring active school travel route perceptions. *Children's Geographies*, 18(6), 667-683.
- Eisenlohr, A., Jamme, H., Bahl, D., & Banerjee, T. (2023). The ambivalence of independent mobility: Balancing perceived risks and expected benefits of walking to school in inner-city neighborhoods. *Travel Behaviour and Society*, 31, 49-62.
- Elshater, A. (2018). What can the urban designer do for children? Normative principles of child-friendly communities for responsive third places. *Journal of Urban Design*, 23(3), 432-455.
- Engwicht, D. (1992). *Towards an eco-city: calming the traffic*.
- Ermagun, A., & Samimi, A. (2015). How are children accompanied to school?. *Journal of Urban Planning and Development*, 142(3).
- Evenson, K. R., Birnbaum, A. S., Bedimo-Rung, A. L., Sallis, J. F., Voorhees, C. C., Ring, K., & Elder, J. P. (2006). Girls' perception of physical environmental factors and transportation: reliability and association with physical activity and active transport to school. *International Journal of Behavioral Nutrition and Physical Activity*, 3(1), 1-16.
- Evers, C., Boles, S., Johnson-Shelton, D., Schlossberg, M., & Richey, D. (2014). Parent safety perceptions of child walking routes. *Journal of transport & health*, 1(2), 108-115.
- Ewing, R., & Cervero, R. (2010). Travel and the built environment: A meta-analysis. *Journal of the American planning association*, 76(3), 265-294.
- Faulkner, G. E., Richichi, V., Buliung, R. N., Fusco, C., & Moola, F. (2010). What's" quickest and easiest?": parental decision making about school trip mode. *International Journal of Behavioral Nutrition and Physical Activity*, 7(1), 1-11.
- Figueroa, M. C. & Forray, F. (2015). Movilidad femenina: los reveses de la utopía socio-espacial en las poblaciones de Santiago de Chile. *Revista de Estudios Sociales* (54), 52-67.
- Figueroa, M. C., Hodgson, F., Mullen, C. & Timms, P. (2019). Walking through deprived neighbourhoods: Meanings and constructions behind the attributes of the built environment. *Travel Behaviour and Society*, 16, 171-181.
- Flowerdew, R., & Martin, D. (2005). *Methods in human geography* (2nd ed.). Harlow: Pearson.
- Foster, S., Villanueva, K., Wood, L., Christian, H., & Giles-Corti, B. (2014). The impact of parents' fear of strangers and perceptions of informal social control on children's independent mobility. *Health & place*, 26, 60-68.

-
- Foster, S., Wood, L., Francis, J., Knuiman, M., Villanueva, K., & Giles-Corti, B. (2015). Suspicious minds: Can features of the local neighbourhood ease parents' fears about stranger danger?. *Journal of environmental psychology*, 42, 48-56.
- Fowler, P., Tompsett, C., Braciszewski, J., Jacques-Tiura, A., & Baltes, B. (2009). Community violence: A meta-analysis on the effect of exposure and mental health outcomes of children and adolescents. *Development and psychopathology*, 21(1), 227-259.
- Francis, J., Martin, K., Wood, L., & Foster, S. (2017). 'I'll be driving you to school for the rest of your life': A qualitative study of parents' fear of stranger danger. *Journal of Environmental Psychology*, 53, 112-120.
- Freeman, C. (2010). Children's neighbourhoods, social centres to 'terra incognita'. *Children's Geographies*, 8(2), 157-176.
- Freeman, C. (2019). Twenty-five years of children's geographies: a planner's perspective. *Children's Geographies*, 18(1), 110-121.
- Furneaux, A., & Manaugh, K. (2019). Eyes on the alley: children's appropriation of alley space in Riverdale, Toronto. *Children's geographies*, 17(2), 204-216.
- Fyhri, A., Hjorthol, R., Mackett, R., Fotel, T., & Kyttä, M. (2011). Children's active travel and independent mobility in four countries: Development, social contributing trends and measures. *Transport policy*, 18(5), 703-710.
- Gallimore, J. M., Brown, B. B. & Werner, C. M. (2011). Walking routes to school in new urban and suburban neighborhoods: An environmental walkability analysis of blocks and routes. *Journal of environmental psychology*, 31(2), 184-191.
- Gaziano, C. (2008). Last-birthday selection. In: *Encyclopedia of survey research methods*. 417-418.
- Geddes, A., Parker, C., & Scott, S. (2018). When the snowball fails to roll and the use of 'horizontal' networking in qualitative social research. *International Journal of Social Research Methodology*, 21(3), 347-358.
- Gehl, J. (1987). *Life between buildings: using public space*. New York: Van Nostrand Reinhold.
- Ghekiere, A., Van Cauwenberg, J., Mertens, L., Clarys, P., de Geus, B., Cardon, G., & Deforche, B. (2015). Assessing cycling-friendly environments for children: are micro-environmental factors equally important across different street settings?. *International journal of behavioral nutrition and physical activity*, 12(1), 1-13.
- Giles-Corti, B., Kelty, S.F., Zubrick, S.R., Villanueva, K.P., 2009. Encouraging walking for transport and physical activity in children and adolescents: How important is the built environment? *Sports Med.* 39, 995-1009.
- Giles-Corti, B., Wood, G., Pikora, T., Larnihan, V., Bulsara, M., Van Niel, K., Timperio, A., McCormack, G. & Villanueva, K. (2011). School site and the potential to walk to school: The impact of street connectivity and traffic exposure in school neighborhoods. *Health & place*, 17(2), 545-550.

- Goodman, A., Jones, A., Roberts, H., Steinbach, R., & Green, J. (2014). 'We can all just get on a bus and go': Rethinking independent mobility in the context of the universal provision of free bus travel to young Londoners. *Mobilities*, 9(2), 275-293.
- Gordon (2017). *PSE-UK 2012 Survey Producing an 'objective' poverty line in eight easy steps*. Poverty and Social Exclusion in the UK.
- Gough, K. V., & Franch, M. (2005). Spaces of the street: Socio-spatial mobility and exclusion of youth in Recife. *Children's Geographies*, 3(2), 149-166.
- Gough, S. & Scott, W. (2000). Exploring the purposes of qualitative data coding in educational enquiry: Insights from recent research. *Educational Studies*, 26(3), 339-354.
- Graham, A., Powell, M., Taylor, N., Anderson, D. & Fitzgerald, R. (2013). *Ethical Research Involving Children*. Florence: UNICEF Office of Research - Innocenti.
- Granovetter, M. S. (1973). The strength of weak ties. *American journal of sociology*, 78(6), 1360-1380.
- Greater London Authority (2018). *The Mayor's Strategy for Social Integration*.
- Greater London Authority (2022). *Parks and green spaces*. Mayor of London & London Assembly. <https://www.london.gov.uk/what-we-do/environment/parks-green-spaces-and-biodiversity/parks-and-green-spaces>
- Greene, J. C., Caracelli, V. J., & Graham, W. F. (1989). Toward a conceptual framework for mixed-method evaluation designs. *Educational evaluation and policy analysis*, 11(3), 255-274.
- Greene, M., Mora, R. I., Figueroa, C., Waintrub, N., & Ortúzar, J. D. D. (2017). Towards a sustainable city: Applying urban renewal incentives according to the social and urban characteristics of the area. *Habitat international*, 68, 15-23.
- Grow, H. M., Saelens, B. E., Kerr, J., Durant, N. H., Norman, G. J., & Sallis, J. F. (2008). Where are youth active? Roles of proximity, active transport, and built environment. *Medicine & Science in Sports & Exercise*, 40(12), 2071-2079.
- Hall, L., Hume, C., & Tazzyman, S. (2016, June). Five degrees of happiness: Effective smiley face likert scales for evaluating with children. In *Proceedings of the the 15th international conference on interaction design and children* (pp. 311-321).
- Hamnett, C. (2003). *Unequal city: London in the global arena*. London: Routledge
- Hart, R. (1979). *Children's Experience of Place*. New York: Irvington.
- Hart, R. (2002). Containing children: some lessons on planning for play from New York City. *Environment and Urbanization*, 14(2), 135-148.
- Hartmann, M., Cash, S. B., Yeh, C. H., Landwehr, S. C., & McAlister, A. R. (2017). Children's purchase behavior in the snack market: Can branding or lower prices motivate healthier choices?. *Appetite*, 117, 247-254.

-
- Hasanzadeh, K., Ikeda, E., Mavoa, S., & Smith, M. (2022). Children's physical activity and active travel: a cross-sectional study of activity spaces, sociodemographic and neighborhood associations. *Children's Geographies*, 1-19.
- Heard, A. M., Harris, J. L., Liu, S., Schwartz, M. B., and Li, X. (2016). Piloting an online grocery store simulation to assess children's food choices. *Appetite*, 96, 260-267.
- Henriquez, M. (2019, November 1). *¿Cuáles son las brechas que existen entre los ingresos municipales de cada comuna? - 2019. Fundación Observatorio Fiscal*. <https://observatoriofiscal.cl/Informate/Repo/BrechasantreMunicipios>
- Hensher, D. A. (2006). How do respondents process stated choice experiments? Attribute consideration under varying information load. *Journal of applied econometrics*, 21(6), 861-878.
- Hensher, D. A., & Mulley, C. (2015). Modal image: candidate drivers of preference differences for BRT and LRT. *Transportation*, 42(1), 7-23.
- Hensher, D. A., Rose, J. M., Rose, J. M., & Greene, W. H. (2005). *Applied choice analysis: a primer*. Cambridge university press.
- Hensher, D. A., Stopher, P. R. & Louviere, J. J. (2001). An exploratory analysis of the effect of numbers of choice sets in designed choice experiments: an airline choice application. *Journal of Air Transport Management*, 7(6), 373-379.
- Herrmann-Lunecke, M. G., Martínez, C. F., & Salgado, P. V. (2021). Caminata y vejez: explorando el espacio público peatonal de las personas mayores en los instrumentos de planificación urbana en Chile. *urbe. Revista Brasileira de Gestão Urbana*, 13.
- Hess, S., & Palma, D. (2019). Apollo: A flexible, powerful and customisable freeware package for choice model estimation and application. *Journal of choice modelling*, 32, 100170.
- Hidalgo, R. (2007). ¿ Se acabó el suelo en la gran ciudad?: Las nuevas periferias metropolitanas de la vivienda social en Santiago de Chile. *EURE* (Santiago), 33(98), 57-75.
- Hillman, M. (1993). Children, transport and the quality of life. *BMJ*, 308(6928), 604-605.
- Hillman, M., Adams, J. & Whitelegg, J. (1990). *One false move*. London: Policy Studies Institute.
- Holt, N. L., Lee, H., Millar, C. A., & Spence, J. C. (2015). 'Eyes on where children play': A retrospective study of active free play. *Children's Geographies*, 13(1), 73-88.
- Honkanen, K., Poikolainen, J., & Karlsson, L. (2018). Children and young people as co-researchers—researching subjective well-being in residential area with visual and verbal methods. *Children's Geographies*, 16(2), 184-195.
- Hopkins, P., & Pain, R. (2007). Geographies of Age: Thinking Relationally. *Area* 39 (3): 287–294.

- Horton, J., & Kraftl, P. (2008). Reflections on geographies of age: A response to Hopkins and Pain. *Area*, 40(2), 284–288.”
- Horton, J., Christensen, P., Kraftl, P., & Hadfield-Hill, S. (2014). ‘Walking... just walking’: how children and young people’s everyday pedestrian practices matter. *Social and Cultural Geography*, 15(1), 94-115.
- Huber, J., & Zwerina, K. (1996). The importance of utility balance in efficient choice designs. *Journal of Marketing research*, 33(3), 307-317.
- Huertas-Delgado, F. J., Chillón, P., Barranco-Ruiz, Y., Herrador-Colmenero, M., Rodríguez-Rodríguez, F., & Villa-González, E. (2018). Parental perceived barriers to active commuting to school in Ecuadorian youth. *Journal of Transport & Health*, 10, 290-296.
- Hurtubia, R., Guevara, A., & Donoso, P. (2015). Using images to measure qualitative attributes of public spaces through SP surveys. *Transportation research procedia*, 11, 460-474.
- Hüttenmoser, M. (1995). Children and their living surroundings: Empirical investigations into the significance of living surroundings for the everyday life and development of children. *Children’s Environments*, 403-413
- Hüttenmoser, M. (1995). Children and their living surroundings: Empirical investigations into the significance of living surroundings for the everyday life and development of children. *Children’s Environments*, 403-413.
- IfG (n.d.). *Timeline of UK coronavirus lockdowns, March 2020 to March 2021*
- Iglesias, P., Greene, M., & Ortúzar, J. D. D. (2013). On the perception of safety in low income neighbourhoods: using digital images in a stated choice experiment. In: *Choice modelling: The state of the art and the state of practice*.
- INE (2017). *CENSO 2017. Población total por sexo y área urbana-rural, según edad simple*.
- INE (2019). *Informe anual de estadísticas policiales, 2019*.
- INE (2021). *INE*. <https://www.ine.cl>
- INRIX (2021, December). *2021 INRIX Global Traffic Scorecard*.
- Jacobs, J. (1961). *The death and life of great American cities*. New York: Random House.
- James, A., Jenks, C. and Prout, A. (1998). *Theorizing Childhood*. Cambridge: Polity Press.
- Jamme, H. T. W., Bahl, D., & Banerjee, T. (2018). Between “broken windows” and the “eyes on the street:” Walking to school in inner city San Diego. *Journal of Environmental Psychology*, 55, 121-138.
- Jansen, S., Boumeester, H., Coolen, H., Goetgeluk, R., & Molin, E. (2009). The impact of including images in a conjoint measurement task: evidence from two small-scale studies. *Journal of housing and the built environment*, 24(3), 271-297.
- Jaramillo, J. (2016). “Andar todo el día”: construcciones de género de niños y niñas en espacios urbanos. *La aljaba*, 20, 168-186.

-
- Jarrett, R. L. (1997). Bringing families back in: Neighborhood effects on child development. *Neighborhood poverty*, 2, 48-64.
- Jensen, O. B., Sheller, M., & Wind, S. (2015). Together and apart: Affective ambiances and negotiation in families' everyday life and mobility. *Mobilities*, 10(3), 363-382.
- Johansson, M. (2006). Environment and parental factors as determinants of mode for children's leisure travel. *Journal of environmental psychology*, 26(2), 156-169.
- Johnson R & Orme, B (2003). Getting the most from CBC. *Sequim: Saw- tooth Software Research Paper Series*, Sawtooth Software.
- Johnson, R. B., & Onwuegbuzie, A. J. (2004). Mixed methods research: A research paradigm whose time has come. *Educational researcher*, 33(7), 14-26.
- Johnson, R. & Orme, B. (2003) Getting the most from CBC, *Sawtooth: Software Research Paper Series*, Sawtooth Software, Sequim
- Joshi, M. S., MacLean, M. & Carter, W. (1999). Children's journey to school: Spatial skills, knowledge and perceptions of the environment. *British Journal of Developmental Psychology*, 17(1), 125-139.
- Kamargianni, M. & Polydoropoulou, A. (2013). Hybrid choice model to investigate effects of teenagers' attitudes toward walking and cycling on mode choice behavior. *Transportation research record*, 2382(1), 151-161.
- Kamargianni, M., & Polydoropoulou, A. (2014). Generation Y's Travel Behavior and Perceptions of Walkability Constraints. *Transportation Research Record*, 2430(1), 59-71.
- Kamphuis, C. B., Mackenbach, J. P., Giskes, K., Huisman, M., Brug, J. & Van Lenthe, F. J. (2010). Why do poor people perceive poor neighbourhoods? The role of objective neighbourhood features and psychosocial factors. *Health and place*, 16(4), 744-754.
- Katz, C. (2006). Power, space, and terror: Social reproduction and the public environment. In S. Low and N. Smith (Ed.), *The politics of public space*, (105-121). New York, NY: Routledge.
- Kemperman, A. & Timmermans, H. (2014). Environmental correlates of active travel behavior of children. *Environment and Behavior*, 46(5), 583-608.
- Kerr, J., Rosenberg, D., Sallis, J. F., Saelens, B. E., Frank, L. D. & Conway, T. L. (2006). Active commuting to school: associations with environment and parental concerns. *Medicine and Science in Sports and Exercise*, 38(4), 787-793.
- Koskela, H. & Pain, R. (2000). Revisiting fear and place: women's fear of attack and the built environment. *Geoforum*, 31(2), 269-280.
- Krishnamurthy, S., Steenhuis, C., Reijnders, D., & Stav, T. (2018). *Child-friendly urban design: observations on public space from Eindhoven (NL) and Jerusalem (IL)*. Eindhoven: Technische Universiteit Eindhoven.
- Kyttä, M. (1997). Children's independent mobility in urban, small town, and rural environments. *Growing up in a changing urban landscape*, 41, 52.

