Socioeconomic inequalities in use of contraception in Colombia: DHS 1986-2010

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I, Catalina Gonzalez Uribe 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.

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Abstract

Background: In 2005 Colombia adopted the national Millennium Development Goal (MDG5) target of 75% modern contraceptive prevalence rate (CPR) by 2015. Important gains have been achieved with respect to living conditions, education and health indicators in recent decades but inequalities within the country remain to be addressed.

Methods: The aim was to analyse socioeconomic inequalities in women's 'current non-use of contraception' using the six Colombian Demographic and Health Surveys (DHS). A multidimensional approach to socioeconomic position was implemented. Absolute and relative socioeconomic inequalities were analysed using the Slope Index of Inequality (SII) and Relative Index of Inequality (RII). The interplay between level of education and Public capital with respect to contraceptive non-use was examined. Individual and contextual effects were investigated using a multilevel approach.

Results: National prevalence in current non-use of contraception between 1986 and 2010 decreased from32.6% to 22.9%. Nationally, absolute inequalities narrowed but relative inequalities did not decline. Women with less than primary education had not met the CPR target in 2010 in urban (30.9%) and rural (41.4%) areas respectively. Absolute inequalities narrowed in urban areas but relative inequalities persisted in urban and rural areas. Gradients in contraceptive non-use with respect to household wealth were stronger among women in rural than in urban areas. The impact of level of education on contraceptive non-use was relatively weak among women in households and within communities with high Public capital compared to low Public capital. Municipality ethnic composition had an effect on women's contraceptive non-use over and above individual and community characteristics.

Conclusion: Colombia reached the national CPR target ahead of time. However, the persistent socioeconomic gradients in non-use of contraception by household wealth and education indicate the need to go beyond country averages and individual level determinants to monitor urban and rural socioeconomic inequalities and contextual effects on women's contraceptive behaviour.

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Acronyms

CPR Contraceptive prevalence rate

CSDH Commission on Social Determinants of Health

DHS Demographic Health Surveys

DALYs Disability adjusted life years

DNP Departamento Nacional de Planeación (Department of National Statistics in Colombia)

FP Family planning

GLLAM Generalised linear latent and mixed model

HWI Household wealth index

IDP Internally displaced populations

IPV Intimate partner violence

MDGs Millennium Development Goals

MDG5 Millennium Development Goal 5

NBI Necesidades básicasinsatisfechas (Unsatisfied basic needs)

NGOs Non-Gouvernemental Organisations

PR Prevalence ratio

SDOH Social Determinants of Health

SEP Socioeconomic position

SRHS Sexual and Reproductive Health Surveys

STI Sexually transmitted infections

TFR Total fertility rate

UN United Nations

USAID United States Agency International Development

WHO World Health Organisation

WTFR Wanted total fertility rate

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Introduction

In the countdown to the 2015 Fifth Millennium Development Goal (MDG5) of improving maternal health, Colombia has reached the national target of 75% modern contraceptive prevalence rate (CPR) ahead of time. However, growing international awareness of the need to consider equity in health policy indicates the importance to go beyond country averages to monitor within-country socioeconomic inequalities on the road to fulfilling the MDGs agenda. The socioeconomic gap in modern contraceptive use across urban and rural areas threatens to leave behind the most disadvantaged groups in their capacity to reach the contraceptive prevalence component of the MDG5 and consequently to improve maternal health outcomes among others.

In Colombia, the Demographic Health Surveys (DHS) provide a rich source of data on demographic indicators and information on sexual and reproductive health including family planning available at six time points (1986, 1990, 1995, 2000, 2005 and 2010). Previous research in the country using the DHS shows that despite official efforts and a health sector reform to improve the health status of the population, health disparities have increased within regions and between rural and urban areas particularly since the 1980s [1-3].

In this context, research is required to understand and monitor socioeconomic inequalities in various dimensions in health as proposed by the Commission on Social Determinants of Health (CSDH). Contraceptive use is an important determinant of women's health and autonomy in low and middle income countries [4-6], attention to national and within country levels, trends and area differences in socioeconomic inequalities in women's use of contraception is long overdue to inform MDGs policy making. From this standpoint the aim of this thesis is to develop a framework to describe and understand socioeconomic inequalities in women's 'current non-use of contraception' using the six Colombian Demographic and Health Surveys (DHS). The thesis has the following structure:

Chapter 1 provides background information starting with a description of Colombia's profile, followed by a review of the indicators used to measure women's SEP in low and middle income countries and finishes with the conceptualisation of contraceptive non-use with a review of selected literature on fertility regulation and its association with women's socioeconomic position and psychosocial factors.

Chapter 2 presents the study aims, objective and hypotheses of this thesis followed by **Chapter 3** in which the main characteristics of the data and the analytical strategy carried out to address the objectives of this thesis is described.

Chapter 4 is divided into three sections. The first section describes the demographic and socioeconomic characteristics of women of reproductive age (15 to 49 years old) in Colombia from 1986 until 2010. The second and third sections describe women's contraceptive behaviour and socioeconomic circumstances of the analytical sample of interest used in chapters 5 and 6, composed of women of reproductive age 'at risk of pregnancy' defined as fecund women (not pregnant, amenorrheic or menopausal) in marital union (married or cohabiting) and single women sexually active in the interview month.

Chapter 5 applies a multidimensional approach to socioeconomic position (SEP), in which levels and trends in absolute and relative socioeconomic inequalities in contraceptive non-use are investigated along four dimensions of SEP: level of education, Household wealth (HWI), Physical and Public capital over the period from 1986 until 2010.

Chapter 6 seeks to determine the interplay between different kinds of social inequality through the identification of interactions between level of education and Public capital on women's current non-use of contraception.

Chapter 7 The objective of this chapter is to provide a description of the individual, community and municipality-level characteristics of the analytical samples used in chapters 7, 8 and 9. Using the Colombian DHS of 2005 and 2010, the analytical samples of interest were women of reproductive age (15-49 years old) 'at risk of pregnancy' defined as fecund women (not pregnant, amenorrheic or menopausal) in marital union (married/cohabiting).

Chapter 8 describes the relationship between women's current non-use of contraception and compositional and contextual (community and municipality) level characteristics of interest.

Chapter 9 presents further analysis on the effect of level of education on women's current non-use of contraception by testing the hypothesis that high community level of Public capital compensates for low levels of education with respect to contraceptive non-use.

Chapter 10 summarises the main findings in relation to the objectives and hypotheses of this thesis and discusses them in the light of previous studies, methodological considerations and future research and policy implications.

Chapter 1: Background

1. Background

The purpose of this chapter is to present the background information of this project as a starting point to understand the context of the study. The information is divided into four sections: first, a description of the study setting; second, a review of the indicators used to measure women's SEP in low and middle income countries; third, the conceptualisation of contraceptive prevalence rate in the context of the 2015 Millennium Development Goals (MDGs); fourth a review of selected literature on fertility regulation and its association with women's socioeconomic position, psychosocial factors and contextual characteristics.

1.1. Colombia

The Republic of Colombia is a Latin American country located in the northern part of South America. The region of Latin America and the Caribbean faces the largest socioeconomic inequalities in the world and progress in reducing income inequalities since the 1990s has been negligible[7,8]. In this context, poverty and inequity are key issues in local and international research agendas and evidence based policy decision-making processes for the region, such as the 2015 MDGs.

Population

Colombia has the third largest population in Latin America after Mexico and Brazil. According to the national census conducted in 2005 [9], the national population was 45 million of which 50.6 % were female, with a median age estimated at 26.3 years (25.4 years for males and 27.2 years for females). This figure does not include Colombians living abroad. Due to political instability, violence and unemployment about 1.2 million Colombians left the country legally between the year 2000 and 2005 and have not returned. The latest figures estimate that approximately more than 4 million Colombians or almost 10% of the population in their most productive years (between 15 and 65) live abroad. This phenomenon has weakened social structures for the younger age groups, but has had a positive impact on the economy with remittances from Colombian emigrants accounting for almost 4% of the GDP in 2003[10].

Colombia's population has become increasingly urbanised from 68.7% in 1990 to 77.4% in 2005 according to the national census. Urbanisation trends reflect a shift away from agriculture and a flight from conflict affected areas by guerrilla and paramilitary violence. About 35% of the total population is concentrated in four cities: Bogotá,

Medellín, Cali, and Barranquilla. Estimates of population density (inhabitants per square kilometre) have varied and are skewed throughout the country, ranging from 37 in 2000 to 44 in 2005 compared to the rural and jungle eastern departments where it is less than one person per square kilometre.

Demography

Men and women's demographic indicators have generally improved over the last four decades; fertility and mortality have declined and life expectancy at birth has increased from 58.5 years for men and 61.2 for women in 1973 to 67.3 and 72.6 in 1999, to most recent figures of 71 and 78 respectively in 2005. As a result of these trends, the population has aged but it is still relatively young. The estimated age profile of the population in 2006 was 30.3 % in the 0–14 age-group, 64.5 % in the 15–64 age-group, and 5.2 % in the 65 and older age-group [9].The 2005 census found that approximately 67% of Colombian homes had four or fewer persons, and the average number was 3.9. Almost 45% of Colombians were single, 23% were married, and 23%lived as unmarried couples. Nuclear families are the most common type (54%), followed by extended families (34%), whereas persons living alone represent about 8% of total households[9,11].

Ethnic composition

Ethnic groups in Colombia include the whites and mestizos -mixed white and indigenous ancestries- which constitute 86 % of the national population, Afro-Colombian population that accounts for 10.5% of the national population (blacks, mulattoes -mixed black and white ancestry- and zambos –mixed indigenous and black ancestry-), indigenous which represent approximately 3.4% and gypsy population with less than 0.01%[9]. Ethnic estimates vary widely due to inconsistent definitions of ethnic groups based on ancestry, language and self-recognition.

The upper socioeconomic group makes up 5% of the population and is mostly white; whereas the middle class constitutes roughly 20% and is mostly mestizos. The relatively lower socioeconomic classes make up more than half of the population (75%) and are proportionately mestizo, Afro-Colombian, and indigenous. The populations of major cities are primarily white and mestizo. Most indigenous people inhabit almost inaccessible regions and Afro-Colombians live in rural areas in the Caribbean and Pacific coastal regions and tropical valleys[12,13].

Epidemiological profile

The country is experiencing changes to its epidemiological profile typical of transitional societies. These changes include the persistence of communicable diseases with a parallel increase in non-communicable diseases [14]. In the past five years Colombia has halved its homicide rate, one of the world's highest. In 2002 the homicide rate was more than 60 per 100,000 inhabitants and it decreased to 44 per 100,000 in 2004. Other than homicide, heart disease is the main cause of premature death, followed by strokes, respiratory diseases, road accidents, and diabetes [10]. Vector-borne diseases such as cerebral malaria and leishmaniasis are prevalent in lowland and coastal areas, and dengue poses a serious public health problem in urban areas [15]. In 2005, an estimated 171,504 persons aged 15–49 were living with HIV, with an estimated prevalence of 0.5%, lower than Brazil (0.6%) but higher compared to Peru (0.3%) [10,16].

Fertility transition

Colombia is currently at the late intermediate stage of fertility transition [17]. Fertility rates in the country have decreased drastically from 6.8 in the early 1960s to 2.1 in 2010, but within country differences suggest that women in rural areas are still above population replacement level [16]. It has been estimated by survey that the total fertility rate would drop from 2.3 to about 1.8 if women's pregnancy desires matched their actual fertility rates [18]. Gaps in the available data limit detailed understanding of the extent of inequalities between different ethnic groups and the influence of important factors like religious beliefs on women's fertility regulation [19].

Family planning in Colombia

During the 1950s and early 1960s Latin America was a strong pro-natalist region that adhered to the motto "to govern is to populate" [20]. It was not until the late 1960s with the increase in unsafe abortion rates and the burden of abortion-related complications in public hospitals, that governments in the region started to worry about population control issues [21]. In Colombia, strong opposition from the Catholic Church diverted all efforts away from national policies and it was only through private endeavours that family planning services were offered to women around the country. The Colombian government's tacit acceptance of these private initiatives led the way to the foundation of Profamilia in 1965, the dominant family planning provider in Colombia for many years and the first one to reach women in rural and poor areas through contraception social marketing and community-based distribution systems [22]. Parallel to

Profamilia's operation and expansion in the late 1960s and early 1970s the country experienced the most rapid fertility decline compared to other major South American countries [20].

Role of USAID

USAID (United States Agency for International Development) assistance for family planning in the country started in the mid 1960 but ended a decade later when the Colombian government claimed that it no longer needed financial and technical support. Afterwards, USAID focused all efforts in the country through the private sector, mainly Profamilia and private medical schools, until the early 1990s when the country experienced the phase-out of USAID funding as part of the family planning graduation experiences in the Latin American region. Colombia received a US$6 million endowment fund that helped subsidized family planning services in the country.

Public and private provision of modern contraceptives has evolved in the last decade (Table 1.1). Since the mid-1990s decentralisation of the health system shifted administration of family planning services from the central level to municipality level. The public sector has grown from 17% in 1986 to 56% in 2010and has adopted similar strategies to Profamilia's programmes, but has not reached its full potential mainly due to poor administration of family planning procurement and distribution [23].

Table 1.1 Reported last source of family planning[1] Colombian DHS 1986-2010

Survey year	Public	Private medical	Private other	Other	Don't know	Missing
2010	56.1	40.6	0.8	2.1	0.5	
2005	38.7	57.1	2.7	0.5	0.9	
2000	27.4	69.4		2.3	0.8	0.1
1995	27.1	72.1		0.3	0.5	
1990	22.6	13.6	32.1	30.1	1.4	0.2
1986	16.7	52.7	28.1	0.6	1.3	0.6

[1] Modern methods of contraception.

Role of religion

The Catholic Church actively opposes birth control and abortion legalisation in Colombia. As a traditional institution in the country it executes enormous power in daily life through education in schools and universities, church groups and with the conservative party in government affairs. The Catholic Church is the predominant religion in the country. Official figures vary but it is estimated that between 75 to 90 %

of Colombians recognise themselves as Catholics. Since the 15th century until 1993 Catholicism was the official religion in the country. With the constitutional reform in 1993 the Colombian government granted equalitarian treatment to all religions. The role of Protestant and independent Christian communities is relatively small but growing and there are Jewish, Mormon and indigenous groups with traditional religions.

Civil conflict

Colombia's civil conflict is mainly attributed to a legacy of political conflict that dates back to the late 1940s, rooted in unequal access to social, economic and political power. Over the years the pattern of violence has evolved and new actors have actively participated in the form of government forces, guerrillas and paramilitary groups [24,25]. In the early 1980s, violence was mainly attributed to poverty, inequality, high levels of impunity and a lack of educational and employment opportunities for the most deprived sectors of the population. This pattern has expanded to a self-perpetuating system funded by drug trafficking, kidnapping, extortion and expropriation -especially victimising civilians in rural areas. In recent years there has been a decline in kidnapping and rural combat; however the failed peace negotiations along with the deterioration of the social organisation and natural habitat are a key constraint for the country's development [26].

In Colombia, men and women are exposed to different types and levels of violence [27]. Although in general violence has a direct effect in the lives of most citizens, men in rural areas are particularly likely to be forced into conflict. In 1999, men (15 to 35 years old) were 15 times more likely to die of homicide than women [28]. On the other hand, women are more likely than men to be victims of displacement, sexual abuse during flight, and suffer from violence as a result of the violent death of their husbands, partners, fathers and sons, and bear the burden of coping with the disruption of their families and social structures [27].

Forced displacement

Violence in Colombia has delayed the country's social and economic growth and has left behind large groups of internally displaced populations (IDPs) [24,29]. IDPs are those who are forced to abandon their place of residence, land, property, belongings, work and communities, but who do not cross an international border [30]. The country is home to the world's second largest population of IDPs after Sudan. More than 3.5 million Colombians have been internally displaced since 1985, according to the

Consultancy for Human Rights and Displacement (CODHES), an authoritative NGO source in the country. Almost 1 million people have been internally displaced since 2002, according to CODHES and official sources; yet figures vary widely, in 2005 CODHES reported more than 250,000 newly displaced people or 90,000 more than government figures.

Most IDPs leave rural areas and seek refuge in the slums of urban settings. Displacement has placed a burden on smaller and medium-sized cities with less substantial infrastructure, and on large cities where there are not enough resources to meet the needs of host impoverished communities [25]. Tensions between IDPs and receptor populations over scarce resources from the government and non-governmental organisations (NGOs) are common in urban settings [31].

Women and displacement

Women and girls of reproductive age constitute half of the displaced population. Afro-Colombian and indigenous women are over represented among the displaced [32]. Female heads of household represent between 34.6% and 49.7% of all displaced households, a much higher percentage than the national average (24%). Fifteen per cent are illiterate, compared to less than five per cent of all women in the country, and 21 % can read and write with difficulty. Female IDPs face discrimination as women, as displaced persons, and as individuals living in poverty; the burden is worse for ethnic minorities [25].

Gender inequality

Women's position in the Colombian society has changed over the past decades. Women are accessing higher levels of education and employment opportunities. Survey data indicates women are getting married at older ages and family size has decreased over the past 25 years. According to the United Nations Human Development Index Colombia received a score of 0.710, placing the country at 87 out of 187 countries. With respect to the Gender Inequality Index the country received a score of 0.482, placing it at 91 out of 146 countries. The World Economic Forum ranked Colombia 80 out of 135 countries in its 2011 Global Gender Gap Report, with a score of 0.6714 where 0 represents inequality and 1 represents equality.

In theory, the Colombian Constitution protects the principle of equality between men and women in all public and private spheres. In practice, many forms of discrimination persist. Women are more likely to be affected by unemployment, lower wages, forced

displacement, poverty and violence than men. In traditional settings i.e. some indigenous groups and peasant communities, a 'macho' culture persists which undermines women's will and aspirations i.e. educational opportunities, reproductive rights.

Reported domestic violence is widespread in Colombia. In 2002, official figures indicate that about one-third of domestic violence cases involved married couples and 23% involved other family members. In response to the high incidence of sexual violence, in 2008 the government established a new Penal code that recognises sexual victimisation and rape as crimes and created a centre that provides assistance to victims of such abuse. Recent judicial reforms i.e. depenalisation of abortion aims to protect women and recognise their equal status in the Colombian society.

Constitutional reform

The 1990s was a decade of political and social reforms in Colombia. The Constitution of 1886 was reformed in 1991 after several years of failed negotiations and political movements to adapt it to the country's changing social, economic and political circumstances. In 1990 a student and political movement proposed the formation of the constituent assembly and succeeded in 1991. The ruling government at the time was forced to carry out the reform and to guarantee the creation and development of political parties other than the two traditional ones, and for the first time to give representation to minorities including women, afro-Colombian and indigenous groups. One of the main outcomes after the reform was the decentralisation of governmental power to its regions. Decentralisation of governmental responsibilities and public finances has had an important effect on health service provision at the municipal and departmental level by providing autonomy at the local level [35].

Health Sector Reform

Colombia is an example of a radical and market oriented health care reform that followed the 1990s agenda for the region dictated by the World Bank's 1993 report 'Investing in Health' [33]. This report promoted decentralisation, privatisation, separation of purchaser and provider functions, cost recovery and user fees [34]. After more than a decade since the health reform, there are mixed findings regarding advancements in quality, efficiency and coverage [35]. According to the National Quality of Life Survey (2003) 42% of the population did not have health insurance and 60% of the poorest quintile of the population was not insured compared to 10% of the

highest quintile [36]. Minorities are significantly less likely to have health insurance in the country; while 48% of black and indigenous populations lack health insurance, 31% of majority ethnic groups do not have health insurance [37].

These figures question the equity of the reform, even more since expanded affiliation does not necessarily translate into higher coverage [38]. Overall, the literature on the Colombian health reform provides growing evidence that the system is deteriorating [34]. In response to this failing scheme the current government is lobbying for a series of Constitutional reforms of the health system.

Socioeconomic inequalities

Colombia is a lower-middle income country marked by large socioeconomic inequalities [39]. Its macroeconomic context over the past two and a half decades is characterised by periods of structural adjustment. In the 1990s the Colombian government introduced liberalisation policies including cuts in public spending particularly in health and education, decentralisation of state functions, liberalisation of labour markets and removal of price control [13,29]. By the end of the decade, fiscal imbalances pushed the country into an economic recession in 1999. A series of macroeconomic shocks in this period had a disproportionate impact on the most vulnerable regions of the country reflected in the worsening of the income distribution [11,29,40] (Appendix 1).

Poverty in Colombia -as measured by the percentage of poor according to the national poverty line using the national household survey information on income and expenses - has followed a downward trend mainly associated with economic growth, and not with improvements in the distribution of income [29]. In 2003 the richest 20% of the population had a 62.7% share of income/consumption and the poorest 20% just 2.5% and 17.8% of Colombians lived on less than $2 a day [11]. Studies in Colombia suggest that excess poverty in the country is caused by high levels of inequality between regions [29]; while the richest social groups particularly in urban areas accumulate the most productive assets, ethnic minorities, rural populations, victims of civil conflict and poorer social groups have been systematically left out in the history of the country [13,29]. These processes have led to sharp regional disparities in quality of life and contribute to the social disintegration in large areas of the country.

Inequalities in Health

Although Colombia fares well in regional comparisons, health inequalities in the country follow similar trends as for other countries in the region. Improvements over the past 35 to 50 years for almost all health indicators including life expectancy, infant mortality, incidence of many communicable diseases, and vaccination coverage have been accompanied by greater within country inequalities [39,41]. The few studies on the relationship between socioeconomic conditions and health in the region have consistently found large health differentials between the upper and lower social group levels, measured by income, education level, region, urban/rural, ethnicity, and gender [42-44]. Health improvements favour disproportionately those who already had a greater share of socioeconomic advantages in society compared to the health of disadvantaged groups who improve less consistently and at slower rates [45,46]. Table 1.2 shows large early life health inequalities in Colombia and two other Latin American countries [47].

Table 1.2 Early life health inequalities in selected Latin American Countries 2005

	Colombia	Peru	Brazil
Infant Mortality Rate[1] per 1,000 Live Births:			
Urban	21.0	28.0	42.0
Rural	31.0	60.0	65.0
No education, Primary	42.0	73.0	93.0
Highest Level of Education	14.0	20.0	9.0
Poorest Quintile	32.0	63.5	83.2
Richest Quintile	17.6	13.9	28.6
Under Age 5 Mortality Rate[2]:			
Poorest Quintile	39.1	92.6	98.9
Richest Quintile	20.2	17.6	33.3
Children Underweight Under 5[3], Severe:			
Urban, %	0.6	0.1	0.5
Rural, %	1.1	1.7	0.9
No education, Primary, %	3.4	3.3	1.2
Secondary or higher level of Education, %	0.0	0.0	0.0
Poorest, %	1.5	2.2	1.2
Richest Quintile, %	0.2	0.0	0.3

[1] Number of deaths to infants aged less than one year per 1,000 live births. [2] Number of deaths of children under 5 years of age per 1,000 live births. [3] Percentage of children aged less than 5 years of age who are underweight

Inequalities in Reproductive Health

In Colombia, national fertility rates mask important within country inequalities; urban versus rural residence, region of origin, age groups, level of education, and individual

circumstances such as displacement are particularly relevant for understanding differences in fertility [18,48-50]. Women without formal schooling had an average of 4.5 children, whereas women with higher education had 1.4 children [10]. Contraceptive prevalence (modern and traditional methods) among women without formal education was 67%, and among women with secondary-level education it was 79%. Maternal mortality in 2002 was estimated at 84.6 per 100,000 live births, lower than in the year 2000, when it stood at 104.9 per 100,000 live births. However, the maternal mortality rate varied from 315.7 per 100,000 live births in the region of Choco –the poorest in the country- to 35 per 100,000 live births in the region of Risaralda in the centre of the country.

In neighbouring Latin American countries, like Peru and Brazil, substantial gains have been made in terms of sexual and reproductive health, but still fertility rates and unmet needs for family planning (limiting and spacing) remain high in rural areas and among women with lower levels of education, compared to urban areas, and women with higher levels of education (Table 1.2) [51]. Studies on the social determinants of access to reproductive health in Latin America suggest that no further gains will be achieved without addressing social and economic disparities [7,8,45]

Table 1.3 Inequalities in reproductive health in Latin American Countries (2005)

	Colombia	Peru	Brazil
Total Fertility Rate[1] per Woman 15-49 years old			
Urban	2.3	2.2	2.3
Rural	3.8	4.3	3.5
No education, Primary	4.0	5.1	5.0
Highest Level of Education	1.5	1.8	1.5
Poorest Quintile	5.2	6.6	4.8
Richest Quintile	1.7	1.7	1.7
Modern Contraceptive Prevalence Rate[2] for women 15-49 years old			
Urban, %	66.2	56.1	72.6
Rural, %	58.4	40.3	61.2
No education, Primary, %	55.5	33.0	56.6
Highest Level of Education, %	63.5	58.1	76.3
Poorest, %	53.8	36.8	55.8
Richest Quintile, %	66.4	58.0	76.8
Unmet Need for Family Planning[3], Limiting			
Poorest Quintile, %	6.2	14.1	11.9
Richest Quintile, %	2.6	3.1	2.0
Unmet Need for Family Planning[4], Spacing			
Poorest Quintile, %	4.0	5.6	5.9
Richest Quintile, %	1.6	2.3	1.6

[1] Number of children born per woman [2]Percentage of women of reproductive age who are using (or whose partner is using) a contraceptive method [3-4] Proportion of currently married women of reproductive age not using contraception but wishing either to postpone (space) or to prevent (limit) childbearing

Colombia and the MDGs

Since 2005, the Colombian Government incorporated the MDGs into its political agenda and assigned its monitoring through the National Planning Department, which coordinates the activities of various governmental entities with those of various United Nations cooperation agencies. The CONPES 91 issued in 2005 defined the targets, strategies and budget to achieve each of the eight MDGs. Each goal was adapted to the country's characteristics following regional recommendations by the United Nations. The MDGs are considered to be the foundation for the government's social programmes and have been integrated to relevant social policies. In practice, Colombia has achieved important gains with respect to the MDG targets but inequalities within the country remain to be addressed [51].Colombia appears well on track to meet the MDGs according to local observatories and PAHO reports[10,52,53]. However, within country inequalities threatens the achievement of the MDGs as some regions and population groups are falling behind national averages. UNDP and Colombia's strategy for MDG achievement focuses on closing urban and rural gaps by putting in place monitoring systems, overcoming scattered and fragmented efforts of multiple cooperation agents and by communicating with stakeholders responsible of seeing through the MDGs agenda at local levels within the country.

1.2. *Summary and implications for this thesis*

Improvements in demographic, social and key health indicators in recent decades, but substantial inequalities are evident. Fertility rates have fallen sharply, however there remains unmet need for family planning particularly for women in marginalised areas and IDPs. Colombia faces the challenge of addressing public health concerns for the people living in precarious multicultural and inequitable conditions. From a social determinants perspective and following the third recommendation of the CSDH, incomparable available sources of information like the Colombian DHS can be used to measure and understand the social determinants in contraceptive non-use in Colombia. Understanding the socioeconomic and cultural determinants of inequalities in health is essential for developing public health policies in the context of the MDGs.