- Kyttä, A. M., Broberg, A. K., & Kahila, M. H. (2012). Urban environment and children's active lifestyle: SoftGIS revealing children's behavioral patterns and meaningful places. *American journal of health promotion*, 26(5).
- Lamíquiz, P. J. & López-Domínguez, J. (2015). Effects of built environment on walking at the neighbourhood scale. A new role for street networks by modelling their configurational accessibility? *Transportation Research Part A: Policy and Practice*, 74, 148-163.
- Lancsar, E., and Louviere, J. (2008). Conducting discrete choice experiments to inform healthcare decision making. *Pharmacoeconomics*, 26(8), 661-677.
- Larouche, R. (2018). *Children's active transportation* (R. Larouche Ed.). Elsevier
- Larsen, K., Gilliland, J., & Hess, P. M. (2012). Route-based analysis to capture the environmental influences on a child's mode of travel between home and school. *Annals of the Association of American Geographers*, 102(6), 1348-1365.
- Larsen, K., Gilliland, J., Hess, P., Tucker, P., Irwin, J. & He, M. (2009). The influence of the physical environment and sociodemographic characteristics on children's mode of travel to and from school. *American Journal of Public Health*, 99(3), 520-526.
- Lees, L., Slater, T., & Wyly, E. K.. (2010). *The gentrification reader* (Vol. 1). London: Routledge.
- Lin, J. J., & Chang, H. T. (2010). Built environment effects on children's school travel in Taipei: independence and travel mode. *Urban studies*, 47(4), 867-889.
- Lindelöw, D., Svensson, Å., Sternudd, C. & Johansson, M. (2014). What limits the pedestrian? Exploring perceptions of walking in the built environment and in the context of every-day life. *Journal of Transport and Health*, 1(4), 223-231.
- Loo, B. P. (2021). Walking towards a happy city. *Journal of transport geography*, 93, 103078.
- Loptson, K., Muhajarine, N., Ridalls, T., Chad, K., Neudorf, C., Baxter-Jones, A., Holden, B., Bell, S., Clark, C., Sherar, L. & Esliger, D., (2012). Walkable for whom? Examining the role of the built environment on the neighbourhood-based physical activity of children. *Canadian journal of public health*, 103(3), pp. S29-S34.
- Lorenc, T., Brunton, G., Oliver, S., Oliver, K., & Oakley, A. (2008). Attitudes to walking and cycling among children, young people and parents: a systematic review. *Journal of Epidemiology & Community Health*, 62(10), 852-857.
- Loukaitou-Sideris, A., & Ehrenfeucht, R. (2009). *Conflict and Negotiation over Public Space*.
- Louviere, J. J., Hensher, D. A., & Swait, J. D. (2000). *Stated choice methods: analysis and applications*. Cambridge university press.
- Louviere, J., Train, K., Ben-Akiva, M., Bhat, C., Brownstone, D., Cameron, T. A., ... & Waldman, D. (2005). Recent progress on endogeneity in choice modeling. *Marketing Letters*, 16(3), 255-265.

- Love, P., Villanueva, K., & Whitzman, C. (2020). Children's independent mobility: the role of school-based social capital. *Children's geographies*, 18(3), 253-268.
- Lucken, E., Soria, J., Niktas, M. A., Wang, T., Stewart, M., & Nikoui, R. (2018). Impact of information about health and academic benefits on parent perception of the feasibility of active transportation to school. *Journal of Transport & Health*, 10, 28-36.
- Lund Research (2018). *Kruskal-Wallis H Test using SPSS Statistics*. Laerd Statistics. <https://statistics.laerd.com/spss-tutorials/kruskal-wallis-h-test-using-spss-statistics.php>
- Lynch, K. (1960) *The image of the city*. Cambridge: MIT press.
- Mackett, R. (2002). Increasing car dependency of children: should we be worried?. *Proceedings of the institution of civil engineers-municipal engineer*, 151(1), 29-38.
- Mackett, R. (2013). Children's travel behaviour and its health implications. *Transport policy*, 26, 66-72.
- Mackett, R., Brown, B., & Paskins, J. (2005, October). *Overcoming the barriers to walking for children*.
- Mackett, R., Brown, B., Gong, Y. I., Kitazawa, K. & Paskins, J. (2007). Children's independent movement in the local environment. *Built environment*, 33(4), 454-468.
- Mah, S., Nettlefold, L., Macdonald, H., Winters, M., Race, D., Voss, C., & McKay, H. A. (2017). Does parental support influence children's active school travel?. *Preventive medicine reports*, 6, 346-351.
- Malhotra, N., & Birks, D. (2007). *Marketing research: An applied approach*. Pearson.
- Mammen, G., Faulkner, G., Buliung, R., & Lay, J. (2012). Understanding the drive to escort: a cross-sectional analysis examining parental attitudes towards children's school travel and independent mobility. *BMC public health*, 12(1), 1-12.
- Marzi, I., Demetriou, Y., & Reimers, A. (2018). Social and physical environmental correlates of independent mobility in children: a systematic review taking sex/gender differences into account. *International Journal of Health Geographics*, 17(1), 1-17.
- Marzi, I., & Reimers, A. (2018). Children's independent mobility: Current knowledge, future directions, and public health implications. *International journal of environmental research and public health*, 15(11), 2441.
- Mason, J. (2002). *Qualitative researching*. United Kingdom: Sage Publishings.
- Matthews, H. (2003). Children and regeneration: Setting an agenda for community participation and integration. *Children and society*, 17(4), 264-276.
- Matthews, H., Taylor, M., Percy-Smith, B., & Limb, M. (2000). The unacceptable flaneur: The shopping mall as a teenage hangout. *Childhood*, 7(3), 279-294.

- Matthews, H. (1992). *Making sense of place: Children's understanding of large-scale environments*. Lanham, MD, US; Barnes & Noble Books.
- Mayeza, E. (2017). Doing child-centered ethnography: Unravelling the complexities of reducing the perceptions of adult male power during fieldwork. *International Journal of Qualitative Methods*, 16(1), 1609406917714162.
- Mayo, F., & Taboada, E. (2020). Ranking factors affecting public transport mode choice of commuters in an urban city of a developing country using analytic hierarchy process: The case of Metro Cebu, Philippines. *Transportation Research Interdisciplinary Perspectives*, 4, 100078.
- McBride, D., & Doshier, B. (2002). A comparison of conscious and automatic memory processes for picture and word stimuli: A process dissociation analysis. *Consciousness and cognition*, 11(3), 423-460.
- McCormack, G. R., & Shiell, A. (2011). In search of causality: a systematic review of the relationship between the built environment and physical activity among adults. *International journal of behavioral nutrition and physical activity*, 8(1), 1-11.
- McDonald, N. C. (2008). Critical factors for active transportation to school among low-income and minority students: evidence from the 2001 National Household Travel Survey. *American journal of preventive medicine*, 34(4), 341-344.
- McDonald, N. C., Deakin, E. & Aalborg, A. E. (2010). Influence of the social environment on children's school travel. *Preventive medicine*, 50, S65-S68.
- McFadden, D. (1974). The measurement of urban travel demand. *Journal of public economics*, 3(4), 303-328.
- McKinsey Global Institute (2011). *Urban world: Mapping the economic power of cities*.
- McLennan, D., Noble, N., Noble, M., Plunkett, E., Wright, G. And Gutacker, N. (2019). *The English Indices of Deprivation 2019: Technical report*. Ministry of Housing, Communities and Local Government
- McMillan, T. E. (2005). Urban form and a child's trip to school: the current literature and a framework for future research. *Journal of planning literature*, 19(4), 440-456.
- McMillan, T. E. (2007). The relative influence of urban form on a child's travel mode to school. *Transportation Research Part A: Policy and Practice*, 41(1), 69-79.
- McNeill, L. H., Kreuter, M. W. and Subramanian, S. V. (2006). Social environment and physical activity: a review of concepts and evidence. *Social science and medicine*, 63(4), 1011-1022.
- MDS – Ministerio de Desarrollo Social y Familia (2017). *Estimaciones de Tasa de Pobreza Multidimensional por Comuna*. Observatorio Social
- Metro de Santiago (2020). *Reporte de sostenibilidad*.
- Metropolitan Police Service (2022). *Crime data dashboard*. <https://www.met.police.uk/sd/stats-and-data/met/crime-data-dashboard/>

- Mikel, B., 2019. *The influence of community elements on school engagement among HRSA Region IV students aged 6–17 years: analysis of 2011–2012 National Survey of Children’s Health (NSCH)*. Georgia State University
- Mikkelsen, M. R. & Christensen, P. (2009). Is children’s independent mobility really independent? A study of children’s mobility combining ethnography and GPS/mobile phone technologies. *Mobilities*, 4(1), 37-58.
- Milne, S. (2009). Moving into and through the public world: children’s perspectives on their encounters with adults. *Mobilities*, 4(1), 103-118.
- Milstein, D. (2008). Conversaciones y percepciones de niños y niñas en las narrativas antropológicas. *Sociedade e cultura*, 11(1).
- Milstein, D. (2013). Cuerpos que se desplazan y lugares que se hacen. Experiencias etnográficas con niños en dos barrios populares de la Argentina. *Sociedade e Cultura*, 16(1), 69-80.
- MINEDUC (2018). *Establecimientos Educación Escolar*.
- Ministerio de Desarrollo Social y Familia (2021a, Julio). *Ingresos de los hogares*. Observatorio Social
- Ministerio de Desarrollo Social y Familia (2021b, Julio). *Resumen de resultados: Pobreza por Ingresos y Distribución de Ingresos*. Observatorio Social
- Ministerio Secretaría General de la Presidencia (1999, 28 August). *Ley 19.628 - Sobre proteccion de la vida privada*. Ministerio Secretaría General de la Presidencia. <http://bcn.cl/2er4q>
- MINSAL (2018). *Establecimientos servicios de salud*.
- MINSAL (2020, March 15). *Presidente anuncia suspensión de clases y reduce actos públicos*. <https://www.minsal.cl/presidente-anuncia-suspension-de-clases-y-reduce-actos-publicos/>
- MINVU (2012). *Límites Operativos de Zonas Prioritarias*. Región Metropolitana de Santiago.
- MINVU (no date). *Memorias de la 6 de Mayo*. Santiago: Secretaría Ejecutiva de Desarrollo de Barrios.
- Mitra, R. (2013). Independent mobility and mode choice for school transportation: a review and framework for future research. *Transport reviews*, 33(1), 21-43.
- Mitra, R., Buliung, R. N. & Roorda, M. J. (2010). Built environment and school travel mode choice in Toronto, Canada. *Transportation Research Record*, 2156(1), 150-159
- Monasterio, F. (2021, March 3). *Un año de pandemia en Chile*. Pauta. <https://www.pauta.cl/nacional/cronologia-primer-ano-pandemia-chile>
- Morales, E. & Rojas, S. (1987). *Sectores populares y municipio*. Santiago, Chile: FLACSO.
- Moran, E., Warden, D., Macleod, L., Mayes, G., & Gillies, J. (1997). Stranger danger: What do children know?. *Child Abuse Review: Journal of the British Association for the Study and Prevention of Child Abuse and Neglect*, 6(1), 11-23.

- Moran, M., Plaut, P., & Baron-Epel, O. (2016). Do children walk where they bike? Exploring built environment correlates of children's walking and bicycling. *Journal of Transport and Land Use*, 9(2), 43-65.
- Mullan, E. (2003). Do you think that your local area is a good place for young people to grow up? The effects of traffic and car parking on young people's views. *Health & place*, 9(4), 351-360.
- Murray, L., & Cortés-Morales, S. (2019). *Children's mobilities: Interdependent, imagined, relational*. Springer.
- NACTO (2020). *Designing Streets for Kids*. Global Designing Cities Initiative.
- Næss, P. (2015). Built environment, causality and travel. *Transport reviews*, 35(3), 275-291.
- Nansen, B., Gibbs, L., MacDougall, C., Vetere, F., Ross, N. J., & McKendrick, J. (2015). Children's interdependent mobility: compositions, collaborations and compromises. *Children's Geographies*, 13(4), 467-481.
- Noble, S., McLennan, D., Noble, M., Plunkett, E., Gutacker, N., Silk, M. & Wright, G. (2019) *The English Indices of Deprivation 2019: Research report*. Ministry of Housing, Communities and Local Government
- Noschis, K. (1992). Child development theory and planning for neighbourhood play. *Children's Environments*, 3-9.
- Noy, C. (2008). Sampling knowledge: The hermeneutics of snowball sampling in qualitative research. *International Journal of social research methodology*, 11(4), 327-344.
- O'brien, M., Jones, D., Sloan, D. & Rustin, M. (2000). Children's independent spatial mobility in the urban public realm. *Childhood*, 7(3), 257-277.
- Observatorio Social Universidad Alberto Hurtado (2014a). *Actualización y recolección de información del sistema de transporte urbano, etapa IX. Encuesta origen destino Santiago 2012. Informe final*. (Volumen I).
- Observatorio Social Universidad Alberto Hurtado (2014b). *Actualización y recolección de información del sistema de transporte urbano, etapa IX. Encuesta origen destino Santiago 2012. Informe final*. (Volumen II).
- OECD (n.d.). *Better Life Index*. <https://www.oecdbetterlifeindex.org>
- ONE (2021, June 25). *Population estimates for the UK, England and Wales, Scotland and Northern Ireland: mid- 2020*.
- ONS (2019, December 5). *Total wealth in Great Britain: April 2016 to March 2018. Statistical bulletin*
- ONS (2020, August 7). *Internet access – households and individuals, Great Britain: 2020*.
- Onukwugha, E., Bergtold, J., & Jain, R. (2015). A primer on marginal effects—part II: health services research applications. *Pharmacoeconomics*, 33(2), 97-103.
- Ortúzar, J., & Willumsen, L. G. (2011). *Modelling transport*. John Wiley & sons.
- Pain, R. (2006). Paranoid parenting? Rematerializing risk and fear for children. *Social & cultural geography*, 7(2), 221-243.

- Palma, X., Chillón, P., Rodríguez-Rodríguez, F., Barranco-Ruiz, Y., & Huertas-Delgado, F. J. (2020). Perceived parental barriers towards active commuting to school in Chilean children and adolescents of Valparaíso. *International journal of sustainable transportation*, 14(7), 525-532.
- Panter, J. R., Jones, A. P. & Van Sluijs, E. M. (2008). Environmental determinants of active travel in youth: a review and framework for future research. *International journal of behavioral nutrition and physical activity*, 5(1), 34.
- Panter, J. R., Jones, A. P., Van Sluijs, E. M. & Griffin, S. J. (2010). Neighborhood, route, and school environments and children's active commuting. *American journal of preventive medicine*, 38(3), 268-278.
- Paulos, E., & Goodman, E. (2004). The familiar stranger: anxiety, comfort, and play in public places. In *Proceedings of the SIGCHI conference on Human factors in computing systems* (pp. 223-230). ACM.
- Paydar, M., Kamani-Fard, A., & Etminani-Ghasrodashti, R. (2017). Perceived security of women in relation to their path choice toward sustainable neighborhood in Santiago, Chile. *Cities*, 60, 289-300.
- Pearmain, D., Swanson, J., Kroes, E. & Bradley, M. (1991). *Stated preference techniques: a guide to practice* (2nd ed). Steer Davies Gleave and Hague Consulting Group: London.
- Ploner, J., & Jones, L. (2020). Learning to belong? 'Culture' and 'place making' among children and young people in Hull, UK City of Culture 2017. *Children's Geographies*, 18(3), 269-282.
- Pollard, E., & Lee, P. (2003). Child well-being: A systematic review of the literature. *Social indicators research*, 61, 59-78.
- Poó, F. M., López, S. S., Tosi, J. D., Nucciarone, M. I., & Ledesma, R. D. (2015). *Educación vial y movilidad en la infancia*.
- Porter, L., Spark, C., & De Kleyn, L. (2021). Navigating the neighbourhood: Gender, place and agency in children's mobility. *Children's Geographies*, 19(3), 339-350.
- Prezza, M., Piloni, S., Morabito, C., Sersante, C., Alparone, F. R. & Giuliani, M. V. (2001). The influence of psychosocial and environmental factors on children's independent mobility and relationship to peer frequentation. *Journal of community and applied social psychology*, 11(6), 435-450
- PricewaterhouseCoopers (2009). *Economic Outlook November 2009*.
- Puga, E. (2006). *Habitabilidad de niños y niñas, Espacio de uso cotidiano de niños y niñas*. Santiago de Chile: Pontificia Universidad Católica de Chile, Políticas Públicas.
- Reis, A., Lay, M. C., Muniz, L., & Ambrosini, V. (2005). Perception of security, visual connections, children and adolescents behaviour in open spaces. In *Space syntax 5th international symposium* (pp. 531-544).
- Reyes, S., & Figueroa, I. M. (2010). Distribución, superficie y accesibilidad de las áreas verdes en Santiago de Chile. *EURE* (Santiago), 36(109), 89-110.

- Reynolds-Keefer, L., Johnson, R., Dickenson, T., & McFadden, L. (2009). Validity issues in the use of pictorial Likert scales. *Studies in Learning, Evaluation, Innovation and Development*, 6(3), 15-24.
- Ridley, D. (2012). *The literature review: A step-by-step guide for students*.
- Riggio, E. (2002). Child friendly cities: good governance in the best interests of the child. *Environment and Urbanization*, 14(2), 45-58.
- Rissotto, A. & Giuliani, M. V. (2006). Learning neighbourhood environments: the loss of experience in a modern world. In C. Spencer and M. Blades (Ed.), *Children and their environments: Learning, using and designing spaces*, (75-90). Cambridge, UK: Cambridge University Press.
- Rizzi, L. I., & Ortúzar, J.D. (2003). Stated preference in the valuation of interurban road safety. *Accident Analysis & Prevention*, 35(1), 9-22.
- Rizzi, L. I., Limonado, J. P., & Steimetz, S. S. (2012). The impact of traffic images on travel time valuation in stated-preference choice experiments. *Transportmetrica*, 8(6), 427-442.
- Rodríguez, A. and Sugranyes, A. (2004). El problema de vivienda de los "con techo". *EURE* 30(91), 53-65.
- Rose, J. M., & Bliemer, M. C. (2007). Stated preference experimental design strategies. In *Handbook of transport modelling*. Emerald Group Publishing Limited.
- Rose, J. M., & Bliemer, M. C. (2013). Sample size requirements for stated choice experiments. *Transportation*, 40(5), 1021-1041
- Rosenberg, D. E., Sallis, J. F., Conway, T. L., Cain, K. L. & McKenzie, T. L. (2006). Active transportation to school over 2 years in relation to weight status and physical activity. *Obesity*, 14(10), 1771-1776.
- Rothman, L., To, T., Buliung, R., Macarthur, C. & Howard, A. (2014). Influence of social and built environment features on children walking to school: an observational study. *Preventive medicine*, 60, 10-15.
- Rowley, J. (2014). Designing and using research questionnaires. *Management Research Review*, 37(3), 308-330.
- Sabatini, F. (2000). Reforma de los mercados de suelo en Santiago, Chile: efectos sobre los precios de la tierra y la segregación residencial. *EURE* (Santiago), 26(77), 49-80.
- Sabatini, F., & Wormald, G. (2013). Segregación de la vivienda social: reducción de oportunidades, pérdida de cohesión. Francisco Sabatini, Guillermo Wormald y Alejandra Rasse (coords.), *Segregación de la vivienda social: ocho conjuntos en Santiago, Concepción y Talca*. Santiago, Pontificia Universidad Católica de Chile, 15-31.
- Sabatini, F., Cáceres, G. & Cerda, J. (2001). Segregación residencial en las principales ciudades chilenas: Tendencias de las tres últimas décadas y posibles cursos de acción. *EURE*, 27(82), 21-42.
- Saelens, B. E., & Handy, S. L. (2008). Built environment correlates of walking: a review. *Medicine and science in sports and exercise*, 40(7 Suppl), S550.

- Saelens, B. E., & Handy, S. L. (2008). Built environment correlates of walking: a review. *Medicine and science in sports and exercise*, 40(7), S550.
- Sagaris, L., & Lanfranco, D. (2019). Beyond “safe”: Chilean “Kool” routes to school address social determinants of health. *Journal of Transport & Health*, 15, 100665.
- Sagaris, L., Flores, M., & Lanfranco, D. (2020). De rutas seguras a rutas bakanes en Chile: cocreación con enfoque de género, educación cívica y derechos. *Hábitat y Sociedad*, 13, 169-191.
- Santos, M. P., Pizarro, A. N., Mota, J., & Marques, E. A. (2013). Parental physical activity, safety perceptions and children’s independent mobility. *BMC public health*, 13(1), 1-6.
- Saraví, G. (2014). Youth experience of urban inequality: space, class, and gender in Mexico. In: *Handbook of childhood and youth*. Singapore: Springer, 1-11.
- Sassen, S. (2001), *The Global City*, Princeton, Princeton University Press.
- Schlossberg, M., Greene, J., Phillips, P. P., Johnson, B., and Parker, B. (2006). School trips: effects of urban form and distance on travel mode. *Journal of the American planning association*, 72(3), 337-346.
- Schoeppe, S., Duncan, M. J., Badland, H. M., Alley, S., Williams, S., Rebar, A. L., & Vandelanotte, C. (2015). Socio-demographic factors and neighbourhood social cohesion influence adults’ willingness to grant children greater independent mobility: A cross-sectional study. *BMC public health*, 15(1), 1-8.
- SECTRA (2014). *Informe ejecutivo. Encuesta Origen Destino de viajes*. Santiago: SECTRA
- Segura, R. (2009). Paisajes del miedo en la ciudad. Miedo y ciudadanía en el espacio urbano de la ciudad de la Plata. *CUADERNO URBANO*. Espacio, cultura, sociedad, 8(8), 59-76.
- Sener, I. N., Lee, R. J., & Sidharthan, R. (2019). An examination of children’s school travel: A focus on active travel and parental effects. *Transportation research part A: policy and practice*, 123, 24-34.
- SEREMI (2018). *Pobreza y distribución del ingreso en la Región metropolitana de Santiago. Resultados Encuesta CASEN 2017*.
- Sharmin, S., & Kamruzzaman, M. (2017). Association between the built environment and children’s independent mobility: A meta-analytic review. *Journal of Transport Geography*, 61, 104-117.
- Shaw, B., Bicket, M., Elliott, B., Fagan-Watson, B., Mocca, E., & Hillman, M. (2015). *Children’s independent mobility: an international comparison and recommendations for action*.
- Shaw, B., Elliot, F., & Mocca, H. (2015b). *Children’s independent mobility: An international comparison and recommendations for action*. Policy Studies Institute
- Shaw, B., Fagan-Watson, B., Frauendienst, B., Redecker, A., Jones, T., & Hillman, M. (2012). *Children’s independent mobility: a comparative study in England and Germany (1971-2010)*.

- Shirazi, M. R., & Keivani, R. (2021). Social sustainability of compact neighbourhoods evidence from London and Berlin. *Sustainability*, 13(4), 2340.
- Shute, R. H., & Slee, P. T. (2015). *Child development: Theories and critical perspectives*. Routledge.
- Simatwa, E. M. (2010). Piagets theory of intellectual development and its implication for instructional management at pre-secondary school level. *Educational Research and Reviews*, 5(7), 366-371.
- Singh, N., & Vasudevan, V. (2018). Understanding school trip mode choice—The case of Kanpur (India). *Journal of transport geography*, 66, 283-290.
- Smith, M., Amann, R., Cavadino, A., Raphael, D., Kearns, R., Mackett, R., ... & Zhao, J. (2019). Children's transport built environments: a mixed methods study of associations between perceived and objective measures and relationships with parent licence for independent mobility in Auckland, New Zealand. *International journal of environmental research and public health*, 16(8), 1361.
- Smith, M., Mavoa, S., Ikeda, E., Hasanzadeh, K., Zhao, J., Rinne, T. E., ... & Cui, J. (2022). Associations between Children's Physical Activity and Neighborhood Environments Using GIS: A Secondary Analysis from a Systematic Scoping Review. *International Journal of Environmental Research and Public Health*, 19(3), 1033.
- Solberg, A. (2015). Negotiating childhood: Changing constructions of age for Norwegian children. In *Constructing and reconstructing childhood* (pp. 111-127). Routledge.
- Soori, H., & Bhopal, R. S. (2002). Parental permission for children's independent outdoor activities: Implications for injury prevention. *The European Journal of Public Health*, 12(2), 104-109.
- Soto Caro, M., Leon Canales, J., & Escobar Gueguen, A. (2022). Public space and urban resilience: children's perspectives. The case of the hills of Valparaíso, Chile. *Children's Geographies*, 20(2), 206-219.
- Staab, S., & Gerhard, R. (2010). Childcare service expansion in Chile and Mexico. *Gender and Development Programme Paper*, (10).
- Stange, M., Barry, A., Smyth, J., & Olson, K. (2018). Effects of smiley face scales on visual processing of satisfaction questions in web surveys. *Social Science Computer Review*, 36(6), 756-766.
- Subsecretaría de Prevención del Delito (2020). *Síntesis Delictual ENUSC 2020: Región Metropolitana*.
- SUBTEL (2021). *Estadísticas servicio de acceso a internet fija*.
- Suess, C., Woosnam, K. M., & Erul, E. (2020). Stranger-danger? Understanding the moderating effects of children in the household on non-hosting residents' emotional solidarity with Airbnb visitors, feeling safe, and support for Airbnb. *Tourism Management*, 77, 103952.
- Svensson, E. (2001). Guidelines to statistical evaluation of data from rating scales and questionnaires. *Journal of Rehabilitation Medicine*, 33(1), 47-48.

- Tammarazio, A., & Requena, M. L. (2015). Caminando con los niños por el espacio público. In *4tas Jornadas de Estudios sobre la Infancia*.
- Tashakkori, A., & Teddlie, C. (Eds.). (2010). *Sage handbook of mixed methods in social and behavioral research*. Sage.
- TfL (2020, September) *Investment to get London and the UK moving again*. Mayor of London
- TfL (2021, March 31). *Bus Fleet Audit*. Mayor of London
- TfL (2022). *London Overground*. Mayor of London
- Three Dragons, David Lock Associates, Traderisks, Opinion Research Services and Jackson Coles (2016). *London Plan density research. Lessons from higher density development*. Report for the GLA.
- Timperio, A., Ball, K., Salmon, J., Roberts, R., Giles-Corti, B., Simmons, D., Baur, L.A. & Crawford, D. (2006). Personal, family, social, and environmental correlates of active commuting to school. *American journal of preventive medicine*, 30(1), 45-51.
- Timperio, A., Veitch, J., & Sahlqvist, S. (2018). Built and physical environment correlates of active transportation. In *Children's Active Transportation* (pp. 141-153). Elsevier.
- Tinson, A., Ayrton, C., Barker, K., Born T.B., & Long., O. (2017). *London's Poverty Profile*.
- Tironi, M. (2003). *Nueva Pobreza Urbana. Vivienda y capital social en Santiago de Chile, 1985 – 2001*. Santiago: PREDES - Editorial RIL.
- Tonucci, F. (2005). Citizen child: play as welfare parameter for urban life. *Topoi*, 24(2), 183-195.
- Tonucci, F. (2016). *La ciudad de los niños*. Graó.
- Train, K. E. (2009). *Discrete choice methods with simulation*. Cambridge university press.
- Tranter, P. & Pawson, E. (2001). Children's access to local environments: a case-study of Christchurch, New Zealand. *Local environment*, 6(1), 27-48.
- Tudge, J. R., & Winterhoff, P. A. (1993). Vygotsky, Piaget, and Bandura: Perspectives on the relations between the social world and cognitive development. *Human development*, 36(2), 61-81.
- Tyagi, M., & Raheja, G. (2021a). Children's independent mobility licence and its association with the built and social environment: a study across neighbourhood typologies in Kolkata. *Children's Geographies*, 19(6), 717-734.
- Tyagi, M., & Raheja, G. (2021b). Indian parents' perception of children's independent mobility in urban neighbourhoods: a case study of Delhi. *Children's Geographies*, 19(4), 390-406.
- UK Goverment. (n.d.) *The law on leaving your child on their own*. <https://www.gov.uk/law-on-leaving-your-child-home-alone>

- UNICEF (2018). *Shaping urbanization for children: A handbook on child-responsive urban planning*.
- UNICEF & WHO (2017). *Progress on household drinking water, sanitation and hygiene 2000-2017. Special focus on inequalities*.
- UNICEF-PNUD-OIT (2021). *Impactos de la pandemia en el bienestar de los hogares de niños, niñas y adolescentes en Chile*.
- United Nations Development Programme (2022). *Human Development Insights. Human Development Reports*. <https://hdr.undp.org/data-center/country-insights>
- United Nations Statistics Division (2019). *Life expectancy at birth for both sexes combined (years). UN data*. <https://data.un.org/Data.aspx?d=PopDiv&f=variableID%3A68>
- UNODC (no date). *Intentional Homicide Victims*. Retrieved from <https://dataunodc.un.org/crime/intentional-homicide-victims> (2019, Jun)
- UNESCO (2020). *UNESCO Statistics*. <http://data.uis.unesco.org>
- Valentine, G. (1997a). "Oh Yes I Can." "Oh no you can't": Children and parents' understandings of kids' competence to negotiate public space safely. *Antipode*, 29(1), 65-89.
- Valentine, G. (1997b). 'My Son's a Bit Dizzy. "My Wife's a Bit Soft': Gender, children and cultures of parenting. *Gender, Place and Culture: A journal of feminist geography*, 4(1), 37-62.
- Valentine, G. (1999). 'Oh Please, Mum. Oh Please, Dad': Negotiating Children's Spatial Boundaries. In *Gender, power and the household* (pp. 137-154). Palgrave Macmillan, London.
- Valentine, G. (2008). Contested terrain: Teenagers in public space. In *The Cultural Geography Reader* (pp. 407-413). Routledge.
- Valentine, G. & McKendrick, J. (1997). Children's outdoor play: Exploring parental concerns about children's safety and the changing nature of childhood. *Geoforum*, 28(2), 219-235.
- Valenzuela, J. M., Labarrera, P. and Rodríguez, P. (2008). Educación en Chile: entre la continuidad y las rupturas. Principales hitos de las políticas educativas. *Revista iberoamericana de educación*, 48, 129-145.
- Valenzuela-Montes, L. M., & Talavera-García, R. (2015). Entornos de movilidad peatonal: una revisión de enfoques, factores y condicionantes. *EURE*, 41(123), 5-27.
- Van den Berg, P., Kemperman, A., de Kleijn, B. & Borgers, A. (2016). Ageing and loneliness: the role of mobility and the built environment. *Travel Behaviour and Society*, 5, 48-55.
- Van Vliet, W. (1983). Exploring the fourth environment: An examination of the home range of city and suburban teenagers. *Environment and Behavior*, 15(5), 567-588.

- Veitch, J., Bagley, S., Ball, K., & Salmon, J. (2006). Where do children usually play? A qualitative study of parents' perceptions of influences on children's active free-play. *Health and place*, 12(4), 383-393.
- Villanueva, K., Giles-Corti, B., Bulsara, M., Timperio, A., McCormack, G., Beesley, B., ... & Middleton, N. (2012). Where do children travel to and what local opportunities are available? The relationship between neighborhood destinations and children's independent mobility. *Environment and Behavior*, 45(6), 679-705.
- Villanueva, K., Giles-Corti, B., Bulsara, M., Trapp, G., Timperio, A., McCormack, G., & Van Niel, K. (2014). Does the walkability of neighbourhoods affect children's independent mobility, independent of parental, socio-cultural and individual factors?. *Children's Geographies*, 12(4), 393-411.
- Visser, K. (2019). 'I didn't listen. I continued hanging out with them; they are my friends.'The negotiation of independent socio-spatial behaviour between young people and parents living in a low-income neighbourhood. *Children's Geographies*, 18(6), 684-698.
- Voss, C. & Sandercock, G. (2010). Aerobic fitness and mode of travel to school in English schoolchildren. *Medicine and science in sports and exercise*, 42(2), 281-287
- Voss, C. (2018). Public Health Benefits of Active Transportation. In *Children's Active Transportation* (pp. 1–20). Amsterdam: Elsevier
- Vriens, M., Loosschilder, G. H., Rosbergen, E., & Wittink, D. R. (1998). Verbal versus realistic pictorial representations in conjoint analysis with design attributes. *Journal of Product Innovation Management*, 15(5), 455-467.
- Waintrub, N., Greene, M., & de Dios Ortúzar, J. (2016). Designing incentive packages for increased density and social inclusion in the neighbourhood of mass transit stations. *Habitat International*, 55, 133-147.
- Wales, M., Mårtensson, F., & Jansson, M. (2021). 'You can be outside a lot': independent mobility and agency among children in a suburban community in Sweden. *Children's Geographies*, 19(2), 184-196.
- Walker, N. (2018). *Brexit timeline: events leading to the UK's exit from the European Union*. House of Commons Library.
- Wang, H., & Yang, Y. (2019). Neighbourhood walkability: A review and bibliometric analysis. *Cities*, 93, 43-61.
- Ward, C. (1990). *The child in the city*. London, UK: Bedford Square.
- Waygood, E. O. D., Friman, M., Olsson, L. E. & Taniguchi, A. (2017). Transport and child well-being: An integrative review. *Travel behaviour and society*, 9, 32-49.
- Waygood, E. O., Friman, M., Taniguchi, A., & Olsson, L. E. (2019). Children's life satisfaction and travel satisfaction: Evidence from Canada, Japan, and Sweden. *Travel behaviour and society*, 16, 214-223.
- Whyte, W. H. (1988). *City: Rediscovering the center*. University of Pennsylvania Press.

- Williams, H. C. (1977). On the formation of travel demand models and economic evaluation measures of user benefit. *Environment and planning A*, 9(3), 285-344.
- Witten, K., & Field, A. (2020). Witten, Karen, and Adrian Field. "Engaging Children in Neighborhood Planning for Active Travel Infrastructure." *Transport and Children's Wellbeing*, 199–216.
- Wolfe, M. K. & McDonald, N. C. (2016). Association between neighborhood social environment and children's independent mobility. *Journal of physical activity and health*, 13(9), 970-979.
- Wood, J., Bornat, D., & Biquelet-Lock, A. (2019). *Child Friendly Planning in the UK*.
- World Bank (2022). *World Bank Open Data*. World Bank Group. <https://data.worldbank.org>
- Yarlagadda, A. K., & Srinivasan, S. (2008). Modeling children's school travel mode and parental escort decisions. *Transportation*, 35(2), 201-218.
- Zannat, K. E., Naim, M. N. H., Islam, K. A., Das, S., Adnan, M. S. G., & Dewan, A. (2022). Does children's independent mobility matter? Insights into escorting practices in a developing country. *Children's Geographies*, 1-16.
- Zeihner, H. (2003) "Shaping Daily Life in Urban Environments. In *Children in the City: Home, Neighbourhood and Community* (pp. 66–81). London: Routledge Falmer.
- Zhu, X., & Lee, C. (2009). Correlates of walking to school and implications for public policies: survey results from parents of elementary school children in Austin, Texas. *Journal of Public Health Policy*, 30(1), S177-S202.

Chapter 10. Appendix

10. 1. Topic guide questionnaire

Interview (topic guide)

I. Children section

Question 1. Children's daily routine and trip behaviour

(SM); blank schedule and pens.

A. How is a typical school day? And a typical weekend day?

- [SQ] Is there a day that you do something different? What do you do that day?
- [SQ] Does the routine change with the season (summer, winter) or weather (sunny, rainy)?

B. Considering the previous trips, how do you normally get around? Are you accompanied?

Question 2. Neighbourhood environment

(SM); blank sheet of paper, colour pencils and sticky post (smiley face, green/red circles).

C. Considering the previous trips, which one is your favourite trip?

Can you draw the things that call your attention of that trip? e.g. trees, houses, fences...