1.3. Measuring women's socioeconomic position in low and middle income countries

Addressing socioeconomic inequalities in health constitutes one of the main challenges for public health worldwide [54]. Increasing evidence of large and widening inequalities in high, middle and low income countries has stimulated international efforts to understand and monitor socioeconomic inequalities in various dimensions of health [55]. These efforts include the task of developing measures of SEP appropriate to the populations in each context of study [56].

In high income countries, most measures of SEP are based upon three related dimensions: occupation, education and income. Multiple ways of measuring each of these dimensions are related to the availability of data and conceptualisation of each indicator. For example, socioeconomic prestige measures based on the ranking of a person's occupation have been widely used in the context of industrialised nations [57]. In low and middle income countries, these dimensions are common in contexts with higher economic development, but less suitable for large culturally diverse populations living in rural and semi-urban areas and urban slums or in traditional social organisations, where data on conventional labour market oriented socioeconomic measures have limitations in terms of availability, reliability and applicability [58].

Women's SEP and health

Classification of women's social position is a topic which raises conceptual and methodological problems. Debate has focused on questions such as whether women are better classified according to their own or their husbands' occupation and on the applicability of standard occupational classification systems originally developed to reflect middle-aged men's work in industrialised societies [59]. Alternative approaches conceptualise SEP as intrinsically entwined with concepts like gender, ethnicity, caste and household organisation among other factors [60,61]. Several of these indicators may be used together to capture different dimensions of a women's socioeconomic circumstances relative to the context and time of interest [60,62]. Some of these measures of women's SEP found in the literature are discussed below.

Level of education

Level of education is probably the most widely used measure of SEP for women in low and middle income countries. National population-based surveys have collected

information on level of education with few non-responses since the early 1970's. Census data provides information on women's education in many countries. Several indicators are used as measures of education e.g. literacy, enrolment, years of education and highest achieved qualification [60]. Compared to measures of occupation and income, level of education is generally fixed at the beginning of adulthood and is stable throughout life but does not capture adult SEP with respect to changes in living circumstances during adult life [46]. On the other hand, comparability over time is somewhat limited as an achieved level of education may have a different social value for each birth cohort leading to different skills, and potential occupational opportunities and income levels [62,62].

A positive association between a women's level of education and health is well established in different contexts [63]. The impact of education on women's health particularly reproductive health is substantial in low and middle income countries [64-66]. Many studies show that lack of education is strongly associated with poor women's nutrition, exposure to violence, low self-esteem, high rates of infectious diseases and shorter life expectancy [67,68]. On the other hand, women with higher achieved levels of education are more likely to work in paid jobs, have meaningful social networks, report better health and more autonomy [3,63,69]. Education is regarded as a good indicator of a women's social position because the intellectual, practical and cultural skills acquired through education serve as a resource of knowledge and empowerment, and as a vehicle of socioeconomic mobility [60].

Occupation

The use of occupation as a measure of women's SEP derives from the conventional sociological approach of measuring SEP at the household level on the basis of men's occupation as the breadwinners [57,62]. Information on occupation is available in large population surveys in low and middle income countries, but the way in which it is collected has several limitations as it does not provide information on women's working conditions [69].

Women's work in low and middle income countries is characterised by gender segregation, primary household and additional out of home roles and unemployment. Women are over-represented in low-paying, low-status and low-security jobs [63,68]. In terms of gender roles, women around the world carry the largest burden for home, family, and household responsibilities in addition with work outside their homes;

traditional measures of SEP do not necessarily account for this double occupation [63]. Most of the evidence of these limitations on the measurement of women's SEP comes from research in the UK and USA; this is an area largely under-study in other contexts around the world and especially in regions with other types of economies e.g. agricultural and large informal economies like Colombia[70].

Money-metric measures

Income, expenditure and consumption are commonly used by economists to measure economic position [71]. Consumption is considered the best indicator of economic position and ideally it would include consumption of goods as well as services like education and health [72]. The income level of a person can be used to indicate its socioeconomic position and/or to indicate access to material resources [73]. Where information is available, the population is classified into deciles or quintiles or by using poverty (basic subsistence income) and/or indigence line (basic food costs) in absolute or relative terms [73,74].

In low and middle income countries data on income and expenditure is scarce and unreliable [72]. Information on income is usually not readily available in national population surveys; instead information on assets is widely collected. In addition, as a measure at the household level it does not account for intra-household allocation between members of the family e.g. women's control over own or partner's earnings and decision making over expenses [63]. As an individual-level measure women in unpaid work or unemployed may be missed out and as a household-level measure they may be assigned the income of the male head of the household. Using income level could lead to limited comparability because, in different regions (urban vs. rural), the cost of living is not the same therefore living standards vary according to geographical zone and time [60]. In the absence of reliable data on income and its poor applicability for measuring women's SEP, money-metric measures are perhaps the less reliable in these contexts. An exception could be the use of census data from working populations particularly in urban areas.

Household wealth

Household wealth is an alternative measure of SEP widely used in low and middle income countries [75], broadly defined by asset ownership and housing quality. Wealth represents a more stable economic status at household level than income or expenditure, because it takes into account available resources and long-run economic status [72].

Household wealth indices (HWI) have been developed for SEP measurement in low and middle income countries over the past fifteen years [76]. The HWI approach measures relative socioeconomic position of the household based on ownership of consumer durables such as radio, TV or refrigerators, structural components of the dwelling like building materials, and amenities such as electricity and sewage system [72]. One of the most common indices was introduced by the Demographic Health Surveys (DHS) and includes a broad set of assets: durable consumer goods, housing quality, water and sanitary facilities and other amenities [72,77].

The HWI is a valuable measure of household-level SEP, but captures a set of publicly provided as well as private household assets which it is important to discriminate with respect to public health interventions [78]. An alternative to this limitation is to take a multidimensional approach, in which different dimensions of SEP are defined separately. This provides a framework for attempting to disentangle causal mechanisms responsible for inequalities in health [79]. Studies in Peru, Brazil and Colombia, have used household wealth as measures of women's SEP and have found that access to public assets (e.g. electricity, sewage) have different effects depending on the interaction with women's level of education, for example education and access to assets may be compliments or substitutes with respect to several health outcomes [80-82]. Identifying these interactions and which dimensions of socioeconomic position are stronger determinants of health outcomes may better target effective policy interventions [80]. This alternative approach derived from the household wealth index framework for the measurement of SEP in low and middle income countries is discussed below.

Multidimensional approach

In research on household wealth in Latin America, asset approaches include a wider portfolio of items in comparison to literature on assets for high income countries [75,83]. In the latter, the term asset is assigned to material items with a market value, whilst in the region the term refers to tangible and intangible resources [75]. Similar categories of assets have been commonly grouped into domains of capital such as natural capital, human capital, physical capital and public capital. Figure 1 shows how different types of assets in the HWI can be split into separate dimensions of SEP described below:

Physical capital is measured using durable consumer goods and indicators of housing quality. This dimension measures within household material living standards and lifestyle i.e. floor material and asset ownership i.e. use of radio and television. This form of capital captures possible causal mechanisms i.e. social standing which influences women's access to health messages through mass media and is a proxy for a household's ability to pay for assets and services i.e. health services and contraceptives.

Public capital is defined as access to services supplied by the state or on its behalf such as electricity and piped water. Its components capture non-material aspects i.e. household connectedness to the public infrastructure in the area and are a proxy for an area's accessibility i.e. roads and public transportation. Public capital differs from Physical capital in that it captures information on possible causal mechanisms that originate outside the household level i.e. piped water in the area which influences household lifestyle i.e. time spent in collecting clean water.

Human capital dimension is often defined as educational attainment, but other potential indicators e.g. measures of occupation are relevant and could be explored for inclusion [83,84]. This thesis includes women's reported achieved level of education as indicator of human capital using the country's standard definition i.e. none, primary, secondary or higher. The literature on the association between fertility regulation and women's level of education suggests that non-material aspects i.e. the skills acquired through education, serve as a resource of knowledge and empowerment and as a vehicle of socioeconomic mobility for women which are associated to contraceptive behaviour in the literature [60].

Figure 1 Asset categories and components of the composite HWI and Physical, Public and Human capital
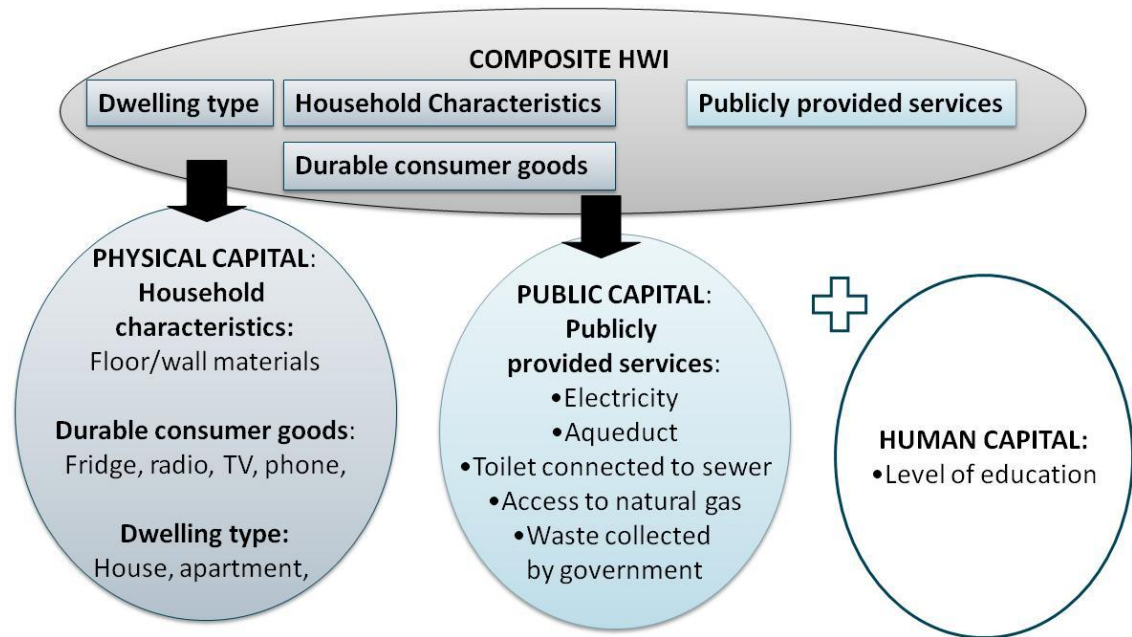
The interplay between different kinds of social inequality is a growing topic of interest in research on social inequalities in health. For example, an intersectionality approach [61] proposes going beyond a one-dimensional analysis where the focus is given to only one conventional measure of social stratification e g. social class or gender, and instead study how these dimensions interact with each other. In the same line of thought a multidimensional asset-based approach could provide a theoretical advantage in health inequalities research. Studies in Peru, Brazil and Colombia found that access to public assets has different effects depending on women's level of education. This interaction indicates that Human capital and Public capital may complement or substitute for each other [80]. Separating different dimensions of SEP and studying their interaction effects provides a framework for disentangling socioeconomic inequalities in health and health related outcomes in a way that is not possible with composite indices.

1.4.   *Summary and implications for this thesis*

Despite practical limitations, women's levels of education and household assets have been widely used as measures of women's SEP in low and middle income countries. Education is probably the most straightforward measure of SEP for women in these contexts. However, it is a factor highly interactive with other social and economic factors e.g. income, occupation, gender, age and place of residence [61,63]. The mechanisms of these interactions may vary by cultural context and historical period and in the context of extreme poverty further conceptual and methodological issues are

raised. A composite asset index i.e. HWI is valuable, but captures a diverse set of direct and indirect health determinants as well as individual and household level dimensions of SEP which introduces difficulties in interpretation with respect to health outcomes. From a social determinants perspective, a multidimensional approach in which different dimensions of SEP are defined separately is innovative and captures distinct and broader aspects of socioeconomic circumstances that could provide a framework for defining women's SEP for research on social inequalities in health. In contexts like Colombia, with scarce information on income and expenditure and where more than 50% of the population works in the informal sector [11] this approach which does not rely in monetary indicators provides a culturally sound framework for SEP measurement.

1.5. Women and family planning: a rights-based framework

Introduction

Over the past two decades it has become increasingly clear that voluntary fertility regulation is a key aspect of reproductive health in more equitable societies [68,85,86]. A major shift in the perception of population growth is reflected in a greater understanding that health, education, poverty, environmental/developmental sustainability and population are inextricably linked [68]. Classic international population-control policies and large scale family planning programmes –sometimes at the expense of women's rights- have been gradually replaced in several countries by a framework that recognises the reproductive needs and rights of individuals including the right to choose to reproduce [87].

Definition of Family Planning

In this framework, the WHO states that "Family planning allows individuals and couples to anticipate and attain their desired number of children and the spacing and timing of their births. It is achieved through use of contraceptive methods and the treatment of involuntary infertility. A woman's ability to space and limit her pregnancies has a direct impact on her health and well-being as well as on the outcome of each pregnancy." Additionally, the World Health Organisation (WHO) states that "Reproductive health affects the lives of women and men from conception to birth, adolescence to old age, and includes the attainment and maintenance of good health as well as the prevention and treatment of ill-health." These definitions are rooted in the

principles of human rights and gender equality endorsed at the Cairo International Conference (1994) [88]. This conceptualisation of fertility regulation in the WHO framework of reproductive health moves away from a stereotyped biological definition of human reproduction as a 'women's problem' into a gender-based analysis that encompasses the normative social and cultural contexts [68]. Further, the identification of violations of human rights in relation to fertility regulation gives attention to socially disadvantaged and marginalised groups including but not limited to the poor and provides mechanisms for governmental accountability [89].

Family planning: the international agenda

One of the most dramatic social transformations of the past decades is the widespread increase in the use of contraception methods [90]. Since reliable methods became available in the 1960s, the use of modern contraception has increased in low and middle income countries and fertility levels have declined in most regions, except sub-Saharan Africa [67]. Access to modern contraceptives was deemed a fundamental human right by the 1994 International Conference on Population and Development, and ever since, international efforts have focused on improving health, educational opportunities, and individual rights particularly for women in low and middle income countries as a way to stabilize population growth [47,91].

These efforts include specific goals towards providing universal access to a full range of safe and reliable contraceptive methods and associated reproductive health services and have been highly contested by coalitions opposed to reproductive rights particularly strong in the United States of America[92].

Strong opposition hampered the inclusion of family planning at the early stages of the MDGs and it was not until 2008 that target 5B –universal access to reproductive health including family planning- was included as part of the MDG5 agenda. After strong international lobbying by organisations like the United Nations Population Fund (UNFPA) allied with NGOs worldwide, voluntary family planning has been recognised as a cost-effective key component to achieving the MDGs[87].

Unmet need for family planning

Unmet need for family planning is an indicator of the gap between fertility desires and reported contraceptive behaviour. Although the concept seems straightforward, the calculation is complex and has changed over time. DHS revised the definition of unmet need in 2012. Using the revised definition, unmet need for family planning is the

percentage of women who do not want to become pregnant but are not using contraception. Information on women's fertility desires and choices are in part captured through reported 'unmet need' for contraception. The definition of 'unmet need for contraception' has been under development since the 1960s and the term 'unmet need' was coined in the 1970s to describe the discrepancy between women's choice and behaviour with respect to use of family planning. Despite increased access and use of modern contraceptives large numbers of women continue to have unmet need for contraception. Globally, some 201 million women lack access to effective contraceptives [93]. In Latin America, Guttmacher has estimated that more than half of all pregnancies in the region are unintended despite reported high use of contraception (65%) among married women of reproductive age [6].

Magnitude of the problem

Reproductive health problems are the leading cause of ill health and death for women of childbearing age (15-49) worldwide [47]. Impoverished women suffer disproportionately from unintended pregnancies, maternal death and disability, sexually transmitted infections including HIV, gender-based violence, discrimination and other problems related to their reproductive system and sexual behaviour [94]. Of about 210 million women that become pregnant each year, 8 million suffer life-threatening complications related to pregnancy leading to long-term morbidities and disabilities, and over half a million women die in pregnancy, childbirth, or following unsafe abortion. More than 99% of these deaths occur in low and middle income countries [95]. Underlying these health issues lays family planning as a key factor for reducing poor maternal and child outcomes. The links between family planning and health are summarised below.

Family planning and health

The voluntary use of effective contraception is essential to reduce the burden of reproductive ill health by decreasing maternal and infant mortality and morbidity [90,93]. Maternal mortality can be reduced through effective methods of contraception by limiting the total number of pregnancies for each woman, reducing the number of unintended pregnancies and unsafe induced abortions, reducing the number of pregnancies to women in groups at increased risk of maternal death, particularly young (<20), old (>39), and women who are high parity (more than five previous births). Some 19 million unsafe abortions take place each year in low and middle income countries an

estimated 68,000 women die as a result. In addition, one in three deaths related to pregnancy and childbirth could be avoided if women who wanted effective contraception had access to it. According to recent estimates, up to 100,000 maternal deaths and 4.6 million disability-adjusted life years (DALYs) would be gained globally if women could prevent unintended pregnancies [50].

1.6. Review of the literature

A review of the literature was carried out for low and middle income countries (Appendix 2). Much of this evidence comes from secondary analyses of large-scale national surveys like the World Fertility Survey (WFS) in the 1970s and early 1980s and the Demographic and Health Surveys (DHS) since the mid-1980s. Most of the evidence is limited to married women of childbearing age, ignoring single women or women in other marital arrangements [68]. Few studies analyse the Latin American context.

Family planning and women's socioeconomic position

The association between socioeconomic position (SEP) and family planning has been explored largely in high, middle and low income countries. The association between fertility regulation and women's SEP has been mainly studied using current and lifetime contraception use as the outcomes and education and household wealth as proxies for women's SEP.

Level of education

Studies in different contexts show that women's level of education is a strong predictor of contraceptive behaviour. In Mexico [96] lack of education increased the likelihood of not using contraception, with illiterate women being 2.15 (95 % CI 1.24-3.76) times more likely to have never used any contraception compared to women with secondary education. Increased availability of family planning services weakened the effect of schooling on contraceptive use. In Peru [97] women with high school or higher education were more likely to use contraception than women who only had primary level education. A study in Pakistan [98] also provides evidence of a strong association, with literate women twice more likely to use contraception (OR 2.02; 95% CI 1.43-2.85) compared to illiterate women.

The association between high levels of education and high current and lifetime prevalence of contraception is partly explained by other factors such as wealth,

urban/rural place of residence and husband's education, yet after controlling for such type of factors in multivariate analyses, it remains statistically significant [99]. Castro Martin [66] and Castro Martin and Juarez [65] have suggested that one pathway through which education influences fertility is through the improvement of women's literacy which may lead to a better understanding of the biology of reproduction, thereby increasing the effectiveness of family planning and contraceptive use methods. Another possible mechanism is through the improvement of women's skills which may increase their chances of employment and other activities that increase preference for delayed childbearing and marriage, influencing knowledge of and demand for contraception [100].

Household wealth

In recent years there has been a growing body of evidence on inequalities in reproductive health measured with the household wealth index of the DHS [73]. Wealth may influence contraceptive use through providing access to economic and social resources [101]. Some of these studies have shown that wealthier women are more likely to use modern methods of contraception than poor women. A study in Indonesia [102] found that better-off and moderately poor women had higher odds of using modern contraceptives than did extremely poor women. In Peru [103] women who lived in households that were in the highest wealth category were more likely to use contraceptive methods than women in households in the lowest wealth category. Data from different contexts shows that wealthier women are more likely to have higher levels of education and live in urban areas, factors associated with higher levels of contraceptive prevalence [64,104,105].

Psychosocial aspects of family planning

The literature exploring the relationship between women's SEP and indicators of reproductive health suggests psychosocial mechanisms through which this relationship operates. A number of studies have examined the effect of women's empowerment and reproductive health outcomes in the context of low and middle income countries (Appendix 2). In these studies, women's empowerment has been measured using a group of proxy indicators such as involvement in decision making, autonomy, freedom of movement, community decision making, freedom from domestic violence, and husband-wife communication among others.

Women's autonomy

These factors have been investigated at the individual and household level and more recently, using aggregate community level variables to explore the influence of factors outside the household such as community-level female autonomy and expected gender roles. For example, at the individual level, a study using data from Pakistan [106] found that decision autonomy was significantly associated with both lifetime and current contraception use. In the adjusted model the odds ratio for the highest vs. the lowest quintile of decision autonomy was 1.8 (95% CI 1.4–2.4) and 2.0 (95% CI 1.4–2.8), respectively. Yet, contraceptive use was not consistently associated with movement autonomy, whereas it was strongly associated with women's education, but this relation was not mediated by women's autonomy. Similarly, in earlier work from Bangladesh [107] three dimensions of women's empowerment had statistically significant effects on contraceptive use: freedom of mobility (OR 1.21 95% CI 1.08-1.36), freedom from domination by family (OR 1.40 95% CI 1.03-1.91) and economic security and contribution (OR 1.53 95% CI 1.11-2.10). Data from Colombian women residing in poor communities [108] suggests that women victims of displaced by conflict were not significantly less likely to report use of contraception compared to poor non-displaced women (OR 0.66 95% CI 0.31-1.43). These studies provide some evidence that women's empowerment plays an important role for women's fertility regulation in low and middle income countries.

Intimate partner violence

Exposure to domestic violence shows a strong negative association with women's ability to control their fertility. Intimate partner violence (IPV) and reproductive health indicators appear linked in different ways. For the case of family planning, research in countries like Cambodia, Haiti, Kenya and the Dominican Republic suggest an association between contraceptive prevalence and increased vulnerability to IPV [109]. For example, data from Kenya suggest that exposure to IPV was associated with greater use of family planning (physical violence: OR 1.2 (95% CI 1.08-1.40); emotional violence OR 1.4 (95% CI 1.22-1.65) sexual violence OR 1.7 (95% CI 1.4-2.0) [109].

Data from a national sample in Colombia [18] suggests that experience of IPV was associated with restricted fertility control although these results were not homogeneous within the country. Women's adjusted odds of having had an unintended pregnancy were significantly elevated if they had been physically or sexually abused (OR 1.4,

p<0.001); the association was observed in the Atlantic and Central regions (OR 1.7 each, <0.01), but was not significant elsewhere. In Peru [97]abused women had a 1.63-fold increased risk for unintended pregnancy compared with non-abused women and the risk was 3.31-fold among women who experienced both physical and sexual abuse compared with non-abused women.

A study using 2005 DHS data from Colombia [110]found that among female youth (aged 13 to 24) sexual violence is associated with increased risk for unintended pregnancy (OR 1.4, 95% CI 1.1-1.8), unmet need for contraception (OR 1.5, 95% CI 1.1-2.0), and decreased likelihood of current contraceptive use (OR 0.8, 95% CI 0.6-1.0). This study suggests that sexual violence is linked to increased risk of unintended pregnancy among female youth. Colombian female youth are particularly vulnerable to sexual violence and may have difficulty accessing reproductive health services, preventive efforts and clinical responses should be specifically crafted to curb violence against young women and providing special support for family planning among victimised women [32,111].

These studies provide some evidence that a relationship exists between experience of IPV and fertility control. Disparities may be due to cultural factors. In some contexts exposure to violence maybe a barrier to contraceptive use, while in others women may find mechanisms -despite violence- to avoid pregnancy in a violent environment [112]. More investigation is needed to explain this relationship in contexts like Colombia.

Family planning and the effect of contextual characteristics

Evidence of the effect of community-level factors on use of contraception is more limited when compared to studies that focus on individual risk factors. Studies of contraceptive use in low and middle income countries have focused on aggregate community-level measures such as the average number of children per woman, the average number of desired children, the percentage of women declaring to know their fertile period, percentage of women who report experiencing any or all forms of violence from their partners. For example, in Mali [113], the odds of modern contraceptive use rose with the proportion of women who were exposed to family planning messages (5.5), and decreased as the mean number of births per woman rose (0.7). In Colombia [50], women's odds of having an unintended pregnancy increased in communities with high rates of male controlling behaviours with respect to fertility, health and money (OR 3.84 (95% CI 1.27-11.57), and high rates of intimate partner

violence (OR 2.79 (95% CI 1.16-6.75)). In South Africa [101], among communities where women had education and employment alternatives that delayed marriage there was an increased likelihood of contraceptive use. In communities where a high proportion of women reported physical violence from male partner was associated with a higher likelihood of contraceptive use. In contrast, women were less likely to use contraception if they lived in a community with higher ratio of male to female education. Community residual variation in contraceptive use has been attributed to factors that are not commonly collected in community surveys or that are difficult to quantify. These may include the presence of social networks that provide access to information, beliefs and community perception on contraception that may influence women's decision making on contraceptive use [114,115].

1.7. Summary and gaps in the literature

The freedom to make reproductive decisions is essential for achieving gender equality and sustainable development. In low and middle income countries, there is increasing evidence that supports a circular relationship between fertility regulation, women's status and health [66,116]. A substantial body of literature explores possible explanations for the social gradient and contextual effects in contraceptive behaviour for low and middle income countries, yet only a limited body of international research explores the Latin American context. For the specific case of Colombia several gaps identified in this review are summarised below:

1. There is a lack of studies of prevalence levels and trends in socioeconomic inequalities in contraceptive behaviour. Urban-rural differences in current use of contraception remain largely unexplored. The study of socioeconomic inequalities in Colombia remains a relatively new and unexplored area of research in Colombia.

2. Overall, there is a lack of studies on the social determinants of women's contraceptive behaviour in Colombia and Latin America. Few epidemiological studies have applied a multidimensional approach to the measurement of SEP. This thesis examines the interplay between different kinds of social inequality through the identification of interactions between socioeconomic dimensions.

3. Studies on fertility regulation have focused on the role of proximate determinants of fertility such as marital status, age at marriage and biological

factors. There is a gap in the literature regarding area effects and the relationship between women's fertility regulation and the effect of socioeconomic, gender-based violence and family planning related characteristics at the individual, community and/or municipality-level in Colombia.

Chapter 2: Aims, objectives and hypotheses

2. Study Aims, objectives and hypotheses

Against the backdrop of the MDGs in Colombia and the third recommendation of the Commission on the Social Determinants of Health which states the need to measure and understand the problem of socioeconomic inequalities in health this projects has the following aims and objectives:

Research aim:

This thesis aims to develop a framework to investigate socioeconomic inequalities in women's current non-use of contraception in Colombia using a multidimensional approach to SEP.

Objectives:

1. To develop a multidimensional approach to SEP, in which levels and trends in absolute and relative socioeconomic inequalities in women's current non-use of modern contraceptive methods are investigated along four dimensions of women's SEP: level of education, HWI, Physical and Public capital.