→ Give **MAP** and the **SURVEY** to PARENTS

D. [New] How long that journey usually take? Why? How much it took today/the last time?

E. Using the sticky posts, stick the things you like and the things you don't like of that trip.

What is that thing you draw? Why do you draw it? Why do (don't) you like it?

- [SQ] *If the children walk alone.* Why do you take that route?
- [SQ] Are you scare of anything in that trip?

F. [New] Do you want to draw in the map anything you forgot to draw?

G. When you go alone or accompanied, what are you not allowed to do? Why?

What things are not allowed to do other children of the neighbourhood? Why?

Question 3. Community environment

H. Think on the people you see in your neighbourhood and its surroundings;

When you go out, how are the people that you may encounter when travelling?

- [SQ] Who are they? How are they? Do you know them?
- [SQ] What do they do in the street or public space?
- [SQ] What do you think about them?
- [SQ] [New] How do you know someone is dangerous?

I. Are there areas that you avoid? Why you avoid those areas?

Question 4. Street environment

(SM); 5 B/W photographs.

J. Do you like this place? Why (not)?

K. Who do you think use that place? Why? How are they?

L. Would you go alone through that place? Why?

Question 5. Recommendations

M. Will you like to do more unaccompanied trips? Do you feel capable to do those trips? Why?

II. Parents section

Question 6. Opening question

A. Can you tell me how is your neighbourhood?

- [SQ] What do you most like? What do you least like?

Question 7. Children's daily routine and trip behaviour

(SM); children's schedule and pens.

B. The child(ren) described a typical school day; at what time are his/her activities?

How do s/he/they normally get around?

Does the routine change with the season (e.g. summer, winter)?

- [SQ] Is/are the child(ren) accompanied?

Question 8. Neighbourhood environment

(SM); blank sheet of paper, markers and colour pencils.

C. (i) Can you draw the route (path, street) that the child(ren) drew in the map?

(ii) **How long that journey usually take? Why? How much it took today/the last time?**

(iii) **Can you describe the surroundings of the route (path, street) drew in the map?**

(iv) **Why do the child(ren) take that route?**

D. When the child(ren) travel alone/with you/another person, what concerns do you have about the street or the public space?

- [SQ] Do you give any advice or take any precautions before trip? Why?

E. When the child(ren) goes alone or accompanied, do you have any rules? Why?

Does those rules differs to the ones other families of the area impose? How?

Question 9. Territorial range.

F. When walking or cycling, which are the limits in which the child(ren) can move?

- [SQ] Can you describe the limits? Why do these limits apply?
- [SQ] The limits change is someone accompany him/her/them?

G. When using other transport means, which are the limits in which the child(ren) can move?

- Ibid [SQ]

Question 10. Community environment

H. Think on the people you see in your neighbourhood and its surroundings;

Who are the people that the child (may) encounter when travelling?

- [SQ] Who are they? How are they? Do you know them?
- [SQ] What do they do in the street or public space?
- [SQ] What do you think about them? Do you trust/distrust on them? Why?

I. Are there areas that you or the child(ren) prefer/avoid cause of the people? Why?

Question 11. Street environment

(SM); 5 B/W photographs.

J. What do you think about that place? Why?

K. Who do you think use that place? How are they?

L. Would you let the child(ren) go alone through that place? Why?

[SP] – support questions
[SM] – supporting material

Question 12. Recommendations

M. How does the child(ren) way of performing trips changed over time?

How do you think it would change in the future? Why?

N. Will you like the child(ren) to do more unaccompanied trips? Why?

What would you change in your neighbourhood to encourage more children unaccompanied trips? Why?

Question 13. Sociodemographic questions and transport resources

O. [Household– Survey]

P. [Urban environment – from the Multiple Deprivation Index]

→ Do you know any family that could answer the interview?

10. 2. Complementary survey

Survey

How long have you lived here?	_____ years, _____ months
How many people live in your house?	_____ people

How are members of this household related to **the child(ren)**?

	Age	Gender <i>choose one</i>	How is related to the child(ren)? (parent, step-parent, brother, sister, aunt, grandparent, etc.)	Main activity (student, independent worker, etc.)
Person 1	_____ years	☐ M ☐ F ☐ N/A		
Person 2	_____ years	☐ M ☐ F ☐ N/A		
Person 3	_____ years	☐ M ☐ F ☐ N/A		
Person 4	_____ years	☐ M ☐ F ☐ N/A		
Person 5	_____ years	☐ M ☐ F ☐ N/A		
Person 6	_____ years	☐ M ☐ F ☐ N/A		

Who look after the child(ren)?	
Are there other carers? ☐ No / ☐ Yes	If yes, who? _____
Do you have any vehicles? ☐ No / ☐ Yes	We have _____ number of vehicles and _____ of motorcycles
Who can drive the vehicles?	

Please **check** any item you do or do not have that applies to you

	Have	Don't have but don't want	Don't have and can't afford	Could not allocate
Enough money to keep your home in a decent state of decoration				
Enough money to replace or repair broken electrical goods such as refrigerator or washing machine				
Two pairs of all-weather shoes				
Regular savings (of at least £20 a month) for rainy days				
Heating to keep home adequately warm				
Household contents insurance				

Please see the questions on the next page →

Survey

Now I would like you to do the same thing for the **activities**

	Do	Don't do but don't want to do	Don't do and can't afford	Don't do for any other reason	Not allocated
A hobby or leisure activity					

Now I would like you to do the same thing, but this time **thinking of children**

	Have	Don't have but don't want	Don't have and can't afford	Could not allocate
Outdoor leisure equipment such as roller skates, skateboards, footballs, etc				
Enough bedrooms for every child of 10 or over of a different sex to have their own bedroom				

Now I would like you to do the same for the following **children's activities**

	Do	Don't do but don't want to do	Don't do and can't afford	Don't do for any other reason	Not allocated
A hobby or leisure activity					
Celebrations on special occasions such as birthdays Christmas or other religious festivals					
A holiday away from home for at least one week a year					
Toddler group or nursery or play group at least once a week for pre-school aged children					
Going on a school trip at least once a term					
Children's clubs or activities such as drama or football training					

Will you please **check** the option that represents your total income before deductions (tax, National Insurance, etc.)?

	Check box	WEEKLY	MONTHLY	ANNUAL
1	☐	Up to £240	Up to £1,040	Up to £12,480
2	☐	£240 up to £310	£1,040 up to £1,343	£12,480 up to £16,120
3	☐	£310 up to £360	£1,343 up to £1,560	£16,120 up to £18,720
4	☐	£360 up to £420	£1,560 up to £1,820	£18,720 up to £21,840
5	☐	£420 up to £480	£1,820 up to £2,080	£21,840 up to £24,960
6	☐	£480 up to £550	£2,080 up to £2,383	£24,960 up to £28,600
7	☐	£550 up to £640	£2,383 up to £2,773	£28,600 up to £33,280
8	☐	£640 up to £750	£2,773 up to £3,250	£33,280 up to £39,000
9	☐	£750 up to £940	£3,250 up to £4,073	£39,000 up to £48,880
10	☐	£940 or more	£4,073 or more	£48,880 or more
11	☐	Don't know / don't want to answer		

10. 3. Interview consents and information sheet for carers and children

Carers consent



Information Sheet for *Caregiver Participant* in Research Studies

You will be given a copy of this information sheet.

Title of Project: **Moving through the built and the social environments; children's unaccompanied trips from caregivers' and childrens' perspectives**

This study has been approved by the UCL Research Ethics Committee (Project ID Number): **11123/001**

Name Natan Waintrub

Work Address University College London, Chadwick Building, Gower St, London WC1E 6BT

Contact Details Phone: CL +569 9035 6080. UK +44(0) 7521 787 022, Email: ucesnwa@ucl.ac.uk

We would like to invite you and the child(ren) you take care of to participate in this UCL PhD research project. This research aims to identify the features of the street environment and the community that influence the trips that children carry out with and without adult company; but, before you decide whether to take part, it is important for you to understand why the research is being done and what it will involve. Please take time to read the following information carefully and discuss it with others if you wish. Ask me if there is anything that is not clear or if you would like more information. Take time to decide whether or not you wish to take part.

If you and your child agree to take part in this research, you will be requested to take part in a one to two hour interview in your house for this initial, exploratory study, which would help us develop a questionnaire, to be sent to a larger number of households. The interview will consist of a series of general topics and questions, which you will be asked to give your thoughts on. This will cover things such as: describing a typical day for your child, where they go and how they get there; why they are accompanied or are allowed to travel alone, or with other children? Are there places, times of day, etc. when children are not allowed out alone? How does the physical environment and neighbourhood social conditions affect these decisions? Supplementary visual materials will be used during the interview, including pictures of your neighbourhood surroundings, a chart to mark out the daily routine of your child(ren) as a schedule, and paper for drawing a map of your neighbourhood and the routes taken, or not taken. You and your child will always be together during the interview.

During the interview the discussion will be recorded and will be used only for analysis by the researcher and some quotations may be used to illustrate in the research. No other use will be made of the recordings or other materials without your written consent, and no one outside the project will be allowed access to the original recordings and materials.

Pseudonyms will be used to anonymise the interview responses. These false names will be used in published material (reports, publications and presentations), where your responses will be used only in summary form and in some quotations. In other words, your name will not be used, and you will not be identifiable in any of the reports, publications and presentations etc. arising from the research.

Due to the nature of this research, we are not expecting to cover information which may put you in risk. However, you can request confidentiality in any moment of the interview if any sensitive issue arises.

Finally, the information that you and your child can provide us will help us to identify improvements in public spaces that can help children have better access to their neighbourhood environment, and potentially give them freedom to make more unaccompanied trips. Therefore, whilst there are no immediate direct benefits for people participating in the project, it is hoped that this research project will help to improve the conditions of the public spaces and, with it, facilitate the life of people who live in this area and similar ones in Chile and in the United Kingdom.

It is up to you to decide whether or not to take part. If you do decide to take part, you will be given this information sheet to keep (and be asked to sign a consent form) and you can still withdraw at any time until the data collection stage at October of 2017. You do not have to give a reason. If you have any question regarding to your participation or the research project, you can contact the researcher Natan Waintrub by email (ucesnwa@ucl.ac.uk) or telephone (CL +569 9035 6080, UK +44 7521 787 022). Or the supervisors, Prof Nick Tyler by email (n.tyler@ucl.ac.uk) or telephone (UK +44 20 7679 1562) or Prof Peter Jones by email (peter.jones@ucl.ac.uk) or telephone (UK +44 20 7679 7224)

All data will be collected and stored in accordance with the Data Protection Act 1998.

Thank you for reading this information sheet and for considering take part in this research.

Informed Consent Form for *Caregiver Participant* in Research Studies

Please complete this form after you have read the Information Sheet and/or listened to an explanation about the research.

Title of Project: **Moving through the built and the social environments; children's unaccompanied trips from caregivers' and childrens' perspectives**

This study has been approved by the UCL Research Ethics Committee (Project ID Number): **11123/001**

Thank you for your interest in taking part in this research. Before you agree to take part, the person organising the research must explain the project to you.

If you have any questions arising from the Information Sheet or explanation already given to you, please ask the researcher before you to decide whether to join in. You will be given a copy of this Consent Form to keep and refer to at any time.

Participant's Statement

- I have read the notes written above and the Information Sheet, and understand what the research project involves.
- I understand that if I decide at any time that I no longer wish to take part in this research project, I can notify the researchers involved and withdraw immediately.
- I give permission for members of the research team to have access to my anonymised responses. I understand that my name will not be linked with the research materials, and I will not be identified or identifiable in the report or reports and publication or publications that result from the research.
- I understand that such information will be treated as strictly confidential and handled in accordance with the provisions of the Data Protection Act 1998.
- I agree that the research project named above has been explained to me to my satisfaction and I agree to take part in this study.
- I understand that my participation will be taped recorded and I consent to use of this material as part of the research project.
- I agree that my data, after it has been fully anonymised, can be shared with other researchers.

Signed:

Date:

Children (6-10 years old) information sheet

Moving in your neighbourhood

A research project.

Santiago - Chile, August – October 2017

This information leaflet is for children aged 6-10 years.

We are doing this research as part of Natan's study.

Please will you help us with our study?

We would to invite you and your parent(s) to take part in this university study. This leaflet gives some details about it.

We have set out the questions you may want to ask, with our answers.

You can talk about the questions with your parent(s), before you decide whether you would like to take part or not.

Please take your time to read this information and discuss it with others, if you wish.



What is the study about?

The streets and the community where you live, and the wider city, affect where you go and how you get there.

But, so far, people have not asked children and their parents about how the street and the community affect them.

We plan to listen to you and your parents.

We want to help to improve the conditions of the streets and benefit the lives of the people who live in this area and others in Chile and the United Kingdom.

What do I have to do?

If you and your parent(s) agree to participate in this research, Natan will ask you some questions and carry out some activities with you.

The conversation will last an hour or two and you will always be with your parent(s).

There are not any 'right' or 'wrong' answers, your opinions are important for us.

The questions are about where you go, how you get there, if there are places you avoid, and if you are accompanied by your parents or other people.

Natan will also show you some pictures, ask you to describe your daily life, and draw a map of your area and the routes you take.

Natan will tape-record the discussion, with your agreement, so that he can listen again to what you say, and the information will be used only for this study.

No other use will be made of your answers without your agreement.

No one outside the research will have access to the original recordings.

Do I have to take part?

No - you decide if you want to take part, or not. Even if you say 'yes', you can drop out at any time. And you can tell us if you want to stop, or have a break.

And you don't have to give us a reason if you say 'no' or 'stop'.

If you don't want to answer some questions, see the photographs, picture your daily activities or draw a map or the routes, just say 'I pass'.

Who will know if I am in the study?

Nobody will know if you take part in the research, as we will not record your name or address, or tell anyone else.

We will keep our tapes and notes about you in a safe place.

When we write documents about your opinions we will change your name, so no one will know who you are.

Will doing the research help me?

The information that you and your parent(s) can give us will help us to improve the streets.

But, our main aim is to write reports so that the authorities that can change things that will help many families in the future.

The improvements identified will enable children, like you, to go to more places and travel safely.

If you have any doubts or concerns about the study, please tell Natan, Professor Tyler or Professor Jones.

All the contact information of us is at the end of this leaflet.

We hope you will like helping us!



The project was approved by UCL Research Ethics Committee, project number 11123/001.

It is up to you to decide whether or not to take part.

If you take part, please keep this leaflet with the copy of your consent form.

You can withdraw from the study at any time until October of 2017, and you do not have to give a reason.

For any questions, you can **contact us**.

Researcher Natan Waintrub,
email: ucesnwa@ucl.ac.uk,
telephone: Chile +569 9035 6080, UK +44 7521 787 022.

Researcher Nick Tyler,
email: n.tyler@ucl.ac.uk,
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Researcher Peter Jones,
email: peter.jones@ucl.ac.uk,
telephone: UK +44 20 7679 0478

July 2017, leaflet version 2.

Thank you for reading this leaflet.

Children (11-16 years old) information sheet

Moving through your environment.

A research project

Santiago - Chile, August – October 2017
London - UK, January – March 2018

This information leaflet is for children aged 11-14 years.

Please will you help us with our research?

We would to invite you and your parent(s) to take part in this university research project.

This leaflet gives some details about the project.

We have set out the questions you might want to ask, with our answers, so you can talk about them with your parent(s), before you decide if you would like to take part.

Please take time to read the following information carefully and discuss it with others if you wish.

Ask me, Natan, if there is anything that is not clear or if you would like more information.

Take time to decide whether or not you wish to take part.

Why is the purpose of this research study?

The streets and the community public spaces where you live, and the wider city, affect where you go and how you get there – and whether your parent(s) accompany you.

But, so far, researchers have not asked children and their parents about how the street and the community affect where you go – or don't go – and how you travel.

We plan to listen to boys and girls and their parents/carers and write reports about their views on children mobility.

We want to help to improve the conditions of the public spaces and, in doing so, to benefit the lives of people who live in this area and similar ones in Chile and in the United Kingdom.

What will happen to me in the study?

If you and your parent(s) agree to take part in this study, the researcher will ask you all some questions, and carry out some activities.

The questions will cover things such as describing a typical school day, where you go and how you get there. Why are you accompanied or are allowed to travel alone, or with other children? Are there places, times of day, etc. when you are not allowed out alone?

With the questions, we will show you some photographs of the area, ask you to describe your daily routine, and draw a map of your neighbourhood and the routes you take. You will always be with your parent(s) during the activities.

When will the study begin and possibly finish?

The study held in Santiago will begin in August 2017 and it will finish in October 2017. The study held in Greater London will begin in January 2018 and it will finish in March 2018.

Do I have to take part?

No. You can decide if you want to take part, or not.

Even if you say 'yes', you can drop out at any time.

And you can tell us if you want to stop or have a break.

If you don't want to answer some questions, see the photographs, picture your daily schedule or draw a map or the routes, just say 'pass'.

You are not obligated to tell us anything unless you want to. And you don't have to give us a reason if you say 'no' or 'stop'.

What will happen to me if I take part?

If you agree, we will have a conversation with you and your parent(s) for an hour or two. We will not look for 'right' or 'wrong' answers, it is your own views that matter.

We would like to tape-record our discussion.

This information will only be used for this research project. No other use will be made of your recordings without your written agreement, and no one outside the project will be allowed access to the original recordings.

Could there be any problems for me if I take part?

We hope you will enjoy talking to us.

We do not expect to find information which may put you in risk. Also, you can ask us if there is some issue you want us to keep as a secret.

If you have any concerns or complaints about the project, please tell me, Professor Nick Tyler or Professor Peter Jones. All of the contact information is at the end of this information leaflet.

Will doing the research help me?

We hope you will like helping us. But our main aim is to write reports that will help very many families in the future.

As this is a initial exploratory study, your responses would help us develop a questionnaire to be sent to a larger number of houses.

Who will know if I am in the research, or what I have talked about?

Nobody will know if you are in the research, as we will not record your personal information or tell anyone else.

We will keep our tapes and notes about you in a safe lockable place.

When we write reports about your views, we will use pseudonyms to change your name, so no one will know what you said.

Your responses will be reported only in general terms and some quotations of what you say might be used in the reports.

Will I benefit from the research results?

The information that you and your parent(s) can provide us will help us to identify improvements in public spaces, which will potentially give children more freedom to make more unaccompanied trips.

Whilst there are no immediate benefits for you, it is hoped that this research project will help to improve the conditions of the public spaces and, so improve the lives of people who live in this and similar areas in Chile and in the United Kingdom.

The project was approved by UCL Research Ethics Committee, project number 11123/001.

It is up to you to decide whether or not to take part.

If you take part, please keep this leaflet with the copy of your consent form.

You can withdraw from the study at any time until October of 2017, and you do not have to give a reason.

For any questions, you can **contact us**.

Researcher Natan Waintrub,
email: ucesnwa@ucl.ac.uk, telephone: Chile +569 9035 6080, UK +44 7521 787 022.

Researcher Nick Tyler,
email: n.tyler@ucl.ac.uk, telephone: UK +44 20 7679 1562.

Researcher Peter Jones,
email: peter.jones@ucl.ac.uk, telephone: UK +44 20 7679 7224

June 2017, leaflet version 2.

Thank you for reading this leaflet!

10.4. Instruction sheet for the interview task (iii) “neighbourhood environment”

Map drawing instructions

- 1.-  in the  that you  most
- 2.-  the 
- 3.-  the 
- 4.-  the vehicle. For example, , , , .
- 5.-  the 
- 6.-  **at least three** important things. For example, , , .

10. 5. Questionnaire sections D, F1 and F2 orthogonal designs

Section D - LON 1

Street A					Street B					Choice situation	Block
Facades	Quality of footpaths	Urban amenities	Facilities	Crossings	Facades	Quality of footpaths	Urban amenities	Facilities	Crossings		
Low density houses	Dirty footpaths	No bus stops or playgrounds	No shops or pubs	Zebra crossing	Medium density houses	Well-kept footpaths	A bus stop and a playground	Variety of shops	Zebra crossing	1	1
Medium density houses	Dirty footpaths	A bus stop and a playground	A variety of shops and a pub	Signalised crossings	Low density houses	Dirty footpaths	A bus stop	Variety of shops	Signalised crossings	2	
Medium density houses	Well-kept footpaths	A bus stop and a playground	Variety of shops	Zebra crossing	Medium density houses	Well-kept footpaths	A bus stop	No shops or pubs	Signalised crossings	3	
Low density houses	Well-kept footpaths	A playground	A variety of shops and a pub	Signalised crossings	Low density houses	Dirty footpaths	No bus stops or playgrounds	No shops or pubs	Zebra crossing	4	
Low density houses	Dirty footpaths	A bus stop	Variety of shops	Signalised crossings	Medium density houses	Dirty footpaths	A bus stop	Variety of shops	Zebra crossing	1	2
Low density houses	Well-kept footpaths	No bus stops or playgrounds	A variety of shops and a pub	Zebra crossing	Medium density houses	Dirty footpaths	A playground	No shops or pubs	Zebra crossing	2	
Medium density houses	Dirty footpaths	A bus stop	Variety of shops	Zebra crossing	Medium density houses	Well-kept footpaths	No bus stops or playgrounds	A pub	Signalised crossings	3	
Medium density houses	Well-kept footpaths	No bus stops or playgrounds	A pub	Signalised crossings	Low density houses	Well-kept footpaths	A playground	A variety of shops and a pub	Signalised crossings	4	
Medium density houses	Well-kept footpaths	A bus stop	No shops or pubs	Signalised crossings	Low density houses	Dirty footpaths	A bus stop and a playground	A pub	Signalised crossings	1	3
Low density houses	Well-kept footpaths	A playground	A pub	Zebra crossing	Low density houses	Well-kept footpaths	No bus stops or playgrounds	A variety of shops and a pub	Zebra crossing	2	
Low density houses	Dirty footpaths	A bus stop and a playground	A pub	Signalised crossings	Medium density houses	Dirty footpaths	A bus stop and a playground	A variety of shops and a pub	Signalised crossings	3	
Medium density houses	Dirty footpaths	A playground	No shops or pubs	Zebra crossing	Low density houses	Well-kept footpaths	A playground	A pub	Zebra crossing	4	

Source: author's own

Section D - LON 2

Street A					Street B					Choice situation	Block
Facades	Natural features	Strangers' Age	Strangers' Activity	Density of people	Facades	Natural features	Strangers' Age	Strangers' Activity	Density of people		
Low density houses	No greenery	Elderly people	standing	Uncrowded footpath	Medium density houses	Trees	Teenagers	standing	Crowded footpath	1	4
Medium density houses	Trees	Adults	walking	Crowded footpath	Low density houses	Trees	Adults	drinking alcohol	Uncrowded footpath	2	
Low density houses	Trees and grass	Teenagers	walking	Uncrowded footpath	Low density houses	No greenery	Children	chatting	Crowded footpath	3	
Low density houses	No greenery	Children	chatting	Crowded footpath	Medium density houses	No greenery	Teenagers	chatting	Uncrowded footpath	4	
Medium density houses	Grass	Elderly people	drinking alcohol	Crowded footpath	Low density houses	Trees and grass	Teenagers	walking	Uncrowded footpath	1	5
Medium density houses	Grass	Adults	standing	Uncrowded footpath	Low density houses	Trees and grass	Elderly people	chatting	Crowded footpath	2	
Medium density houses	Trees and grass	Children	walking	Uncrowded footpath	Low density houses	No greenery	Elderly people	standing	Uncrowded footpath	3	
Medium density houses	Trees	Teenagers	standing	Crowded footpath	Medium density houses	Grass	Elderly people	drinking alcohol	Crowded footpath	4	
Low density houses	Grass	Children	standing	Crowded footpath	Medium density houses	Trees	Adults	walking	Crowded footpath	1	6
Low density houses	Trees	Adults	drinking alcohol	Uncrowded footpath	Medium density houses	Grass	Adults	standing	Uncrowded footpath	2	
Low density houses	Trees and grass	Elderly people	chatting	Crowded footpath	Low density houses	Grass	Children	standing	Crowded footpath	3	
Medium density houses	No greenery	Teenagers	chatting	Uncrowded footpath	Medium density houses	Trees and grass	Children	walking	Uncrowded footpath	4	

Source: author's own

Section D - SCL 1

Street A					Street B					Choice situation	Block
Facades	Quality of footpahts	Urban amenities	Facilities	Parked vehicles	Facades	Quality of footpahts	Urban amenities	Facilities	Parked vehicles		
Permeable fences	Well-kept footpahts	A bus stop	Local shops	No parked vehicles	Closed fences	Neglected footpaths	A bus stop and a playground	No facilities	Vehicles parked on the footpath	1	1
Permeable fences	Dirty and neglected footpaths	A playground	School	Vehicles parked on the footpath	Closed fences	Dirty footpaths	A bus stop	An off-licence	Vehicles parked on the footpath	2	
Closed fences	Neglected footpaths	A bus stop and a playground	No facilities	Vehicles parked on the footpath	Permeable fences	Neglected footpaths	No urban amenities	School	Vehicles parked on the footpath	3	
Closed fences	Dirty footpaths	No urban amenities	Local shops	Vehicles parked on the footpath	Permeable fences	Dirty footpaths	A bus stop and a playground	An off-licence	No parked vehicles	4	
Permeable fences	Dirty and neglected footpaths	No urban amenities	No facilities	No parked vehicles	Permeable fences	Well-kept footpahts	A bus stop	Local shops	No parked vehicles	1	2
Permeable fences	Dirty footpaths	A bus stop and a playground	An off-licence	No parked vehicles	Closed fences	Neglected footpaths	A bus stop	An off-licence	No parked vehicles	2	
Closed fences	Neglected footpaths	A bus stop	An off-licence	No parked vehicles	Permeable fences	Dirty and neglected footpaths	A playground	School	Vehicles parked on the footpath	3	
Closed fences	Well-kept footpahts	A bus stop and a playground	School	No parked vehicles	Closed fences	Dirty and neglected footpaths	A playground	Local shops	No parked vehicles	4	
Closed fences	Dirty footpaths	A bus stop	An off-licence	Vehicles parked on the footpath	Permeable fences	Well-kept footpahts	A playground	No facilities	Vehicles parked on the footpath	1	3
Permeable fences	Neglected footpaths	No urban amenities	School	Vehicles parked on the footpath	Permeable fences	Dirty and neglected footpaths	No urban amenities	No facilities	No parked vehicles	2	
Permeable fences	Well-kept footpahts	A playground	No facilities	Vehicles parked on the footpath	Closed fences	Well-kept footpahts	A bus stop and a playground	School	No parked vehicles	3	
Closed fences	Dirty and neglected footpaths	A playground	Local shops	No parked vehicles	Closed fences	Dirty footpaths	No urban amenities	Local shops	Vehicles parked on the footpath	4	

Source: author's own

Section D - SCL 2

Street A					Street B					Choice situation	Block
Facades	Greenery	Strangers' age	Strangers' gender	Strangers' activities	Facades	Greenery	Strangers' age	Strangers' gender	Strangers' activities		
Permeable fences	No greenery	Children	Male	chatting	Closed fences	Trees and grass	Children	Female	chatting	1	4
Closed fences	Grass	Elderly people	Male	drinking alcohol	Closed fences	Trees	Adults	Male	walking	2	
Closed fences	Grass	Adults	Female	walking	Permeable fences	Trees and grass	Elderly people	Male	chatting	3	
Closed fences	Trees and grass	Children	Female	walking	Permeable fences	No greenery	Elderly people	Female	standing	4	
Permeable fences	No greenery	Elderly people	Female	standing	Permeable fences	Grass	Children	Male	standing	1	5
Permeable fences	Grass	Children	Male	standing	Permeable fences	No greenery	Children	Male	chatting	2	
Permeable fences	Trees	Adults	Female	drinking alcohol	Closed fences	Trees	Teenagers	Male	standing	3	
Permeable fences	Trees and grass	Elderly people	Male	chatting	Closed fences	No greenery	Teenagers	Female	walking	4	
Closed fences	Trees	Adults	Male	walking	Permeable fences	Trees	Adults	Female	drinking alcohol	1	6
Permeable fences	Trees and grass	Teenagers	Female	drinking alcohol	Closed fences	Grass	Adults	Female	walking	2	
Closed fences	No greenery	Teenagers	Female	chatting	Closed fences	Grass	Elderly people	Male	drinking alcohol	3	
Closed fences	Trees	Teenagers	Male	standing	Permeable fences	Trees and grass	Teenagers	Female	drinking alcohol	4	

Source: author's own

Section F1

Street A					Street B					Choice situation	Block
Quality of footpaths	Greenery	Urban amenities	Strangers' Age	Strangers' Activity	Quality of footpaths	Greenery	Urban amenities	Strangers' Age	Strangers' Activity		
Dirty footpaths	No greenery	A playground	Adults	walking	Dirty footpaths	Grass	A bus stop and a playground	Adults	drinking alcohol	1	1
Dirty footpaths	Trees and grass	A bus stop and a playground	Elderly people	standing	Well-kept foot-paths	No greenery	No urban ame-nities	Children	standing	2	
Dirty footpaths	Grass	A bus stop and a playground	Adults	drinking alcohol	Well-kept foot-paths	Trees and grass	A playground	Children	walking	3	
Well-kept footpaths	Trees and grass	A bus stop	Adults	chatting	Well-kept foot-paths	No greenery	A playground	Elderly people	standing	4	
Well-kept footpaths	Trees and grass	A playground	Children	chatting	Dirty footpaths	Grass	A bus stop	Teenagers	drinking alcohol	1	2
Well-kept footpaths	No greenery	A bus stop and a playground	Teenagers	drinking alcohol	Dirty footpaths	Trees	No urban ame-nities	Elderly people	walking	2	
Dirty footpaths	Trees	No urban ame-nities	Children	walking	Dirty footpaths	Trees and grass	A bus stop and a playground	Elderly people	chatting	3	
Well-kept footpaths	Grass	No urban ame-nities	Adults	standing	Well-kept foot-paths	Trees and grass	A bus stop	Adults	standing	4	
Dirty footpaths	Grass	A bus stop	Teenagers	standing	Well-kept foot-paths	Trees	A bus stop	Elderly people	drinking alcohol	1	3t
Well-kept footpaths	No greenery	No urban ame-nities	Children	standing	Dirty footpaths	Trees	A playground	Children	walking	2	
Well-kept footpaths	Trees and grass	A bus stop and a playground	Teenagers	walking	Dirty footpaths	Trees	No urban ame-nities	Children	chatting	3	
Well-kept footpaths	No greenery	A playground	Elderly people	chatting	Dirty footpaths	Grass	A bus stop	Teenagers	walking	4	

Section F1 (continued)

Street A					Street B					Choice situation	Block
Quality of footpaths	Greenery	Urban amenities	Strangers' Age	Strangers' Activity	Quality of footpaths	Greenery	Urban a menities	Strangers' Age	Strangers' Activity		
Well-kept footpaths	Trees	A bus stop	Elderly people	drinking alcohol	Well-kept foot- paths	Trees and grass	A bus stop and a playground	Teenagers	chatting	1	4
Dirty footpaths	Trees	No urban ame- nities	Elderly people	walking	Well-kept foot- paths	Grass	No urban ame- nities	Adults	walking	2	
Dirty footpaths	Grass	A bus stop	Teenagers	chatting	Well-kept foot- paths	No greenery	A bus stop and a playground	Teenagers	standing	3	
Dirty footpaths	Trees	A playground	Children	walking	Dirty footpaths	No greenery	A playground	Adults	chatting	4	

Source: author's own

Section F2

Crossing A			Crossing B			Choice situation	Block
Crossings	Vehicle lanes direction	Traffic composition	Crossings	Vehicle lanes direction	Traffic composition		
Controlled pedestrian crossing (zebra crossing)	with traffic in one direction	Car traffic	Uncontrolled pedestrian crossing (dropped kerbs)	with traffic in both directions	Car and bus traffic	1	1
Uncontrolled pedestrian crossing (dropped kerbs)	with traffic in one direction	Car traffic	Controlled pedestrian crossing (zebra crossing)	with traffic in both directions	Car and bus traffic	2	
Uncontrolled pedestrian crossing (dropped kerbs)	with traffic in one direction	Car and bus traffic	Uncontrolled pedestrian crossing (dropped kerbs)	with traffic in one direction	Car traffic	1	2
Controlled pedestrian crossing (zebra crossing)	with traffic in one direction	Car and bus traffic	Uncontrolled pedestrian crossing (dropped kerbs)	with traffic in both directions	Car and bus traffic	2	
Uncontrolled pedestrian crossing (dropped kerbs)	with traffic in both directions	Car traffic	Uncontrolled pedestrian crossing (dropped kerbs)	with traffic in one direction	Car traffic	1	3
Controlled pedestrian crossing (zebra crossing)	with traffic in both directions	Car traffic	Uncontrolled pedestrian crossing (dropped kerbs)	with traffic in both directions	Car and bus traffic	2	
Controlled pedestrian crossing (zebra crossing)	with traffic in both directions	Car and bus traffic	Controlled pedestrian crossing (zebra crossing)	with traffic in one direction	Car traffic	1	4
Uncontrolled pedestrian crossing (dropped kerbs)	with traffic in both directions	Car and bus traffic	Controlled pedestrian crossing (zebra crossing)	with traffic in both directions	Car and bus traffic	2	

Source: author's own

10. 6. Questionnaire sections D, F1 and F2 efficient designs

Section D - LON 1

	Street A					Street B					Choice situation	Block
	Facades	Quality of footpaths	Urban amenities	Facilities	Crossings	Facades	Quality of footpaths	Urban amenities	Facilities	Crossings		
335	Medoum density houses	Well-kept footpaths	A bus stop	A pub	Signalised crossing	Low density houses	Dirty footpaths	A playground	A variety of shops and a pub	Zebra crossing	1	1
	Low density houses	Dirty footpaths	No bus stops or playgrounds	A variety of shops and a pub	Signalised crossing	Medoum density houses	Well-kept footpaths	A bus stop and a playground	Variety of shops	Zebra crossing	2	
	Medoum density houses	Dirty footpaths	A bus stop	No shops or pubs	Zebra crossing	Low density houses	Well-kept footpaths	No bus stops or playgrounds	A variety of shops and a pub	Signalised crossing	3	
	Low density houses	Well-kept footpaths	A playground	Variety of shops	Zebra crossing	Medoum density houses	Dirty footpaths	A bus stop and a playground	No shops or pubs	Signalised crossing	4	
	Low density houses	Well-kept footpaths	A playground	No shops or pubs	Signalised crossing	Medoum density houses	Dirty footpaths	A bus stop	Variety of shops	Zebra crossing	1	2
	Medoum density houses	Dirty footpaths	A bus stop and a playground	A variety of shops and a pub	Zebra crossing	Low density houses	Well-kept footpaths	A playground	No shops or pubs	Signalised crossing	2	
	Medoum density houses	Well-kept footpaths	A bus stop and a playground	A pub	Zebra crossing	Low density houses	Dirty footpaths	A bus stop	Variety of shops	Signalised crossing	3	
	Low density houses	Dirty footpaths	No bus stops or playgrounds	Variety of shops	Signalised crossing	Medoum density houses	Well-kept footpaths	A bus stop	A variety of shops and a pub	Zebra crossing	4	
	Medoum density houses	Dirty footpaths	A bus stop	A variety of shops and a pub	Signalised crossing	Medoum density houses	Well-kept footpaths	No bus stops or playgrounds	A pub	Zebra crossing	1	3
	Medoum density houses	Well-kept footpaths	A bus stop and a playground	Variety of shops	Signalised crossing	Low density houses	Dirty footpaths	No bus stops or playgrounds	A pub	Zebra crossing	2	
	Low density houses	Well-kept footpaths	No bus stops or playgrounds	No shops or pubs	Zebra crossing	Medoum density houses	Dirty footpaths	A playground	A pub	Signalised crossing	3	
	Low density houses	Dirty footpaths	A playground	A pub	Zebra crossing	Low density houses	Well-kept footpaths	A bus stop and a playground	No shops or pubs	Signalised crossing	4	