Hypotheses:

 a. Absolute and relative socioeconomic inequalities in women's current non-use of contraception in Colombia are greater in rural than urban areas. The rationale underlying this approach builds on evidence from Latin American countries where national improvements in health in the last decades have been accompanied by greater within country inequalities by place of residence [45,47,127,128].

 b. Socioeconomic inequalities in women's current non-use of contraception are larger by Physical capital when compared to inequalities by women's level of education. The literature on the education-fertility relationship has consistently shown that the experience of education is associated with women's contraceptive behaviour. Findings from Colombia show that in addition to education, material living conditions are key determinants of use of contraception particularly in a context with economic barriers for accessing and acquiring contraceptive methods [129].

c. There has been a decrease or no change at the national level that masks differences in socioeconomic trends within the country, whereby inequalities in contraceptive non-use have stayed the same in urban areas but have increased in rural areas. The rationale for this hypothesis was based on the experience, during the 1990s, of family planning graduation programmes parallel to the health sector reform in Colombia, two factors that have been associated with an increase in national CPR levels, but important within country variations [130-133].

2. To examine the interplay between different kinds of social inequality on women's non-use of contraception through the identification of interactions between socioeconomic dimensions.

Hypothesis:

a. Provision of Public capital compensates for low levels of education such that the education gradient in contraceptive non-use is smaller among women in households and in households within communities with high Public capital than low Public capital. Studies in Peru, Brazil and Colombia have found that access to public assets has different effects depending on women's level of education [80,82,143]. This interaction indicates that women's level of education and Public capital may complement or substitute for each other. The rationale underlying this hypothesis is that women in households with higher Public capital i.e. public provision of infrastructure are better served areas with respect to family planning services through higher availability of health services and pharmacies.

3. To explore area differences and the effect of individual and contextual community and municipality socioeconomic circumstances, intimate partner violence (IPV) and family planning related characteristics using a multilevel approach. The proposed hypotheses are divided into three sections below:

3.1 Effect of individual characteristics on women's current non-use of contraception.

Hypotheses:

a. Individual exposure to sexual violence will be associated with higher current non-use of contraception. There is a vast literature with mixed findings on the effects of sexual violence on women's health and its repercussions in women's reproductive choices [97, 109, 111]. Little is known of the Colombian context where there is a high prevalence of intimate partner violence.

b. Individual discussion, approval and exposure to family planning information will be associated with lower current non-use of contraception. There is a growing literature on the importance of women's autonomy as an important factor associated to fertility regulation in low and middle income countries [106-108] Little is known about the effects of women's decision making and contraceptive behaviour in Colombia

c. Individual lower levels of SEP i.e. level of education and low Physical capital will be associated with higher current non-use of contraception. Studies in different contexts show that women's SEP is a strong predictor of contraceptive behaviour. Previous studies confirm this association in the Colombian context [18,120, 143], little is known from a multidimensional approach to SEP.

3.2 Effect of community characteristics on women's current non-use of contraception.

Studies in African countries have found important area effects in contraceptive use which are not explained by cultural differences and socioeconomic circumstances [114,115]. This topic remains to be explored in Colombia. Based on a review of the literature the following hypotheses were tested:

Hypotheses:

d. Community (level-2) characteristics will have an effect on women's use of contraception over and above women's individual level characteristics.

e. Disparities in contraceptive use between communities will remain after accounting for selected individual and contextual characteristics.

3.3 Effect of municipality characteristics on women's current non-use of contraception.

Hypotheses:

f. Municipality (level-3) characteristics will have an effect on women's use of contraception over and above women's compositional (level-1) and community (level-2) characteristics.

g. Disparities in contraceptive use between municipalities will remain after accounting for selected individual and contextual characteristics.

Chapter 3: Methodology

3. Methodology

3.1. Introduction

The purpose of this chapter is to describe the main characteristics of the data and the analytical strategy carried out to address the objectives of this thesis. The description of the data includes the study population, sampling procedure, questionnaires and variables. The analytical strategy includes the rationale for sampling restrictions and statistical analyses. Missing data and advantages and disadvantages of the Colombian DHS data are presented at the end.

3.2. The Datasets

Six rounds of the Demographic and Health Surveys (DHS) for Colombia were used in this thesis. Figure 2shows the time period of interest (1986-2010) and the points in time of DHS data collection in Colombia. The methodology and key characteristics are described in the following section. See background section page 28 for information on historical events.
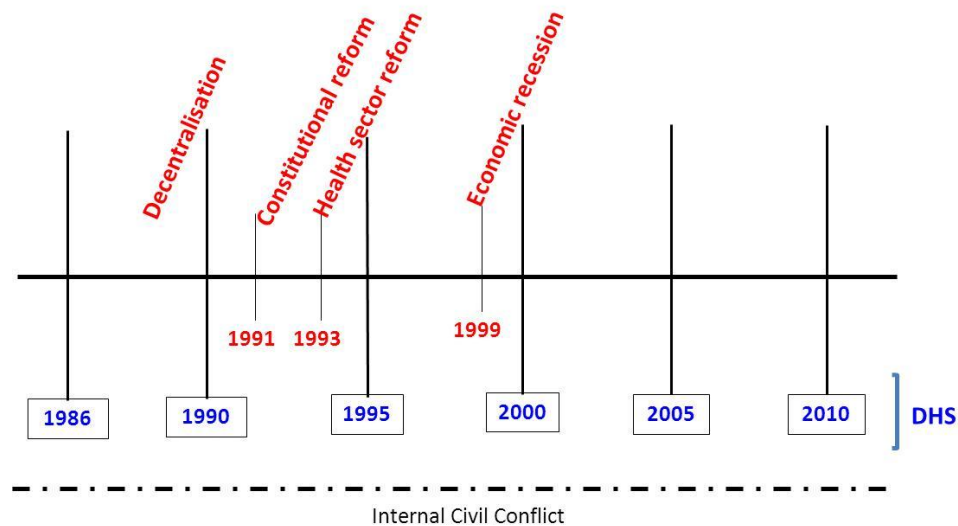
Figure 2 Period of interest and DHS data collection in Colombia

Demographic and Health Surveys (DHS)

The DHS are designed as nationally representative household surveys to provide data for a wide range of monitoring and impact evaluation indicators in the areas of population, health, and nutrition for over 75 countries across Africa, Asia, Latin America, the Middle East and the former Soviet Union. Large DHS have been

conducted by ORC Macro with support from the U.S. Agency for International Development and other external assistance organizations since 1984. In Colombia, the DHS have been implemented since 1990 by Profamilia, a private entity affiliated to the International Planned Parenthood Federation and the country's primary provider of sexual and reproductive health services.

The DHS are the follow-on to two earlier household survey programmes: the World Fertility Surveys (WFS) and Contraceptive Prevalence Surveys (CPS). The WFS Surveys took place from 1973 to 1984, and the CPS from 1977 to 1985 [117]. The DHS for Colombia consist of one survey in 1986 and five surveys since 1990 with a 5 year interval. These surveys were designed to collect mainly information on sexual and reproductive health. Respondents are asked about their reproductive and sexual history, knowledge and use of contraception methods, HIV/AIDS knowledge and attitudes, nutritional status and gender-based violence.

3.3. Study population and sampling procedure

The DHS for Colombia are a series of surveys with a multistage probability sampling design to identify households. These surveys are designed to be representative at national (1986-2010), regional (1986-2010) and sub-regional levels (2005, 2010) and includes the three major urban centres of Colombia. The sample of households is drawn from a two-stage cluster design. In the first stage, enumeration areas (EA) are drawn from census files and in the second stage a sample of households is systematically selected from an updated map of households.

A pre-existing master sample of the country used for the 1985 national census was adapted to use as sampling frame for the Colombian DHS and was updated for each consecutive survey until the year 2000. For the 2005 survey the master sample of the 1986 census was redesigned to reach a representative sample at the departmental level. Each department (first administrative level) is composed of several municipalities (second administrative level) which are the smallest administrative units in the country. Currently there are 32 departments and 1103 municipalities [9].In 2010 a master sample based on the 2005 census sampling frame was adapted to improve coverage levels in comparison to the 2005 DHS survey.

Household surveys in low and middle income countries usually benefit from a high level of cooperation by potential respondents. In Colombia, high response rates were achieved both at the household and individual level (

Table 3.1).Lower levels of cooperation in Colombia have been reported for respondents in the capital city of Bogota particularly in high socioeconomic households. The analytical samples of interest are presented in Figures 4 and 5 (see pages 72 and 78).

Table 3.1 Sample size and response rate DHS Colombia 1986-2010

Year	Number of Households (Response rate %)			Eligible women interviewed (Response rate %)		
	Total	**Urban**	**Rural**	**Total**	**Urban**	**Rural**
1986	4873 (N/A)	3248 (N/A)	1625 (N/A)	5329 (N/A)	3831 (N/A)	1498 (N/A)
1990	7412 (91.4)	6340 (90.0)	1072 (94.7)	8644 (89.0)	7562 (88.7)	1082 (90.6)
1995	10112 (89.5)	7090 (89.2)	3022 (90.3)	11140 (92.2)	8292 (92.3)	2848 (91.9)
2000	10907 (92.8)	7839 (91.7)	3068 (95.8)	11585 (92.5)	8799 (92.3)	2786 (93.0)
2005	37211 (87.9)	27794 (86.9)	9417 (91.0)	38143 (91.8)	29337 (91.6)	8806 (92.4)
2010	51447 (91.6)	36412 (90.2)	15035 (95.4)	53521 (94.1)	38885 (93.7)	14636 (95.1)

N/A=information not available from authors [118]

3.4. Questionnaires

DHS surveys in Colombia collect primary data using two types of questionnaires. First, a Household questionnaire is used to collect information on characteristics of the household and to identify members of the household who are eligible for an individual interview. Second, eligible respondents are then interviewed using an individual Women's questionnaire. For special information on topics that are not contained in the core questionnaires, optional Questionnaire Modules are available. For Colombia, the optional module on Domestic Violence has been implemented since 1990. All of these questionnaires have changed slightly over time.

Household questionnaires

The household questionnaires are used to obtain basic data on age, sex, survivorship of the parents and schooling for members of the household. It is also used to collect information on household characteristics such as: dwelling type, source of drinking water, access to utilities, and durable goods.

Women's questionnaire

The individual/women's questionnaires are applied to all women of childbearing age (15-49 years and 13-49 in 2005 and 2010) present in the selected households who provide informed consent. Respondents are asked about their background characteristics, reproductive history, contraception, pregnancy, post-natal care and breastfeeding, immunization, health and nutrition, marriage and sexual activity, fertility preferences, knowledge of HIV/AIDS and other sexually transmitted infections, gender-based violence and women's autonomy.

Ethical guidelines

DHS data in Colombia is collected in the households of the respondents by female interviewers only. The team of interviewers receive extensive training on the survey instruments, administration of the modules and safety procedures. The ethical guidelines of the project focus on disclosure of family violence, crisis situations and how to emotionally prepare and respond in the fieldwork. To ensure guideline implementation there is a team leader that verifies quality procedures with respect to informed consent, privacy while the family violence module is conducted, and provision of referrals to women who report exposure to violence among others.

3.5. Variables

Outcome of interest

The outcome of interest was 'current non-use of contraception'. This indicator measures a woman's contraceptive behaviour based on reported current use of any method to delay or avoid getting pregnant at or about the time of the survey (yes/no). Only modern methods of contraception according to the DHS for Colombia were considered for the analysis (oral contraceptive, intra-uterine devices, hormone injections, diaphragm, male/female condom, male/female sterilization, implants, foam/jelly and lactation amenorrhoea).

Definition of current non-use of contraception

The outcome was operationalized following the MDG5 guidelines for measurement of the contraceptive prevalence rate (CPR) adapted by the Colombian government. The CPR is defined by the WHO as the percentage of women of reproductive age (15-49 years old) who are practising, or whose sexual partners are practising, any form of

contraception. Using the Colombian guidelines the numerator corresponds to the number of women who reported current use of modern contraceptive methods. The denominator corresponds to women 'at risk of pregnancy' defined as fecund women (not pregnant, amenorrheic or menopausal) of reproductive age (15-49 years old) in marital union (married/cohabiting) and/or single women but sexually active in the past month. For the purpose of this thesis the main outcome of interest is expressed in terms of an adverse event that is to be reduced and was re-coded as a negatively stated measure for interpretation.

This definition of CPR differs from other countries, particularly African with respect to the sample of interest. Standard definitions include only women in marital union in the absence of information on sexual activity from single women. Based on data availability and national public health guidelines in Colombia the denominator of interest is broadly defined as fecund sexually active women as restricted for this thesis.

Increased contraceptive use and reduced unmet need for contraception are indicators of progress toward the MDG5 and contribute directly or indirectly to achieving all eight goals. Both indicators provide information about women's reported contraceptive behaviour. For the purpose of this thesis 'use of contraception' is the main outcome of interest. In Colombia, the contraceptive prevalence rate (CPR) is an important indicator used to evaluate and calculate municipal and departmental budget allocation for contraceptive service provision. In addition, descriptive information about 'unmet need for contraception' is presented to provide complementary information of women's choice with respect to reported fertility desires vs. reported use of contraception, and related fertility regulation outcomes i.e. knowledge of contraception and ever use of contraception. Definition of these variables is provided below see Table 3.2.

Table 3.2 Available indicators related to women's fertility regulation Colombian DHS 1986-2010

Variables	1986	1990	1995	2000	2005	2010
Current contraceptive use (traditional/modern)						
Knowledge of any contraceptive method (traditional/modern)						
Ever use of contraception (traditional/modern)						
Unmet need for family planning						

Knowledge of any method of contraception

Information on knowledge of contraceptive methods is collected in two steps. First, the interviewer records the methods mentioned spontaneously by the respondent when inquired about any contraceptive methods she has heard of. Second, the interviewer reads out loud from a list any methods not mentioned by the respondent and provides a short description. The response is recorded for each method reported spontaneously or recognized after probing and coded no/yes. Responses are categorised into knowledge of any: modern, traditional or folk method. For this thesis all categories were used for characterisation of the samples.

Ever use of any method of contraception

The respondent is asked whether she has ever used any method read out loud from a list of methods e.g. have you ever used a condom (no/yes). Interviewers are instructed to record the respondent's status with respect to ever use of each method. In the case of female sterilization, women are asked if they ever had an operation to avoid having any (more) children (no/yes). Similarly, in the case of male sterilization, women are asked if their partner ever had an operation to avoid having any (more) children (no/yes).

Unmet need for family planning

Unmet need for contraception is constructed using information on women's reported fertility desire and current use of contraception. Two categories of unmet need of contraception are used in the DHS: limiting and spacing. Unmet need for limiting is assigned to fecund/pregnant women who are not using a method of contraception and report they do not want or did not want to become pregnant. Unmet need for spacing includes fecund/pregnant women who are not using a method of contraception and report they want to wait two or more years for their next birth, or for whom the current or last pregnancy (within 6 months) was mistimed or are unsure whether they want another child.

Exposures of interest

- **Women's socioeconomic position (SEP)**

In the context of low and middle income countries like Colombia, monitoring socioeconomic inequalities in health include the task of developing measures of SEP (see background page 33)suitable for culturally diverse populations living in contrasting

socioeconomic circumstances where data on conventional labour market oriented socioeconomic measures e.g. income, expenditure have limitations in terms of availability, reliability and applicability. This thesis used a multidimensional approach to the measurement of women's SEP (Figure 1 page 36). Based on this approach four variables of SEP were constructed: Household wealth index (HWI), Physical capital, Public capital and Human capital (Table 3.3).

HWI

The HWI is an asset-based measure of SEP widely used in DHS surveys in low and middle-income countries. The HWI includes information on all asset categories available in all DHS rounds for Colombia (Table 3.3.) A continuous score was derived through MCA and categorised in a hierarchical order from richest to poorest into SEP groups (see Analytical strategy page 71).

Physical capital

The Physical capital index is measured using durable consumer goods and indicators of housing quality (Table 3.3). A continuous score was derived through MCA and categorised in a hierarchical order from richest to poorest into SEP groups (see Analytical strategy page 71).

Public capital

Public capital is defined as access to services supplied by the state or on its behalf such as electricity and piped water. Its components capture connectedness to the public infrastructure and organisation (Table 3.3). A continuous score was derived through MCA and categorised in a hierarchical order from richest to poorest into SEP groups (see Analytical strategy page 71).

Human capital

Human capital is defined as women's educational attainment divided into four categories based on the country's national standard levels: higher, secondary, primary and no achieved level of education. Women's level of education is the only indicator used in this thesis to measure Human capital, hereafter it will be referred to as level of education only. 'No achieved' level of education refers to women with less than primary level of education and 'higher' level of education refers to university degrees. For analytical purposes the categories 'secondary' and 'higher' were combined into one

category to have larger reference groups of analyses. Overtime women in Colombia have achieved higher levels of education yet women with 'higher levels' i.e. university degrees remains a small group.

Table 3.3 Asset categories and components of the HWI and Physical, Public and Human capital

	Dimension	Asset categories	Components
HWI	**Physical capital**	Housing characteristics	Floor materials
		Durable consumer goods	Phone Radio TV Fridge Motorcycle
	Public Capital	Publicly provided services	Electricity Drinking water Non-drinking water Toilet connected to sewer
	Human capital	Education	Achieved level of education

- **Intimate partner violence (IPV)**

The DHS began collecting information on IPV in 1990 with the Colombia DHS survey. A decade later this experience developed into a standard module for the collection of data on IPV for many countries of the DHS series. Standardisation increased the validity and comparability of IPV data and improved ethical guidelines. Several indicators of abuse inflicted by partner were categorised into four variables: 'less severe abuse', 'severe abuse', sexual abuse and any form of abuse inflicted by partner. The definitions for each variable of IPV based on DHS guidelines are provided below as used in the analytical strategy (see analytical strategy page 79).

'Less severe abuse'

A woman was categorised as having experienced 'less severe' abuse (no/yes) if she reported her current partner had pushed, slapped, punched, dragged, bitten or kicked her.

'Severe abuse'

A woman was categorised as having experienced 'severe' abuse (no/yes) if she reported her current partner had tried to choke her, burn her, threaten or attacked with a knife or a gun.

Sexual abuse

A woman was categorised as having experienced sexual abuse (no/yes) if she reported her current partner had forced her to have sex.

Any form of abuse

Information on IPV was pooled to create an aggregate measure of abuse (no/yes) if a woman reported 'less severe', 'severe' or sexual abuse inflicted by current partner.

Family planning explanatory related characteristics

The DHS for Colombia collects information on family planning related characteristics as proximate determinants of women's decision-making and use of contraception including approval and discussion of family planning and exposure to media messages about family planning. Variables included in the analytical strategy of the second part of this thesis (see analytical strategy page 79) are defined below.

Discussion of family planning with partner

Women reported discussing family planning with partner/husband in the past 12 months (no/yes). This question was restricted to women in marital union (married or cohabiting) in the DHS 2005 and further restricted to women who reported use of contraception in the DHS 2010 limiting comparability between both surveys.

Discussion of family planning with friends

Women reported discussing family planning with friends in the past 12 months (no/yes). This question was restricted to women in marital union (married or cohabiting) and was not available for the DHS 2010.

Husband/partner approves family planning

Women reported their perception on husband/partner's approval of family planning (no/yes/does not know). This question was restricted to women in marital union (married or cohabiting) in the DHS 2005 and further restricted to women who reported use of contraception in the DHS 2010 limiting comparability between both surveys.

Heard of family planning at health centre

Women reported if they received information about family planning at a health centre in the past 12 months. In the DHS 2005 the variable was categorised as no/yes/not

affiliated to health services and in the DHS 2010 differed slightly to no/yes/did not visit health centre.

Exposure to family planning messages on the media

A woman was categorised as being exposed to family planning messages if she reported (no/yes) hearing or seeing a family planning message on the radio, television or in a newspaper or magazine in the past 12months.

Demographic and reproductive health related explanatory variables

Table 3.4 presents available variables included in the analytical strategy for different purposes including characterisation and restriction of the samples, explanatory variables and effect modifiers. Variables are divided into socio-demographic and reproductive health characteristics and are described below.

Socio demographic

Women's age

Women reported their date of birth and years of age. Women's age was used as a continuous variable in the statistical analyses and as a categorical variable for descriptive purposes. 5-year age groups were used for standardisation of contraceptive prevalence rates. Only women of reproductive age between 15 and 49 years old are included in the analytical strategy.

Marital status

Women were categorised into one of three categories based on self-reported marital status: single, marital union (married/cohabiting) and widowed/divorced.

Place of residence

The household is classified according to its geographical location as an urban or rural place of residence (urban/rural).

Reproductive health

Fecundity status

According to the DHS definition a woman is assumed to be fecund unless she declares that she is infecund, had a hysterectomy, or is menopause. Women are also classified as

infecund if they report:1) not being pregnant nor postpartum amenorrheic and has not had a menstruation for six or more months, 2) if while married and not using contraception during the past five years, have not had a birth and are not currently pregnant.

Age at first intercourse

All women are asked the age at which they first had sexual intercourse. This question directly asks respondents about first sexual intercourse rather than first asking if they have ever had sexual intercourse because the latter leads to underreporting of sexual experience among young unmarried women.

Age at first marital union

Reported by woman as age in completed years or reported as age when she began living with first husband or partner. The age at which marriage/co-habitation begins is an indicator, although imperfect one, of the beginning of exposure to the risk of pregnancy and is highly correlated with lifetime fertility.

Age at first birth

This variable is calculated as the difference between birth date of first-born child and birth date of woman. Women with no births are included in a separate category.

Children ever born

Women were asked for birth history with up to twenty entries. For the purpose of this analysis, the information was used as continuous and/or categorized into three levels for tabular analysis: no births, one or two children (below population replacement level) and three or more children (above population replacement level).

Number of children at first use of contraception

Women who have ever used contraception are asked the number of living children at first use of contraception (traditional/modern).This question is intended to locate the start of a woman's contraceptive history and is useful for distinguishing whether first use of a method was for spacing or for limiting fertility.

Terminated pregnancy

Respondents whether they had ever had a pregnancy that terminated early (no/yes) without distinguishing between spontaneous and induced abortion.

Wanted last child

Respondents are asked if their last pregnancy was wanted (no/yes).

Family size preferences

This question is a proxy of reproductive norms reported by women on the number of desired children. Women with living children were asked: 'If you could go back to the time when you still did not have any children and if you could choose the exact number of children to have in your lifetime, how many would you have?' In the case of women with no living children, the question was 'If you could choose the exact number of children to have in your lifetime, how many would you have?' This information is used to derive wanted total fertility rates (WTFR) for comparison with total fertility rates (TFR) to estimate the gap between realised fertility (the final number of children per woman) and desired fertility (the reported preferred number of children per woman).

Knowledge of fertile cycle

Respondents are asked if there is some time in the monthly ovulatory cycle when the risk of pregnancy is greatest and when during the cycle that time is. This information is used as an indicator of familiarity with the biology of human reproduction and in Colombia it is also used as a proxy indicator of exposure and/or quality of sexual health education.

Health affiliation status

Respondents were asked to report if they were currently affiliated to the national health system (no/yes). The question has varied slightly over the years; in some surveys women who report being affiliated are also asked if they have visited a health centre in the past 12 months.

Table 3.4 Explanatory variables DHS 1986-2010

Dimension	Variables	1986	1990	1995	2000	2005	2010
Socio-Demographic							
	Women's age	■	■	■	■	■	■
	Marital status (single/married-cohabiting)	■	■	■	■	■	■
	Place of residence (urban/rural)	■	■	■	■	■	■
Reproductive health related characteristics	Fecundity status	■	■	■	■	■	■
	Age at first intercourse		■	■	■	■	■
	Age at first marital union	■	■	■	■	■	■
	Age at first birth	■	■	■	■	■	■
	Children ever born	■	■	■	■	■	■
	First use of contraception		■	■	■	■	■
	Terminated pregnancy			■	■	■	■
	Wanted last child		■	■	■	■	■
	Family size preferences		■	■	■	■	■
	Knowledge of fertile cycle		■	■	■	■	■
	Number of living children	■	■	■	■	■	■
	Health affiliation status				■	■	■

Community-level variables

The DHS in Colombia do not collect information on area-level data. Based on the standard approach in the literature [113,119]area-level variables were derived by aggregating individual level data to a woman's community of residence. For the Colombian DHS a community corresponds to the smallest unit into which the respondents could be aggregated equivalent to one or two blocks of households in urban areas or a small village in rural areas with an average mean size of 10 women per community. This approach assumes that based on geographical proximity a community of people are likely to share a common normative and socioeconomic environment.

Table 3.5 presents the number of communities by size and the distribution of women for the 2005 and 2010 surveys.

Table 3.5 Community size, frequency and distribution of women %(No. of women)

Community size[1]	2005		2010	
	Frequency	% (No of women)	Frequency	% (No of women)
1	411	2.6 (411)	110	0.5 (110)
2	556	7.1 (1112)	288	2.6 (576)
3	617	11.8 (1851)	486	6.7 (1458)
4	578	14.8 (2312)	571	10.5 (2284)
5	466	14.9 (2330)	635	14.6 (3175)
6	413	15.9 (2478)	606	16.7 (3636)
7	226	10.1 (1582)	439	14.1 (3073)
8	162	8.3 (1296)	350	12.8 (2800)
9	94	5.4 (846)	213	8.8(1917)
10	50	3.2 (500)	120	5.5 (1200)
11	35	2.5 (385)	69	3.5 (759)
12	21	1.6 (252)	38	2.1 (456)
13	10	0.8 (130)	18	1.1 (234)
14	7	0.6 (98)	4	0.3 (56)
15	N/A	N/A	3	0.2 (45)
16	2	0.2 (32)	2	0.2 (32)
17	1	0.1 (17)	1	0.1 (17)

[1]Community size corresponds to the number of women per community (primary sampling unit)

Operationalization

Community-level variables correspond to means or proportions for the woman's community of residence derived by aggregating individual-level information. Two methods of derivation widely found in the literature were compared: non-self-means and simple means[119]. Derivation using non-self means assigns each woman a value representing the average of all other women in her community. Simple means derivation assigns each woman a value representing the average of all women in her community including her own value. Non-self means procedure was chosen to present the main results in Chapters 7 to 9 to avoid overlap of information between the two levels of analysis: individual and community. Sensitivity analyses are presented for community-level variables derived through simple means (see analytical strategy page 79).All community-level variables were standardised to have a mean of zero and a standard deviation of one to ease interpretation using the *egen=std (var)* command in Stata version 12.

To derive the community-level variables communities were restricted according to their size. Communities with less than five women were excluded based on guidelines in the literature. This restriction of the sample reduced the analytical sample of 2005 and 2010

by 36% and 20% respectively. Table 3.6 presents the community-level dimensions of interest and the operationalization of each variable included in the analysis.