Source: author's own

Section D - LON 2

Street A					Street B					Choice situation	Block
Facades	Greenery	Strangers' age	Strangers' activities	Density of people	Facades	Greenery	Strangers' age	Strangers' activities	Density of people		
Medoum density houses	Trees	Children	chatting	Crowded footpath	Low density houses	No greenery like trees or grass	Elderly people	standing	Uncrowded footpath	1	4
Low density houses	Trees	Children	walking	Uncrowded footpath	Medoum density houses	Grass	Teenagers	standing	Crowded footpath	2	
Low density houses	No greenery like trees or grass	Adults	drinking alcohol	Uncrowded footpath	Medoum density houses	Trees and grass	Teenagers	drinking alcohol	Crowded footpath	3	
Medoum density houses	Grass	Elderly people	walking	Crowded footpath	Low density houses	Trees and grass	Children	chatting	Uncrowded footpath	4	
Low density houses	Trees and grass	Adults	walking	Crowded footpath	Medoum density houses	No greenery like trees or grass	Elderly people	chatting	Uncrowded footpath	1	5
Medoum density houses	No greenery like trees or grass	Elderly people	standing	Crowded footpath	Medoum density houses	Grass	Children	walking	Uncrowded footpath	2	
Low density houses	Trees	Teenagers	standing	Uncrowded footpath	Low density houses	Trees and grass	Elderly people	drinking alcohol	Crowded footpath	3	
Medoum density houses	Trees and grass	Teenagers	walking	Uncrowded footpath	Low density houses	Grass	Adults	chatting	Crowded footpath	4	
Low density houses	No greenery like trees or grass	Teenagers	chatting	Crowded footpath	Medoum density houses	Trees	Adults	drinking alcohol	Uncrowded footpath	1	6
Medoum density houses	Trees and grass	Adults	chatting	Uncrowded footpath	Low density houses	Trees	Children	standing	Crowded footpath	2	
Medoum density houses	Grass	Children	standing	Crowded footpath	Low density houses	Trees	Teenagers	chatting	Uncrowded footpath	3	
Low density houses	Grass	Elderly people	drinking alcohol	Uncrowded footpath	Medoum density houses	No greenery like trees or grass	Adults	walking	Crowded footpath	4	

Source: author's own

Section D - SCL 1

Street A					Street B					Choice situation	Block
Facades	Quality of footpahts	Urban amenities	Facilities	Parked vehicles	Facades	Quality of footpahts	Urban amenities	Facilities	Parked vehicles		
Permeable fences	Neglected footpahts	A bus stop	An off-licence	No parked vehicles	Closed fences	Dirty footpahts	A playground	A school	Vehicles parked on the footpaht	1	1
Closed fences	Dirty footpahts	No urban amenities	Local shops	No parked vehicles	Permeable fences	Neglected footpahts	A bus stop y A playground	An off-licence	Vehicles parked on the footpaht	2	
Permeable fences	Well-kept footpahts	A bus stop	A school	Vehicles parked on the footpaht	Closed fences	Neglected footpahts	A bus stop y A playground	No facilities	No parked vehicles	3	
Closed fences	Dirty and neglected footpahts	A bus stop	No facilities	Vehicles parked on the footpaht	Permeable fences	Well-kept footpahts	A bus stop y A playground	Local shops	No parked vehicles	4	
Permeable fences	Dirty and neglected footpahts	No urban amenities	An off-licence	Vehicles parked on the footpaht	Permeable fences	Well-kept footpahts	A playground	An off-licence	No parked vehicles	1	2
Permeable fences	Dirty footpahts	A playground	No facilities	No parked vehicles	Closed fences	Neglected footpahts	No urban amenities	A school	Vehicles parked on the footpaht	2	
Closed fences	Dirty footpahts	A bus stop y A playground	An off-licence	Vehicles parked on the footpaht	Closed fences	Dirty and neglected footpahts	A playground	Local shops	No parked vehicles	3	
Closed fences	Neglected footpahts	A playground	A school	No parked vehicles	Permeable fences	Dirty and neglected footpahts	No urban amenities	No facilities	Vehicles parked on the footpaht	4	
Permeable fences	Dirty and neglected footpahts	A bus stop y A playground	A school	No parked vehicles	Closed fences	Well-kept footpahts	A bus stop	No facilities	Vehicles parked on the footpaht	1	3
Closed fences	Well-kept footpahts	A bus stop y A playground	Local shops	Vehicles parked on the footpaht	Permeable fences	Dirty footpahts	No urban amenities	A school	No parked vehicles	2	
Permeable fences	Neglected footpahts	A playground	Local shops	Vehicles parked on the footpaht	Closed fences	Dirty and neglected footpahts	A bus stop	An off-licence	No parked vehicles	3	
Closed fences	Well-kept footpahts	No urban amenities	No facilities	No parked vehicles	Permeable fences	Dirty footpahts	A bus stop	Local shops	Vehicles parked on the footpaht	4	

Source: author's own

Section D - SCL 2

Street A					Street B					Choice situation	Block
Facades	Greenery	Strangers' age	Strangers' gender	Strangers' activities	Facades	Greenery	Strangers' age	Strangers' gender	Strangers' activities		
Permeable fences	Greenery	Teenagers	Female	walking	Closed fences	Grass	Children	Male	standing	1	4
Permeable fences	Trees	Teenagers	Male	chatting	Closed fences	Greenery	Elderly people	Female	walking	2	
Closed fences	Grass	Adults	Female	standing	Permeable fences	Trees	Elderly people	Male	drinking alcohol	3	
Closed fences	Trees	Adults	Male	walking	Permeable fences	Trees y Grass	Children	Female	chatting	4	
Permeable fences	Grass	Elderly people	Male	walking	Closed fences	Trees y Grass	Adults	Female	drinking alcohol	1	5
Closed fences	Grass	Teenagers	Female	drinking alcohol	Permeable fences	Trees	Adults	Female	chatting	2	
Closed fences	Trees	Children	Female	standing	Permeable fences	Grass	Adults	Male	walking	3	
Permeable fences	Trees y Grass	Adults	Male	drinking alcohol	Closed fences	Greenery	Elderly people	Male	chatting	4	
Closed fences	Greenery	Children	Male	chatting	Permeable fences	Trees	Adults	Female	standing	1	6
Closed fences	Trees y Grass	Elderly people	Female	chatting	Permeable fences	Greenery	Teenagers	Male	standing	2	
Permeable fences	Trees y Grass	Elderly people	Male	standing	Closed fences	Grass	Teenagers	Female	chatting	3	
Permeable fences	Greenery	Children	Female	walking	Closed fences	Trees y Grass	Teenagers	Male	walking	4	

Source: author's own

Section F1

Street A					Street B					Choice situation	Block
Quality of footpaths	Greenery	Urban amenities	Strangers' Age	Strangers' Activity	Quality of footpaths	Greenery	Urban amenities	Strangers' Age	Strangers' Activity		
Dirty footpaths	Trees and grass	A bus stop and a playground	Adults	drinking alcohol	Dirty footpaths	No greenery like trees or grass	A bus stop	Teenagers	walking	1	1
Dirty footpaths	Trees	A playground	Children	walking	Well-kept foot-paths	Trees and grass	A bus stop	Teenagers	chatting	2	
Well-kept footpaths	No greenery like trees or grass	A playground	Teenagers	standing	Dirty footpaths	Trees and grass	No bus stops or playgrounds	Elderly people	walking	3	
Well-kept footpaths	Trees	A bus stop	Elderly people	chatting	Well-kept foot-paths	Grass	A playground	Teenagers	standing	4	
Well-kept footpaths	Grass	No bus stops or playgrounds	Elderly people	standing	Dirty footpaths	No greenery like trees or grass	A bus stop and a playground	Children	walking	1	2
Dirty footpaths	Grass	A bus stop and a playground	Children	chatting	Well-kept foot-paths	Trees	No bus stops or playgrounds	Adults	walking	2	
Well-kept footpaths	Grass	A bus stop	Adults	walking	Dirty footpaths	No greenery like trees or grass	A playground	Elderly people	standing	3	
Dirty footpaths	Trees and grass	No bus stops or playgrounds	Teenagers	drinking alcohol	Well-kept foot-paths	Grass	A bus stop	Adults	drinking alcohol	4	
Dirty footpaths	Trees and grass	A playground	Elderly people	walking	Well-kept foot-paths	Trees	No bus stops or playgrounds	Children	chatting	1	3
Well-kept footpaths	No greenery like trees or grass	No bus stops or playgrounds	Children	walking	Dirty footpaths	Trees	A bus stop and a playground	Adults	standing	2	
Well-kept footpaths	No greenery like trees or grass	A bus stop and a playground	Adults	chatting	Dirty footpaths	Grass	A bus stop	Children	walking	3	
Dirty footpaths	Grass	No bus stops or playgrounds	Adults	standing	Well-kept foot-paths	Trees and grass	A playground	Elderly people	drinking alcohol	4	

Section F1 (continued)

Street A					Street B					Choice situation	Block
Quality of footpaths	Greenery	Urban amenities	Strangers' Age	Strangers' Activity	Quality of footpaths	Greenery	Urban amenities	Strangers' Age	Strangers' Activity		
Well-kept footpaths	Trees	A bus stop and a playground	Teenagers	walking	Dirty footpaths	Trees and grass	A playground	Adults	chatting	1	4
Well-kept footpaths	No greenery like trees or grass	A bus stop	Elderly people	drinking alcohol	Well-kept foot-paths	Trees	No bus stops or playgrounds	Teenagers	drinking alcohol	2	
Dirty footpaths	Trees	A playground	Teenagers	chatting	Dirty footpaths	No greenery like trees or grass	A bus stop and a playground	Children	standing	3	
Dirty footpaths	Trees and grass	A bus stop	Children	standing	Well-kept foot-paths	Grass	A bus stop and a playground	Elderly people	chatting	4	

Source: author's own

Section F2

Crossing A			Crossing B			Choice situation	Block
Crossings	Vehicle lanes direction	Traffic composition	Crossings	Vehicle lanes direction	Traffic composition		
Zebra crossing	One way traffic	CAR and BUS traffic	Dropped kerbs (informal crossing)	One way traffic	CAR traffic	1	1
Zebra crossing	One way traffic	CAR and BUS traffic	Dropped kerbs (informal crossing)	Two-way traffic	CAR traffic	2	
Zebra crossing	Two-way traffic	CAR traffic	Zebra crossing	One way traffic	CAR and BUS traffic	1	2
Dropped kerbs (informal crossing)	One way traffic	CAR and BUS traffic	Zebra crossing	Two-way traffic	CAR and BUS traffic	2	
Dropped kerbs (informal crossing)	Two-way traffic	CAR traffic	Dropped kerbs (informal crossing)	One way traffic	CAR and BUS traffic	1	3
Dropped kerbs (informal crossing)	One way traffic	CAR and BUS traffic	Zebra crossing	Two-way traffic	CAR traffic	2	
Zebra crossing	Two-way traffic	CAR traffic	Dropped kerbs (informal crossing)	One way traffic	CAR traffic	1	4
Dropped kerbs (informal crossing)	Two-way traffic	CAR traffic	Zebra crossing	Two-way traffic	CAR and BUS traffic	2	

Source: author's own

10. 7. Invitation to take part in the research study (quantitative stage)



Walking around your neighbourhood - UCL PhD research project

Invitation to participate

Dear parents/caregivers,

We would like to invite you and your child(ren) to take part in a PhD research project being conducted from University College London (UCL), which is comparing walking conditions in parts of London and Santiago de Chile.

The quality of the streets where families live affects where children can go and how they get there; but, so far, children and their parents have not been asked by professionals about how they view their local streets or the places where they travel to, in terms of whether they feel that they are safe for their children to walk unaccompanied. We want to help to improve the conditions of the streets where children travel and, by doing this, the lives of the people who live in this area and other places in London and Santiago de Chile.

If you agree to participate, you and your child(ren) will be asked to complete an online questionnaire in which you will both be asked, in turn, to look at different types of street environment and rate them in terms of how comfortable you would feel about your child walking along them unaccompanied, and of how your child(ren) feel about doing so. Each part should take approximately 25 minutes.

The information that you and your child(ren) provide will help us to identify ways to improve the streets and create better and safer environments for children to walk around their neighbourhoods.

We will write a report drawing on the completed questionnaires, a copy of which will be provided to your school. The report will include the analysis of the information and some suggestions to encourage more children's unaccompanied walking trips.

Additionally, three participants will be selected at random to win a £20 cinema voucher at the end of the study.

This research has full UCL Ethics Committee approvals and all of your information will be handled **anonymously**.

If you are willing to participate in the study, please follow **this link**:

bit.ly/UCLSurvey

If you have any doubts, please contact Natan Waintrub by email:
ucesnwa@ucl.ac.uk

We hope you will like helping us!

10. 8. Analysis of the rating scale data (quantitative stage)

Non-parametric test of hypothesis

London

Facades

The attribute medium density houses show a statistically significant different distribution for carers and children (K-W p 0.024), with children's ratings ranging between 'very comfortable' and 'neutral' values, and carers ranging between 'fairly comfortable' and 'neutral' values. Responses also differed by the gender of the carers (Pearson χ^2 p 0.026, K-W p 0.004), with male carers leaning to 'very' and 'fairly comfortable' values, and female carers ranging between 'fairly comfortable' and 'neutral' values. Among carers' answers, a statistically significant difference is observed on medium density houses according to the age of the child (K-W p 0.009) with carers reporting mostly 'fairly comfortable' and 'neutral' values for primary school children, while secondary school children mainly reported 'very comfortable' or 'neutral' values for.

Regarding the low-density houses attribute, responses were significantly different according to the gender of the carers (Pearson χ^2 p 0.026, K-W p 0.004), with male carers reporting more 'neutral' values and female carers leaning towards 'fairly comfortable' values. This attribute is also statistically significantly different when the IMD crime domain is considered (K-W p 0.050). The participants answers' from least deprived participants mostly range between 'fairly comfortable' and 'neutral', whereas those residing in the most deprived areas ranged between 'fairly comfortable' and 'fairly uncomfortable' values.

Quality of footpaths

The attribute well-kept footpaths show a statistically significantly different distribution according to the child's last walking trip companion (K-W p 0.013), with participants walking with another child mostly reporting 'very comfortable' values, whereas those accompanied by an adult or unaccompanied preferring 'fairly comfortable' values. For the same attribute, results show statistically significantly different among carers, if the child's age range is taken into account (K-W p 0.018) as they reported 'very' or 'fairly comfortable' values for primary school children and 'very comfortable' values for secondary school children.

In the case of dirty footpaths, responses are also significantly different according to the last walking trip companion (Pearson χ^2 p 0.034, K-W p 0.008), with a child's walking accompanied by an adult ranging between 'neutral' to 'very uncomfortable' values, and unaccompanied children or those accompanied by another child reporting 'fairly comfortable' to 'fairly uncomfortable' values. For this attribute, results also show statistically significant differences according to the purpose of the trip (K-W p 0.027), with school trip responses ranging between 'fairly comfortable' and 'fairly uncomfortable' values, and non-school trips having values between 'neutral' and 'very uncomfortable'. Similarly, significant differences are observed among carers when the gender of the child is considered (K-W p 0.040), with carers of boys reporting mostly 'fairly comfortable' to 'fairly uncomfortable' values and carers of girls ranging between 'neutral' to 'very uncomfortable' values. Statistically significant differences were also found according to the recruitment method (K-W p 0.007), with participants directly recruited ranging between 'fairly comfortable' and 'fairly uncomfortable' values and participants recruited by the panel varying between 'neutral' and 'very uncomfortable' values.

Greenery

The trees and grass attribute showed statistically significant differences according to the carers' gender (K-W p 0.007), with female carers mostly reporting 'fairly comfortable' values and male carers leaning to 'very comfortable' values.

Considering the attribute trees, significant differences were observed from the child and carer participants (K-W p 0.032), with children mostly reporting 'very comfortable' values while carers were mostly 'fairly comfortable'. Results show that responses are significantly different according to the IMD crime domain decile (Pearson χ^2 p 0.034, K-W p 0.004), with least deprived deciles showing 'very comfortable' values whereas most deprived deciles reporting mostly 'fairly comfortable' values.

In the case of the attribute grass, responses are significantly different according to the carer's gender (Pearson χ^2 p 0.013, K-W p 0.012), with male carers mostly reporting 'very' and 'fairly comfortable' values and female carers ranging between 'very comfortable' and 'neutral' values. Results show significant differences among carers when considering the child's gender (K-W p 0.025), with carers of boys mostly being 'very' and 'fairly comfortable' with grass in the street environment, and carers of girls ranging between 'very comfortable' and 'neutral' values. For the same attribute, results show significant differences according to the IMD crime domain (K-W p 0.039),

with participants from least deprived deciles reporting mostly 'very' and 'fairly comfortable' values, and those from most deprived deciles ranging between 'very comfortable' and 'neutral' values.