Table 3.6 Operationalization of community-level variables

Dimension	Variables	Operationalization
Community socioeconomic characteristics	Community access to Public capital	Mean Public capital level for households in the PSU[1].
	Number of years of education	Mean number of years of education reported by women in the PSU.
Community IPV[2] levels	Reported sexual abuse	Percentage of women in the PSU who reported sexual abuse inflicted by husband or partner.
	Reported IPV (any form)	Percentage of women in the PSU who reported any form of IPV.
FP[3] community norms	Female approval of FP	Percentage of women in the PSU who reported they approve FP.
	Partner/husband approval of FP[4]	Percentage of partner/husband approval of FP in the PSU reported by women.
Fertility related community norms	Age at first marital union (married/cohabiting)	Mean age of first marital union (married/cohabiting) by PSU.
	Children born per woman	Mean number of children per woman by PSU
Community demographic characteristics	Women's age in years	Mean age in years by PSU.

[1] PSU=Primary sampling unit corresponds to the community, [2] IPV=Intimate Partner Violence, [3] FP=Family Planning, [4] Available in models with DHS 2005 data.

Municipality-level variables

Municipality-level characteristics were extracted from the Colombian 2005 National Census provided by the Colombian Statistical Office DANE. The country had 1098 municipalities in 2005 and 1103 in 2010. Municipalities correspond to the smallest administrative level units in the country and vary widely in geographical extension and population size. According to the 2005 National Census the municipality mean population size was 38,328 including relatively small municipalities (five in total) with less than 1,000 inhabitants (range 225-979) and the four main capital cities in the country with more than one million inhabitants (range 1,146,359-6,840,116). The mean

population size excluding the relatively small municipalities of less than 1,000 inhabitants and the main capital cities was 27,535.

Two municipality indicators were selected as variables of interest to characterise socioeconomic and cultural circumstances: 1. The NBI (Spanish acronym for 'unsatisfied basic needs') as an indicator of household socioeconomic circumstances and 2. 'Ethnic diversity' an indicator of cultural homogeneity within the municipality; both indicators are described below.

NBI

The NBI is a government indicator of the proportion of households with unsatisfied basic needs in each municipality. A household is categorised with unsatisfied basic needs when at least one of the five following characteristics is present:

1) Inadequate housing: with dirt flooring or poor wall material

2) Housing without utility services: household without aqueduct water or in urban areas, without connection to sewage or septic tank

3) Critical overcrowding: number of people per room higher than three

4) School non-attendance: household with boys and girls of 7 to 11 years of age who do not attend school.

This indicator is widely used and relatively comparable across Latin American countries. In Colombia it is constructed with Census data by the Colombian Statistical Office DANE[11].

Proportion of ethnic minorities

This variable is defined as the proportion of ethnic minorities in each municipality including indigenous, Afro-Colombian and gypsy communities who account for about 32% of the Colombian population. The predominant ethnic groups in the country are the mestizo –mixed white and indigenous ancestry- 58% and white 20%.

Both municipality indicators are presented in maps to illustrate the distribution of these characteristics of interest across the Colombian territory. Information is displayed for the whole country and specifically for the municipalities in the analytical sample of interest of 2005 and 2010 (page 192).

3.6. Analytical strategy

The analytical strategy of the thesis in presented in three sub-sections: 1. Description of methodology used for the construction of the SEP dimensions, 2. Data analysis for

examining socioeconomic inequalities and time trends in current non-use of contraception, 3. Data analysis for examining area differences and the effect of individual and contextual factors on women's current non-use of contraception.

Construction of the HWI, Physical and Public capital SEP measures

This thesis used a multidimensional approach to the measurement of women's SEP (see Background section page 33). Based on this approach four measures of SEP were used in the data analysis: HWI, Physical, Public and women's level of education (Human capital). This section describes the steps applied to derive the HWI, Physical and Public capital. As mentioned in the variables section (page 60) Human capital is measured through women's level of education categorised into achieved levels of formal education. This data analysis was developed in a series of steps described below:

Selection of asset variables

For comparability, only those asset variables available with questions phrased similarly in all six rounds of the Colombian DHS were used. These include source of drinking water, type of toilet, principal material of floor, electricity supply, and ownership of radio, television, fridge and phone (see description of variables page 59). For the HWI, the selection of assets follows the original criteria of the DHS whereby a composite indicator is created by including all available information on household's asset variables. In contrast, the rationale for the selection of assets for the Physical capital, Public capital and Human capital indices, is based on a theoretically-driven approach in which the inclusion of items aims to conceptually distinguish differing asset dimensions, i.e. private or public assets, instead of combining all available assets as the HWI. In terms of this project, this approach specifically allows for the comparison of the HWI to three alternative indices: Physical capital, Public capital and Human capital (level of education). Factor analysis was used to explore the underlying dimensions of the data.

Construction of the indices

The HWI, Physical and Public capital were computed using multiple correspondence analysis (MCA) a weighting method suited for categorical data. Asset variables from 1986 to 2010 were pooled together and included in the form of binary indicators e.g. do you have a television yes/no and categorical indicators e.g. type of flooring dirt/sand/wood planks/polished woods/cement/marble. Weights were derived from the

application of MCA (*mca* command in Stata) to the pooled household-level data on assets (1986-2010) to create the HWI, and separately to each set of assets based on the multidimensional classification to create the Physical and Public score (see multidimensional approach page 36).

Classification of households into SEP groups

Using the pooled household-level scores derived through applying MCA, quintiles, quartiles and tertiles were constructed separately for each survey wave to differentiate households into wealth groups for tabular analyses. The cut-off points in the HWI, Physical and Public capital score were calculated by obtaining a weighted frequency distribution of households. The weight applied follows the criteria of the DHS and is equal to the product of the sampling weight of the households with the number of de jure members of the household[120]. In this way, each household is assigned a HWI, Physical and Public capital value according to the corresponding capital score and each woman is given the HWI, Physical and Public score of her household.

Figure 3 Workflow construction of MCA scores using household data
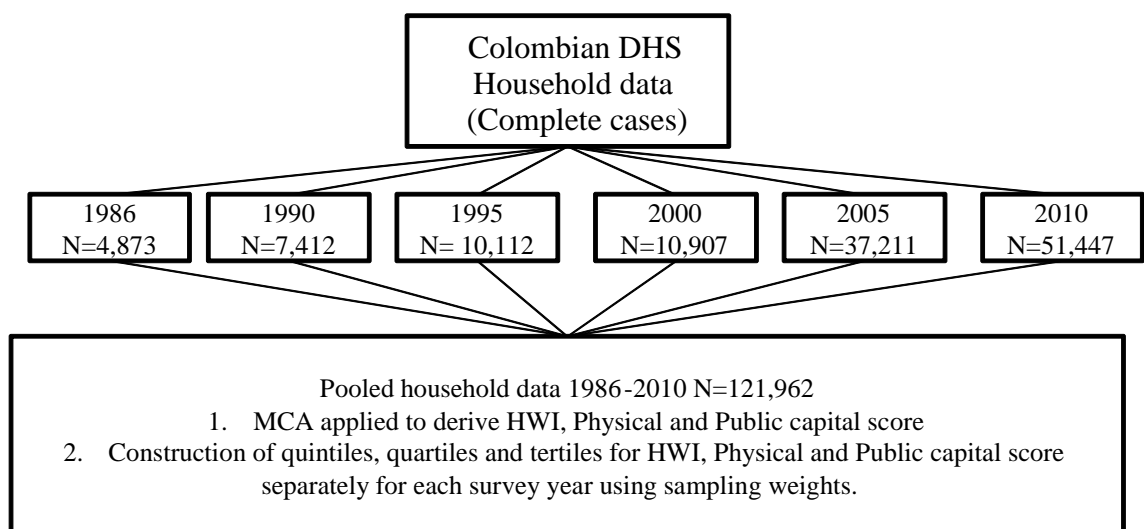
Gini coefficients and Lorenz curves of SEP variables

Gini coefficients and Lorenz curves of level of education, HWI, Physical and Public capital were calculated to describe the level of inequality in the distribution of these

characteristics among women at the national level and by urban and rural place of residence. The Gini coefficient is the most commonly used measure of inequality. The coefficient varies between 0, which reflects complete equality and 1, which indicates complete inequality. Gini coefficients were derived using the *ineqdeco* ado file for Stata[121]. To represent the Gini coefficient graphically, the Lorenz curve for each measure of SEP was plotted using the *glcurve* command for Stata.

Independence of SEP dimensions

To determine the independence of the HWI, Physical and Public capital dimensions, Spearman's rank order correlations were calculated between all categorical and ranked score measures of SEP for each survey at the national level and by urban and rural place of residence.

Sensitivity analyses

A series of sensitivity analyses were applied to examine alternative methods for derivation of the SEP measures and distribution of women into SEP groups. MCA derived scores were compared to principal component analysis (PCA) derived scores with respect to three aspects: direction of the weights (positive/negative), Spearman correlation coefficients between scores, categorisation of women into SEP groups (Appendix 9). The rationale for comparing methods lies in the fact that PCA is most widely used in the literature using DHS data for construction of wealth variables despite its limitations for this type of data e.g. assumption of normal distribution of assets, designed for continuous variables[122]. Recent advances in statistical packages e.g. MCA post-estimation commands in Stata version 11 allows the use of MCA which is more suitable for categorical asset variables[58].

Inequalities and time trends on current non-use of contraception

This section describes the analytical strategy carried out for the first set of analyses presented inresultschapters4 to 6. The rationale for the selected analytical sample, variables and data analysis is described below.

Analytical sample

The 1986 to 2010 rounds of the Colombian DHS were used. The main analytical sample is women of reproductive age (15-49 years old) 'at risk of pregnancy' defined as fecund women (not pregnant, amenorrheic or menopausal) in marital union

(married/cohabiting) and women not union but sexually active in the interview month. This analytical sample follows international and national guidelines for monitoring the CPR target for the 2015 MDG5 in the country. See Figure 4for information on sample restrictions.

Variables

The outcome of interest is current non-use of contraception. The exposures of interest were four different dimensions of SEP: women's level of education (higher-secondary/primary/none), the household wealth index (HWI) (richer/poorer), Physical and Public capital (richer/poorer). The covariates used were place of residence (urban/rural), women's age in years (15 to 49), and marital status categorised into two groups (single/married-cohabiting).

Figure 4Restriction of analytical samples 1986-2010 complete cases
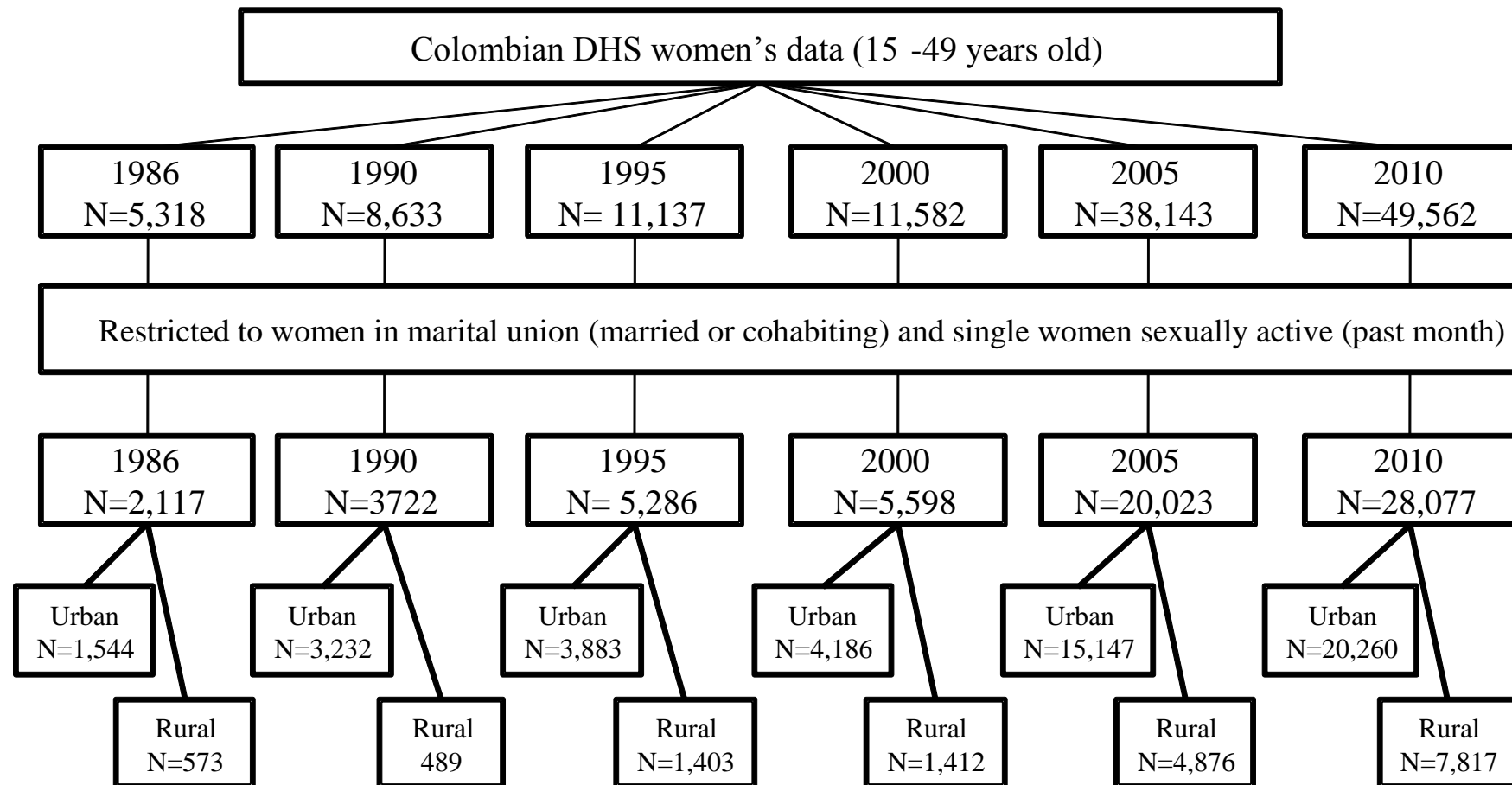
Data analysis

All analyses were applied to the whole country and separately for urban and rural place of residence.Statistical analyses were carried out in three steps.