For the attribute no greenery, responses are significantly different according to the last trip companion (Pearson χ^2 p 0.014, K-W p 0.008), with children walking unaccompanied showing mostly 'very comfortable' to 'neutral' values, whereas those walking with an adult reporting mostly 'fairly comfortable' and 'neutral' values. For the same attribute, results show that responses are statistically significantly different according to the recruitment strategy (Pearson χ^2 p 0.000, K-W p 0.000), with panel participants ranging between 'very comfortable' and 'neutral' for no greenery on the street and directly recruited participants ranging between 'neutral' and 'very uncomfortable' values.

Urban amenities

Results from the attribute playgrounds on the street show that carers and children's responses are statistically significantly different (Pearson χ^2 p 0.001, K-W p 0.000), with children being mostly 'very' and 'fairly comfortable' and carers ranging between 'very comfortable' and 'neutral' values. Significant differences are also observed according to carers' gender (K-W p 0.021), with female carers being mostly 'fairly comfortable' to 'neutral', and male carers ranging between 'very' and 'fairly comfortable' values. Considering the child's age, statistically significant differences were found (K-W p 0.029) with carers of primary school children's answers ranging between 'fairly comfortable' to 'fairly uncomfortable' with playgrounds, while those of secondary school children ranged between 'very comfortable' and 'neutral'.

The bus stops attribute found that carers and children's responses are significantly different (Pearson χ^2 p 0.008, K-W p 0.004), with children being mostly 'very' and 'fairly comfortable' with that attribute and carers being 'fairly comfortable' and 'neutral'. Similarly, responses considering the child's age are significantly different (K-W p 0.026), with primary school children reporting mostly 'fairly comfortable' and 'neutral' values, and secondary school children reporting mostly 'very comfortable' to 'fairly uncomfortable' values. Results also show that carers' responses are affected by the child's age (K-W p 0.018, Pearson χ^2 p 0.029), with carers of primary school children reporting mostly 'fairly comfortable' and 'neutral' values and carers of secondary school children ranging between 'very comfortable' and 'neutral'. For the attribute bus stops, significant differences were observed for the type of companion on the last walking trip, (K-W p 0.008), with children walking

unaccompanied being mostly 'very' and 'fairly comfortable', and those walking with adults ranging between 'fairly comfortable' and 'neutral' values.

In the case of a combined bus stop and a playground attribute, carers and child participants' responses are statistically significantly different (Pearson χ^2 p 0.000, K-W p 0.000), with children being mostly 'very' and 'fairly comfortable' with that combined attribute and carers ratings ranging between 'very comfortable' and 'neutral'. Similar differences are observed among carers' responses considering the child's age range (K-W p 0.002, Pearson χ^2 p 0.019), with carers of primary school children reporting mostly 'fairly comfortable' to 'fairly uncomfortable' values, and carers of secondary school children ranging between 'very comfortable' and 'neutral'.

Regarding the attribute no urban amenities, results show that responses are significantly different when considering the last walking trip companion (Pearson χ^2 p 0.025, K-W p 0.006), with children walking unaccompanied or with another child reporting mostly 'fairly comfortable' and 'neutral' values and children walking with an adult ranging between 'fairly comfortable' and 'fairly uncomfortable'. Also, the results show significant differences by trip purpose (K-W p 0.007), with school trips reporting mostly 'fairly comfortable' and 'neutral' values for no urban amenities on the streets, and non-school trips ranging between 'fairly comfortable' and 'fairly uncomfortable' ratings.

Facilities

For the attribute a variety of shops the responses of carers and child respondents are significantly different (Pearson χ^2 p 0.002, K-W p 0.000), with children mostly reporting 'very comfortable' to 'fairly uncomfortable' values and carers ranging between 'fairly comfortable' and 'fairly uncomfortable'. Similar results are observed if the child age range is taken into account (Pearson χ^2 p 0.046, K-W p 0.004), with primary school children's ratings ranging between 'very comfortable' and 'neutral' values, and secondary school children moving between 'very' and 'fairly comfortable' values. Carers' responses for a variety of shops vary according to the child's age (Pearson χ^2 p 0.019, K-W p 0.001), with carers of primary school children reporting mostly 'fairly comfortable' to 'fairly uncomfortable' values and carers of secondary school children ranging between 'very comfortable' and 'neutral'. Lastly, statistically significant differences emerged when the last trip companion is considered (K-W p 0.006), with unaccompanied walking trips having mostly 'very' and 'fairly comfortable' values for a variety of shops and those walking with an adult varying between 'fairly comfortable' and 'neutral' values.

Considering the attribute pub, results show that children and carer participants' responses are statistically significantly different (Pearson χ^2 p 0.007, K-W p 0.001), with children reporting mostly 'fairly comfortable' and 'neutral' values and carers ranging between 'fairly comfortable' and 'fairly uncomfortable'. Similar results are observed for that attribute taking into account the child's age range (Pearson χ^2 p 0.002, K-W p 0.000), with primary school children ranging between 'fairly comfortable' and 'fairly uncomfortable' values, whereas the values for secondary school children ranged between 'very' and 'fairly comfortable'. Similar results are observed for carers depending on the child's age range (Pearson χ^2 p 0.007, K-W p 0.000), with carers of primary school children moving between 'fairly comfortable' and 'fairly uncomfortable' and carers of secondary school children ranging between 'fairly comfortable' and 'neutral'.

In the case of the combination of a variety of shops and a pub, responses are statistically significantly for the child's age (Pearson χ^2 p 0.045, K-W p 0.008), with primary school children ranging between 'fairly comfortable' and 'fairly uncomfortable', and secondary school children moving between 'fairly comfortable' and 'neutral' values. In the case of carers considering the child's age group, responses for a variety of shops and a pub are statistically significantly different (Pearson χ^2 p 0.022, K-W p 0.003), with carers of primary school children reporting mostly 'fairly' and 'very uncomfortable' values, and carers of secondary school children ranging between 'fairly comfortable' and 'fairly uncomfortable'. Also, results for the attribute a variety of shops and a pub show that carers' responses are related to the gender of the child (Pearson χ^2 p 0.039, K-W p 0.029), with carers of boys reporting mostly 'fairly comfortable' and 'fairly uncomfortable' values and carers of girls ranging between 'neutral' and 'fairly uncomfortable'.

Crossings

The attribute signalised crossings show statistically significant differences for carers and child participants (K-W p 0.011), with carers reporting mostly 'very comfortable' to 'neutral' values and children reporting values between 'very' and 'fairly comfortable'. A similar result is observed for the child's age range (K-W p 0.18), with primary school children selecting values between 'very comfortable' and 'neutral', and secondary school children ranging between 'very' and 'fairly comfortable'. Results show that carers' responses depend on the child's age range (Pearson χ^2 p 0.000, K-W p 0.000), with carers of primary school children preferring options between 'fairly comfortable' and 'fairly uncomfortable' for signalised crossings, and those of secondary school children moving between 'very' and 'fairly comfortable'. Results for

the same attribute reveal that responses are statistically significantly different depending on the last trip companion (Pearson χ^2 p 0.010, K-W p 0.000), with children walking unaccompanied mostly reporting 'very' and 'fairly comfortable' values and children walking with an adult mostly preferring values between 'fairly comfortable' and 'neutral'.

In the case of zebra crossings, results show statistically significant differences for carers and child participants (K-W p 0.008), with children's answers varying between 'very' and 'fairly comfortable' and carers ranging between 'fairly comfortable' and 'neutral'. For the same attribute, carers' responses split according to the age of their child (Pearson χ^2 p 0.017, K-W p 0.010), with carers ranging between 'fairly comfortable' and 'neutral' for primary school children and between 'very' and 'fairly comfortable' for secondary school children. Lastly, the results show that responses vary according to the last trip companion (Pearson χ^2 p 0.013, K-W p 0.004), with children walking unaccompanied mostly reporting 'very' and 'fairly comfortable' values, and children walking with an adult mostly ranging between 'fairly comfortable' and 'neutral'.

Strangers on the street (different generations of people)

Regarding the social aspects of the environment, the attribute children on the street show that carers and children's responses are statistically significantly different (K-W p 0.000, Pearson χ^2 p 0.000), with children being 'very' and 'fairly comfortable' with other children on the street, and carers varying between 'very comfortable' and 'neutral'.

In the case of the attribute teenagers on the street, results show significant differences according to the last trip companion (Pearson χ^2 p 0.021, K-W p 0.004), with children walking unaccompanied ranging between 'very' and 'fairly comfortable', and between 'fairly comfortable' and 'fairly uncomfortable' for other trip companions. For the same attribute, statistically significant differences are observed according to the IMD crime domain (K-W p 0.044), with most deprived deciles' answers ranging between 'fairly comfortable' and 'fairly uncomfortable' values and least deprived decile varying between 'very comfortable' and 'neutral'. Also, responses are significantly different when the recruitment strategy is taken into account (K-W p 0.031, Pearson χ^2 p 0.017), with directly recruited participants reporting mostly 'neutral' and 'fairly uncomfortable' values, and participants recruited by the panel mostly ranging between 'fairly comfortable' and 'neutral' values.

Strangers' activities

Results for the attribute chatting show statistically significant differences for the last trip companion (K-W p 0.006), with children walking unaccompanied mostly having 'very' and 'fairly comfortable' values and children walking with an adult reporting answers that mostly ranged between 'fairly comfortable' and 'neutral'. For the same attribute, responses are significantly different according to the IMD income domain (Pearson χ^2 p 0.036, K-W p 0.011), with most deprived deciles rating strangers' chatting between 'fairly comfortable' to 'neutral', and least deprived deciles being between 'very comfortable' and 'neutral'. Statistically significant differences are observed for the IMD crime domain (K-W p 0.008), with most deprived decile mostly reporting that attribute as 'fairly comfortable' or 'neutral', and the least deprived deciles varying between 'very comfortable' and 'neutral'.

In the case of the attribute strangers walking on the street, carers and children' answers show statistically significant differences (K-W p 0.028), with children reporting mostly 'very' and 'fairly comfortable' responses, and carers ranging between 'very comfortable' and 'neutral'. Likewise, significant differences emerged among carers when their gender is considered (K-W p 0.017), with female carers rating between 'very comfortable' and 'neutral' with that attribute, and male carers ranging between 'very' and 'fairly comfortable'. For the same attribute, carers' responses differ according to the child's gender (Pearson χ^2 p 0.048, K-W p 0.007), with carers reporting mostly 'very' and 'fairly comfortable' values for boys, and 'fairly comfortable' and 'neutral' values for girls. Strangers' walking responses also differ according to the last trip companion (Pearson χ^2 p 0.041, K-W p 0.030), with children walking with an adult mostly reporting 'very comfortable' and 'neutral' values, compared to the 'very' and 'fairly comfortable' values that children walking unaccompanied reported. This attribute has statistically significant differences according to the IMD income domain (K-W p 0.028), with most deprived deciles reporting mostly 'very comfortable' and 'neutral' values, and the least deprived deciles ranging between 'very' and 'fairly comfortable'.

The attribute strangers' drinking alcohol show statistically significant differences for the child's age (K-W p 0.032), with primary school children reporting mostly 'fairly' to 'very uncomfortable' values, and secondary school children being between 'neutral' and 'very uncomfortable'. Results show that responses are sensitive to the carers' gender (Pearson χ^2 p 0.007, K-W p 0.013), with female carers mostly reporting between 'very' and 'fairly uncomfortable' values, and male carers varying between 'very uncomfortable' and 'neutral' values. Strangers' drinking alcohol showed statistically significant differences by the last walking trip companion (K-W p 0.004), with children

walking unaccompanied reporting mostly 'very uncomfortable' and 'neutral' values, and children walking with an adult varying between 'very' and 'fairly uncomfortable' values.

For the attribute standing on the footpath, results show that responses are statistically significantly different for carers and children (Pearson χ^2 p 0.012, K-W p 0.004), with children answers ranging between 'very comfortable' and 'neutral' values, and carers ranging between 'fairly comfortable' to 'neutral'. Likewise, significant differences appeared when considering the carer's gender (Pearson χ^2 p 0.031, K-W p 0.005), with female carers reporting more 'fairly comfortable' and 'fairly uncomfortable' values, compared to male carers whose answers mostly moved between 'fairly comfortable' and 'neutral' values. This attribute shows statistically significant differences according to the child's gender (K-W p 0.037), with guardians of boys being between 'fairly comfortable' and 'neutral' for this attribute, and carers of girls ranging mostly between 'fairly comfortable' and 'fairly uncomfortable'. Responses for standing on the footpath vary according to the child's trip purpose (Pearson χ^2 p 0.048; K-W p 0.039), with school trips leaning to 'neutral' values and non-school trips leaning to 'fairly comfortable' values. Lastly, results show differences for the IMD crime domain (K-W p 0.016), with most deprived deciles mostly reporting 'fairly comfortable' and 'neutral' values for strangers' standing, and the least deprived deciles ranging between 'very comfortable' and 'neutral'. Significant differences were observed according to the recruitment strategy (K-W p 0.036), with participants recruited by the survey panel reporting mostly 'fairly comfortable' and 'neutral' values, whereas those directly recruited ranged between 'fairly comfortable' and 'fairly uncomfortable' values.

Density of people

Carers' responses to crowded footpaths in a street environment are different according to the carers' gender (Pearson χ^2 p 0.015, K-W p 0.005), with male carers' answers ranging between 'fairly comfortable' and 'fairly uncomfortable' values, and females' responses moving between 'neutral' and 'fairly uncomfortable'. Results for that attribute are also statistically significant for the children's last trip companion (K-W p 0.002), with children walking unaccompanied mostly having 'fairly comfortable' to 'neutral' values, and all other cases ranging between 'fairly comfortable' and 'fairly uncomfortable'. Results for crowded footpaths show statistically significant differences according to the recruitment strategy (K-W p 0.047), with participants from the panel reporting mostly 'fairly comfortable' and 'fairly uncomfortable'

values, and directly recruited participants varying between 'neutral' and 'fairly uncomfortable' values.

The attribute uncrowded footpath shows that responses differ between carer and child participants (Pearson χ^2 p 0.044, K-W p 0.044), with child respondents reporting mostly 'very' and 'fairly comfortable' and carers ranging between 'very comfortable' and 'neutral'. Uncrowded footpath showed statistically significant differences for the last trip companion (K-W p 0.046), with children walking unaccompanied having mostly 'very comfortable' values, and all other cases leaning to 'fairly comfortable' values.

Santiago

Facades (private property division)

The results show that carers' responses for the attribute permeable fences are statistically significant different distribution according to the child's age (Pearson χ^2 p 0.000, K-W p 0.002), with carers of primary school children ranging between 'fairly comfortable' and 'fairly uncomfortable' values, and carers of secondary school children being mostly 'fairly comfortable' and 'neutral'. They are also statistically significantly different considering the type of accompaniment on the last walking trip (Pearson χ^2 p 0.006, K-W p 0.014), with those walking with an adult ranging between 'fairly comfortable' and 'fairly uncomfortable' values, whereas those accompanied by a child, a child and an adult, or unaccompanied reported mostly 'fairly comfortable' and 'neutral' values.

In the case of the attribute closed fences, carers and child participants' responses are statistically significantly different (Pearson χ^2 p 0.000, K-W p 0.000), with children reporting mostly 'fairly comfortable' and 'neutral' values and carers ranging between 'neutral' and 'fairly uncomfortable' values. Carers' responses also vary by the age of the child (Pearson χ^2 p 0.030, K-W p 0.002), with carers of primary school children mostly reporting 'fairly uncomfortable' values, and carers of secondary school children leaning to 'neutral' values.

Quality of footpaths

The results for the attribute dirty footpaths have statistically significant differences according to the child's age (K-W p 0.049), with primary school children mostly being 'fairly' to 'very uncomfortable' with that attribute, and secondary school children ranging between 'neutral' and 'fairly uncomfortable'.

In the case of neglected footpaths, results are statistically significantly different by age of child age (K-W p 0.019), with primary school children showing mostly 'fairly' to 'very uncomfortable' values, and secondary school children reporting values between 'neutral' and 'very uncomfortable'.

Likewise, for the attribute dirty and neglected footpaths, responses are significantly different according to the child's age (Pearson χ^2 p 0.046, K-W p 0.015), with primary school children leaning to 'very uncomfortable' values, and secondary school children reporting mostly 'fairly uncomfortable' values.

Greenery

Results for the attribute trees and grass show that carers and children's responses are significantly different (Pearson χ^2 p 0.000, K-W p 0.000), with children reporting mostly 'very' and 'fairly comfortable' values, and carers ranging between 'very comfortable' and 'neutral' values. Similarly, the results show that carers' responses vary according to the child's age (Pearson χ^2 p 0.024, K-W p 0.001), with carers of primary school children reporting mostly 'fairly comfortable' to 'fairly uncomfortable' values, and carers of secondary school children moving between 'very' and 'fairly comfortable' values.

In the case of trees, responses are statistically significant different according to the child's gender (K-W p 0.047), with girls reporting mostly 'fairly comfortable' and 'neutral' values and boys leaning to 'fairly comfortable' values. Carers' responses also vary with the child's gender (Pearson χ^2 p 0.012, K-W p 0.001), with carers of girls reporting mostly 'fairly comfortable' and 'neutral' values, and carers of boys ranging between 'very' and 'fairly comfortable'.

For the grass attribute, responses for carers differ for children of different ages (Pearson χ^2 p 0.022, K-W p 0.021), with carers of primary school children mostly reporting 'fairly comfortable' to 'fairly uncomfortable' values, and carers of secondary school children ranging between 'fairly comfortable' and 'neutral'.

Urban amenities

Carers and children's responses for the attribute playground are significantly different (Pearson χ^2 p 0.024, K-W p 0.008), with children reporting mostly 'very' and 'fairly comfortable' values, and carers ranging between 'very comfortable' and 'neutral'.

In the case of bus stops attribute, carers and children's responses are also significantly different (Pearson χ^2 p 0.004, K-W p 0.002), with children reporting mostly 'fairly comfortable' and 'neutral' values and carers ranging

between 'fairly comfortable' and 'fairly uncomfortable'. Carers' answers also show statistically significant differences by gender (K-W p 0.042), with female carers reporting mostly 'neutral' and 'fairly uncomfortable' values, and male carers mostly being 'fairly comfortable' and 'neutral'. Carers' responses also differ according to the child's age (Pearson χ^2 p 0.006, K-W p 0.000), with carers of primary school children reporting mostly 'neutral' to 'fairly uncomfortable' values and carers of secondary school children ranging between 'fairly comfortable' and 'neutral'. Lastly for the same attribute, results differ according to the child's last walking trip companion (Pearson χ^2 p 0.005, K-W p 0.000), with children walking unaccompanied or with another child mostly showing 'fairly comfortable' to 'neutral' values, and children walking with an adult mostly showing values between 'fairly comfortable' and 'fairly uncomfortable'.

For the combined attribute a bus stop and a playground, results show that carers and children's responses are significantly different (Pearson χ^2 p 0.004, K-W p 0.000), with children reporting mostly 'very comfortable' to 'neutral' values and carers ranging between 'fairly comfortable' and 'fairly uncomfortable' values. Results also differ by the carers' gender (K-W p 0.007), with female carers reporting mostly 'fairly comfortable' to 'fairly uncomfortable' values and male carers ranging between 'very comfortable' and 'fairly comfortable'; and by the child's age (K-W p 0.038), with carers of primary school children reporting values between 'fairly comfortable' and 'fairly uncomfortable' and carers of secondary school children between mostly 'fairly comfortable' and 'neutral'. Lastly, responses differ by the last walking trip companion (Pearson χ^2 p 0.020, K-W p 0.001), with children unaccompanied showing mostly 'very' and 'fairly comfortable' values for a bus stop and a playground, children walking with another child showing values between 'very comfortable' to 'neutral' values, and children walking with an adult ranging between 'fairly comfortable' and 'fairly uncomfortable'.

Facilities

The results for attribute schools show that responses are different according to the last trip companion (Pearson χ^2 p 0.019, K-W p 0.031) with children's last walking trip being unaccompanied leaning to 'fairly comfortable' values, and children walking with an adult or with an adult and a child mostly report 'fairly comfortable' and 'neutral' values.

In the case of local shops, carers' responses show statistically significant differences by gender (K-W p 0.030), with female carers reporting mostly 'fairly comfortable' and 'neutral' values, and males carers leaning to 'fairly comfortable'. Responses also differ by the last trip companion (Pearson χ^2 p

0.026, K-W p 0.045), with children walking unaccompanied mostly showing 'fairly comfortable' values, and ratings of children walking with another child or with an adult ranging between 'fairly comfortable' and 'neutral'. Lastly, the responses also differ significantly according to whether the area where the participant lives is wealthy or not (Pearson χ^2 p 0.023, K-W p 0.048), with those living in wealthier areas reporting mostly 'neutral' values to local shops in the street, and participants living in other areas leaning to 'fairly comfortable' values.

For the off-licence attribute, results show that carers and children's responses are statistically significant different (Pearson χ^2 p 0.001, K-W p 0.000), with children reporting mostly 'fairly comfortable' to 'fairly uncomfortable' values and carers ranging between 'neutral' and 'very uncomfortable' values. Results also differ significantly according to the child's gender (K-W p 0.025), with girls reporting mostly 'neutral' to 'very uncomfortable' values, and boys ranging between 'fairly comfortable' and 'fairly uncomfortable'.

Carers and child participants' responses for the no facilities attribute are significantly different (Pearson χ^2 p 0.034, K-W p 0.013), with children reporting mostly 'fairly comfortable' to 'fairly uncomfortable' values, and carers' answers ranging between 'neutral' and 'fairly uncomfortable' values. Results also show statistically significant differences according to the last trip companion (K-W p 0.040), with children walking unaccompanied showing mostly 'fairly comfortable' to 'fairly uncomfortable' values for no facilities, and children walking with another child or with an adult mostly ranging between 'neutral' and 'fairly uncomfortable' values.

Parked vehicles

The results for vehicles parked on the footpath show that carers' and children's responses are significantly different (Pearson χ^2 p 0.001, K-W p 0.000), with children reporting mostly 'fairly comfortable' to 'fairly uncomfortable' values, and carers providing answers ranging between 'neutral' and 'very uncomfortable'. Carers' responses also differ significantly according to the child's age (Pearson χ^2 p 0.034, K-W p 0.030), with carers of primary school children reporting mostly 'fairly' to 'very uncomfortable' ratings, and carers of secondary school children ranging between 'neutral' and 'fairly uncomfortable' values.

Strangers on the street (different generations of people)

For the attribute children on the street, results show statistically significant differences between children and carers (K-W p 0.011), with children reporting mostly 'very comfortable' to 'neutral' values, and carers mostly being between

'fairly comfortable' and 'neutral'. Differences emerged when considering the child's gender (K-W p 0.035), with girls reporting mostly 'fairly comfortable' and 'neutral' values and boys mostly being 'very' and 'fairly comfortable' with this attribute. Carers' views also vary according to the child's age (K-W p 0.020), with carers of primary school children reporting mostly 'fairly comfortable' to 'fairly uncomfortable' values, and carers of secondary school children ranging between 'fairly uncomfortable' and 'neutral'. Responses also differ by the area where the participant lives (Pearson χ^2 p 0.022, K-W p 0.045), with those living in wealthy areas reporting mostly 'very comfortable' to 'neutral' values for children on the street, and those from not wealthy areas mostly ranging between 'fairly comfortable' and 'neutral' values.

In the case of teenagers on the street, carers and children's responses are significantly different (Pearson χ^2 p 0.000, K-W p 0.000), with children reporting mostly 'fairly comfortable' and 'neutral' values, and carers ranging mostly between 'fairly comfortable' and 'fairly uncomfortable' values. Responses also differ according to the child's age (Pearson χ^2 p 0.0031, K-W p 0.002), with primary school children reporting mostly 'fairly comfortable' to 'fairly uncomfortable' values, and secondary school children ranging between 'fairly comfortable' and 'neutral' values. Carers' responses are also significantly different according to the child's age (Pearson χ^2 p 0.001, K-W p 0.000), with carers of primary school children reporting mostly 'neutral' to 'fairly uncomfortable' values, and carers of secondary school children ranging between 'fairly comfortable' and 'neutral' values. Ratings also differ by the child's gender (K-W p 0.031), with girls reporting mostly 'neutral' and 'fairly uncomfortable' values, and boys ranging between 'fairly comfortable' and 'neutral' values; and according to the last trip companion (K-W p 0.025), with children walking unaccompanied or with another child showing mostly 'fairly comfortable' and 'neutral' values for the teenagers attribute, and children walking with an adult ranging between 'fairly comfortable' and 'fairly uncomfortable' values. Lastly, for the same attribute, results show statistically significant differences by the type of area where the participant lives (K-W p 0.037), with those living in wealthier areas reporting mostly 'fairly comfortable' and 'neutral' values, and those living in other areas mostly ranging between 'fairly comfortable' and 'fairly uncomfortable'.

The results for the adults on the street attribute show that carers and children's responses are significantly different (Pearson χ^2 p 0.000, K-W p 0.000), with children reporting mostly 'fairly comfortable' and 'neutral' values, and carers ranging between 'neutral' and 'fairly uncomfortable' values. Results show statistically significant differences considering the child's gender (K-W p 0.048), with girls reporting mostly 'fairly comfortable' to 'fairly uncomfortable'

values, and boys ranging between 'fairly comfortable' and 'neutral'. Carers' responses also differ by the child's gender (Pearson χ^2 p 0.034, K-W p 0.005), with carers of girls reporting mostly 'neutral' and 'fairly uncomfortable' values, and carers of boys giving answers that varied between 'fairly comfortable' and 'fairly uncomfortable'; and by the child's age group (Pearson χ^2 p 0.003, K-W p 0.040), with carers of primary school children reporting mostly 'fairly uncomfortable' values, and carers of secondary school children leaning to 'neutral' values. Lastly, responses differ by the type of area (Pearson χ^2 p 0.000, K-W p 0.003), with those living in wealthier areas reporting mostly 'fairly comfortable' and 'neutral' values, and those living in other areas mostly ranging between 'fairly comfortable' and 'fairly uncomfortable'.

In the case of the attribute elderly people on the footpath, carers' answers show statistically significant differences according to the child's gender (K-W p 0.015), with carers of girls reporting mostly 'fairly comfortable' to 'fairly uncomfortable' values, and carers of boys ranging between 'fairly comfortable' and 'neutral'. Carers' responses also show significant differences according to the child's age (K-W p 0.033), with carers of primary school children reporting mostly 'fairly comfortable' to 'fairly uncomfortable' values, and carers of secondary school children being mostly 'fairly comfortable' and 'neutral'. Again, area of residence is also significant (Pearson χ^2 p 0.001, K-W p 0.000), with those living in wealthier areas reporting mostly 'very comfortable' to 'neutral' values to elderly people on the footpath, and those living in other areas ranging between 'fairly comfortable' and 'fairly uncomfortable'.

Strangers' gender

For the attribute male stranger, results show that carers and children's responses are statistically significantly different (Pearson χ^2 p 0.000, K-W p 0.000), with children ranging between 'fairly comfortable' and 'fairly uncomfortable' values, and carers moving between 'neutral' and 'fairly uncomfortable'. Responses also differ according to the child's gender (Pearson χ^2 p 0.000, K-W p 0.000), with girls reporting mostly 'neutral' and 'fairly uncomfortable' values, and boys leaning to 'fairly comfortable' and 'neutral' values. Similarly, carers' responses also differ according to the child's gender (Pearson χ^2 p 0.000, K-W p 0.000), with carers of girls reporting mostly 'fairly' and 'very uncomfortable' values for male strangers, and carers of boys being mostly 'neutral' and 'fairly uncomfortable'. Results show statistically significant differences according to the trip purpose (K-W p 0.017), with responses for school trips showing mostly 'fairly uncomfortable' values, and non-school trips observations leaning to 'neutral' values. Again,

area of residence is also statistically significant (Pearson χ^2 p 0.000, K-W p 0.001), with those living in wealthier areas reporting mostly 'neutral' values, and those living in other areas leaning to 'fairly uncomfortable' values.

In the case of the female strangers attribute, carers and children's responses are significantly different (Pearson χ^2 p 0.005, K-W p 0.000), with children reporting mostly 'fairly comfortable' values, and carers leaning to 'neutral' values. Similarly, carers' answers also differ by the child's age (Pearson χ^2 p 0.003, K-W p 0.030), with carers of primary school children reporting mostly 'fairly comfortable' to 'fairly uncomfortable' values, and carers of secondary school children ranging between 'fairly comfortable' and 'neutral' values.

Strangers' activities

The results for the attribute strangers chatting on the street shows statistically significant differences according to the child's gender (K-W p 0.023), with girls mostly reporting 'neutral' values and boys leaning to 'fairly comfortable' values. Carer's responses also differ according to the child's age (Pearson χ^2 p 0.008, K-W p 0.022), with carers of primary school children reporting mostly 'fairly comfortable' to 'fairly uncomfortable' values, and carers of secondary school children ranging between 'fairly comfortable' and 'neutral' values.

For the attribute strangers walking, carers and children's responses are statistically significantly different (Pearson χ^2 p 0.000, K-W p 0.000), with children mostly reporting 'fairly comfortable' values and carers leaning to 'neutral' values. Carers' answers also differ according to the child's age (K-W p 0.031), with carers of primary school children reporting mostly 'fairly comfortable' to 'fairly uncomfortable' values, and carers of secondary school children ranging between 'fairly comfortable' and 'neutral'. The responses are different according to the area where the participants live (Pearson χ^2 p 0.000, K-W p 0.009), with those living in wealthier areas reporting mostly 'fairly comfortable' and 'neutral' values to strangers walking on the street, and those living in other areas leaning to 'neutral' values.

For the attribute strangers drinking alcohol, carers and children's responses are statistically significantly different (Pearson χ^2 p 0.002, K-W p 0.000), with children reporting mostly 'fairly' to 'very uncomfortable' values, and carers leaning to 'very uncomfortable' values. Children's responses are statistically significantly different by age (Pearson χ^2 p 0.008, K-W p 0.001), with primary school children reporting mostly 'very uncomfortable' values, and secondary school children being mostly 'fairly uncomfortable'. Lastly, carers' results differ when the child's age is considered (K-W p 0.044), with carers

of primary school children reporting mostly 'very uncomfortable' values for strangers drinking alcohol, and carers of secondary school children ranging between 'fairly' and 'very uncomfortable'.

Carers and children' responses for the attribute strangers standing on the street are statistically significantly different (Pearson χ^2 p 0.003, K-W p 0.001), with children ranging between 'fairly comfortable' and 'fairly uncomfortable' values, and carers reporting answers that moved between 'neutral' and 'fairly uncomfortable' values.

10. 9. Independent generic city link and junction models for London and Santiago database

GC-Link model for London (London)

	LL(final)	-1452.88
	Estimated parameters	31
	ρ^2 ρ^2 adj.	0.2465 0.2304
	Estimate	t-ratio(0)
ASC_Street_A	0.000	NA
ASC_Street_B	0.000	NA
ASC_Neither	0.102	0.562
B1_DC1	2.019	15.085
B2_DC2	0.000	NA
C1_DC1	0.753	5.513
C2_DC2	0.604	5.297
C3_DC3	0.381	3.415
C4_DC4	0.000	NA
D1_DC1	0.469	3.960
D2_DC2	0.439	3.611
D3_DC3	0.685	4.928
D4_DC4	0.000	NA
F1_DC1	0.041	0.377
F2_DC2	0.232	2.300
F3_DC3	-2.380	-9.862
F4_DC4	0.000	NA
G1_DC1	0.107	0.952
G2_DC2	-1.317	-7.684
G3_DC3	-0.340	-2.632
G4_DC4	0.000	NA
B1_DC1_CARER_LivingEnvironmentDecile	-0.558	-3.380
B1_DC1_IncomeDecile	-0.521	-2.904
C3_DC3_CARER_SoloTrip	-0.685	-2.898
D1_DC1_DataTraditionalSource	0.531	1.979
D2_DC2_Age8_10	-0.502	-2.668
D3_DC3_CARER_IncomeDecile	0.497	2.520
D3_DC3_IncomeDecile	0.553	2.747
F3_DC3_CARER_LivingEnvironmentDecile	0.992	3.472
F3_DC3_IncomeDecile	0.782	2.509
F3_DC3_NonSchoolTrip	1.151	3.841
G2_DC2_Age8_10	0.737	3.719
G2_DC2_CARER_LivingEnvironmentDecile	0.805	3.921
G2_DC2_CarerAge18_30	0.927	3.869
G2_DC2_IncomeDecile	0.712	3.382
G3_DC3_CARER_CrimeDecile	-0.661	-3.092
G3_DC3_CARER_NonSchoolTrip	0.578	2.708
G3_DC3_CARER_TripWithChildAndAdult	1.131	2.470

Source: author's own

GC-Link model for Santiago (SCL)

	LL(final)	-1352.007
	Estimated parameters	37
	ρ^2 ρ^2 adj.	0.229 1.262
	Estimate	t-ratio(0)
ASC_Neither	0.229	1.262
B1_DC1	1.366	11.323
B2_DC2	0.000	NA
C1_DC1	0.382	2.400
C2_DC2	0.604	5.230
C3_DC3	0.368	3.383
C4_DC4	0.000	NA
D1_DC1	0.403	3.041
D2_DC2	0.355	2.647
D3_DC3	0.610	4.372
D4_DC4	0.000	NA
F1_DC1	-0.276	-1.772
F2_DC2	0.173	1.592
F3_DC3	-2.702	-14.601
F4_DC4	0.000	NA
G1_DC1	0.302	1.992
G2_DC2	0.457	2.334
G3_DC3	0.175	1.107
G4_DC4	0.000	NA
B1_DC1_Age8_12	-0.663	-3.934
B1_DC1_CARER_Age8_12	-0.375	-2.280
B1_DC1_ChildMALE	0.692	4.282
C1_DC1_ChildMALE	0.610	2.776
D1_DC1_CARER_Age8_12	-0.460	-2.082
D2_DC2_CARER_Age8_12	-0.760	-3.327
D3_DC3_CARER_Age8_12	-0.507	-2.282
D3_DC3_ChildMALE	0.573	2.744
F1_DC1_Parent	0.651	3.608
F1_DC1_SoloTrip	0.596	2.020
F2_DC2_SoloTrip	0.685	2.714
F3_DC3_ParentMALE	1.379	3.216
G1_DC1_CARER_ChildMALE	0.500	1.980
G1_DC1_CARER_NonSchoolTrip	0.910	2.432
G1_DC1_Parent	-1.169	-2.949
G1_DC1_TripWithAnotherChild	0.919	2.368
G2_DC2_Age8_12	-0.670	-2.647
G2_DC2_CARER_ChildMALE	0.887	3.653
G2_DC2_Parent	-1.081	-4.246
G3_DC3_CARER_ChildMALE	0.750	2.957
G3_DC3_CARER_NonSchoolTrip	0.893	2.323
G3_DC3_Parent	-1.459	-3.539
G3_DC3_TripWithAnotherChild	0.994	2.370

Source: author's own