- First, data was cleaned, coded and restricted to the analytical sample of interest.
- Second, descriptive statistics were calculated by tabulation of current non-use of contraception and SEP exposure variables.
- Third, bivariateand multivariate analyses were applied to examine the strength and direction of associations between current non-use of contraception and SEP exposure variables. Socioeconomic inequalities in non-use of contraception were described and estimated using absolute and relative measures of inequality. Age standardised prevalence rates and the Slope Index of Inequality (SII) were used as absolute measures of socioeconomic inequalities. Prevalence ratios (PR) and the Relative Index of Inequality (RII) were used as relative measures of socioeconomic inequalities. All models take into account survey design (sampling weights) and clustering. Detailed description of the statistical analyses is provided below.

Age standardised prevalence-rates

Specific prevalence rates by women's level of education, HWI, Physical and Public capital were calculated in each round adjusted for marital status (single/married or cohabiting) and standardised to 5-year age groups using the pooled age distribution of the 1986-2010 rounds of the Colombian DHS.

Prevalence ratios (PR)

PRs were obtained by regressing each categorical measure of SEP on the binary outcome of interest (current non-use of contraception) using a generalised linear model specifying a binomial family distribution with the log link function. Exponentiation of the beta coefficient provided the PR with 95% confidence intervals. The simplest model was adjusted for age in years and the final model was adjusted for marital status (single/married-cohabiting).PR estimates were used instead of Odds Ratios (OR) as previous studies suggest it is a better estimate for outcomes of relatively high prevalence (>10%) [123,124].

Slope Index of Inequality (SII) and Relative Index of Inequality (RII)

The SII and RII are regression-based measures used to present population weighted estimates of absolute and relative inequalities respectively over the period from 1986 until 2010. The advantage of the SII and RII is that both measures take into account the size of the sample in each category and use all available data[62]. To obtain the SII and RII the first step was to construct a weighted score of each measure of SEP (HWI, Physical and Public capital and level of education) by hierarchically organising the categories of the HWI, Physical and Public capital from the richest to the poorest quartile/tertiles and in the case of women's level of education, from the highest to no achieved level of education.

Each SEP score was converted into a continuous distribution between 0 (highest SEP) and 1(lowest SEP) and weighted according to the population in each SEP group by calculating the midpoint of the proportion in each category separately for the analytical sample of each survey year. For example, if the first SEP category of HWI includes 20% of the sample each woman in this category was assigned a value of 0.2/2= 0.1, whereas if the second category included 30% of the sample women in this category were assigned a value of 0.3/2+0.2=0.35 and so forth.

SII

The SII was obtained by regressing each weighted score measure of SEP on the binary outcome of interest (current non-use of contraception) using a generalised linear model specifying a binomial family distribution with the identity link function. The beta or slope coefficient is the predicted SII and represents the hypothetical absolute difference in women's current non-use of contraception prevalence between the two extreme values 0 (highest SEP) and 1(lowest SEP) of the weighted score distribution for each measure of SEP.

RII

The RII was obtained by regressing each weighted score measure of SEP on the binary outcome of interest (current non-use of contraception). The analysis was performed specifying a binomial family distribution and a log link function. The RII was obtained by exponentiation of the beta coefficient and corresponds to the ratio in non-use of contraception between the two extreme values of the weighted score SEP distribution, 0 (highest SEP) and 1(lowest SEP).

Trends in absolute and relative socioeconomic inequalities

To assess absolute (SII) and relative (RII) trends in socioeconomic inequalities in contraceptive non-use interactions were tested between the population weighted measure of SEP and the survey year variable in the pooled dataset (1986-2010) using Wald tests.

Interaction between women's level of education and household Public capital

The first model estimates the effect of women's level of education on current non-use of contraception in households with low and high Public capital by fitting an interaction term between level of education (population weighted score) and Public capital (High/Low) adjusted for age (continuous and quadratic term) and marital status (single/married or cohabiting).The second level of adjustment takes account of household wealth differences in the form of Physical capital. All models were applied separately for each survey year from 1986 until 2010 at the national level (page 163) and stratified by urban and rural place of residence (page 173).

To illustrate the effect of each category of women's level of education (High or secondary/primary/None) interacting with Public capital (high/Low) on current non-use of contraception at the national level and by urban and rural place of residence results were modelled as predicted probabilities (95% CI)(results page 172).

Sensitivity analyses

Three sensitivity analyses were carried out. First, PRs were compared to ORs estimates to investigate differences in the size of the effect of each measure of SEP on current non-use of contraception based on high prevalence levels (>10%) of the outcome (Appendix 7 page 327).Second, tests for departure from linear trend for each population weighted measure of SEP were applied using the *nlcheck* command for Stata11 to investigate the linearity assumption between the SEP exposures of interest and current non-use of contraception (Appendix 6 page 325).Third, to account for fertility desires of women in the denominator all models were carried out excluding women who reported intending to become pregnant at some point in the following two years for surveys 1990 to 2010 (Appendix 4 page 306). The 1986 survey did not provide information of women's fertility desires in the next two years.

Area differences on women's current non-use of contraception

This section describes the analytical strategy applied to investigate area differences and the effect of individual and contextual factors on women's current non-use of contraception (see results chapters 7to 9). The rationale for the selected analytical sample, variables and data analysis used in the second set of analyses of this thesis is described below.

Analytical sample

The main analytical sample of interest were women 'at risk of pregnancy' defined as fecund women (not pregnant, amenorrheic or menopausal) in marital union (married/cohabiting) of reproductive age (15-49 years old). Single sexually active women were not included in the analytical sample of interest as there was no information available from them about IPV and family planning decision making, two dimensions of interest in the second set of analyses in this thesis. The 2005 and 2010 samples were analysed separately due to differences in the sampling frame and questionnaire. The 2010 DHS sampling frame was redesigned to improve representativeness of the sample and family planning related variables were changed slightly in 2010 compared to 2005.

Figure 5Restriction of analytical samples 2005 and 2010 complete cases

2005 DHS N=38,143 women Communities=3,827	2010 DHS N=49,562 women Communities=3,983

Full sample of women of reproductive age (15-49 years old)

Restricted to women in communities of minimum five women

N=15,632 women Communities=3,649	N=21,828 women Communities=3,953

Sample used for deriving community-level variables by aggregating individual-level data

Restricted to women in marital union (married or cohabiting)

N=9,946 women Communities=1,487 Municipalities=219	N=17,400 women Communities=2,498 Municipalities=257

Analytical sample by levels of interest for multilevel models

Note: Levels of interest correspond to women (level-1), communities (level-2) and municipalities (level-3).

Variables

The outcome of interest was current non-use of contraception. Individual, community and municipality level factors are presented in Table 3.7.

For description of these variables see variables section from page 59.

Table 3.7 Variables included in the analyses by level and dimension of interest

Level	SEP[1]	IPV[2]	FP[3] related characteristics	Cultural
Individual	Physical capital Women and partner's level of education	Sexual abuse	Woman's age Children ever born Wants to have a child (next two years) Discussion of FP[1] with partner and friends Perception of partner's approval of FP FP information at health centre FP information in the media	N/A
Community	Mean community level of Public capital Mean community years of education (women). Urban/rural place of residence [1]	Proportion of women who reported sexual abuse	Women's mean age (years). Women's mean years of education. Mean age at first marital union (married/cohabiting) Mean number of children born per woman. Proportion of FP approval by women. Proportion of FP approval by husband/partner.[4]	N/A
Municipality	Proportion of people living with unsatisfied basic needs (NBI)	N/A	N/A	Proportion ethnic minorities

[1]SEP=socioeconomic position, [2] IPV=Intimate partner violence, [3]FP=Family planning[4]Only in models using DHS 2005 data.

Data analysis

Statistical analyses were carried out in three steps.

- First, data was merged, cleaned and restricted to the analytical sample and all variables were constructed and community-level variables were standardised.

- Second, descriptive statistics were calculated by tabulation of current non-use of contraception and exposure variables adjusted for survey design (sampling weights) and clustering.

- Third, Spearman correlations, bivariateand multivariate analyses were performed to examine strength and direction of associations between current non-use of contraception and individual and community level variables of interest. Multilevel modeling techniques were used to analyse the data. This modeling technique is suited to take into account similarities among women living in the same communities, to provide estimates of the unexplained variance in current non-use of contraception due to unobserved community/municipality factors and to analyse the influence of variables at different levels of the outcome e.g. individual, community and municipality.

Multilevel modeling strategy

The multilevel modeling strategy was applied to the national level and separately to urban and rural areas in a series of 12 models described below.Analyses were first conducted using the generalised linear latent and mixed model (GLLAM commands) procedure in Stata to provide PRs by specifying a log link function. This approach was not suitable for the data as models did not converge. Failure to converge with a log link is common, it is usually the result of a predicted probability that falls outside the admissible range of [0, 1].Alternatively the multilevel strategy was conducted in Stata using multilevel mixed-effects logistic regression.

Exploring the effect of individual characteristics on women's current non-use of contraception:

Model 1:

Is an empty model (without covariates) to give a baseline estimation of the community (level-2) variance ($\sigma^2 u$). This model estimates the total variance in current non-use of contraception between communities.

Model 2:

The second model shows the effect of women's age on current non-use of contraception. This model provides information on how much level 2 variance is explained by age as an individual-level characteristic.

Model 3:

The third model shows the effect of family planning decision making on current non-use of contraception adjusted for women's age. This model provides information on how much level 2 variance is explained by adding family planning decision making individual-level factors.

Model 4:

The fourth model includes individual-level SEP variables (but not family planning decision-making variables) adjusted for women's age. This model provides information on how much level 2 variance is explained after adding SEP individual-level factors.

Model 5:

Combines models 3 and 4 and shows the effect of individual-level family planning decision-making and SEP variables adjusted for women's age. This model provides information on between-community differences after accounting for all selected individual factors of interest.

Exploring the effect of community characteristics on women's current non-use of contraception:

Model 6:

IPV and Family planning related characteristics and socioeconomic circumstances are introduced separately to the model. This model provides crude information on the direction, strength and level of significance of the association between current non-use of contraception and each community-level family planning related characteristic.

Model 7:

Based on Model 6, IPV and family planning related community-level characteristics are introduced to the model. This model explores the association between women's current non-use of contraception mutually adjusted for IPV and family planning related community-level characteristics.

Model 8:

Based on Model 6, socioeconomic community-level characteristics are introduced to the model. This model explores the association between women's current non-use of contraception mutually adjusted for socioeconomic community-level characteristics.

Exploring the combined effect of individual and community characteristics on women's current non-use of contraception:

Model 9:

Based on the results from models 7 and 8, community-level family planning related characteristics and socioeconomic circumstances associated with women's current non-use of contraception are introduced to the model without adjustment for individual characteristics. This model provides information on the extent of between-community differences.

Model 10:

Community-level family planning related characteristics and socioeconomic circumstances associated with women's current non-use of contraception are adjusted for individual characteristics. This model shows to what extent community-level factors associated with current non-use of contraception are explained by age and individual characteristics of interest.

Exploring the effect of municipality characteristics on women's current non-use of contraception:

Model 11:

Municipality-level characteristics are introduced to the model without adjustment for individual and community level characteristics. This model provides information on the direction and strength of the effect of municipality characteristics on current non-use of contraception and the extent of between-municipality differences.

Model 12:

This is a fully adjusted model for all selected individual, community and municipality level characteristics of interest. This model provides information on the effect of all variables on women's current non-use of contraception and the extent of differences between communities nested in municipalities.

Exploring the effect of Public capital by level of education on women's current non-use of contraception:

Model 13:

Based on model 9, a cross-level interaction model is fitted by introducing an interaction term between women's level of education and community mean Public capital while adjusting for all individual and community factors of interest. This model provides information of the effect of women's level of education interacting with community level of Public capital.

Sensitivity analysis

Sensitivity analyses were applied to examine alternative analytical samples and derivation methods for constructing community-level indicators. Between-community and municipality variance, covariate coefficients and standard errors were compared in the following scenario: 1. Simple means vs. non-self means community variables.

3.7. Working with DHS data

Missing values

The DHS defines "missing value" as a variable that should have a response, but was not asked because of interviewer error or the respondent did not respond to the question. The general rule established by DHS Macro for survey data processing is that under no circumstances should an answer be made up. A missing value is assigned in the data. Some questions are classified as essential e.g. number of children (no unknown number allowed), birth date of woman (imputed using calendar month data) and floor type (respondent's answer and/or interviewer's observation).

For the analytical strategy of this thesis only complete case analyses were used and presented in the results chapters. Missing data by type of questionnaire for the Colombian DHS is described below in more detail. Overall, the proportion of missing data were very low, as is common for DHS surveys in Latin America [117].

Household questionnaires

Missing data on household assets were very low and mainly found in the earlier waves, 12% in 1986 and less than 1% in 1990, 1995 and 2000respectively. There were no missing data for waves 2005 and 2010. Information about the household is recorded based on answers by respondent and verified through observation by the interviewer.

Women's questionnaires

Missing data was low and mainly found in the earlier waves with the exception of data regarding sexual activity with decreasing levels of missingness over time. The proportion of missing data found specifically for variables included in the analytical strategy was less than 1% for women's level of education, age at first sex and 'ever sexually active'. For information on reported 'last time sexual activity' missing data was respectively 31%, 29%, 22%, 18% and 16% for waves 1986, 1990, 1995 , 2000 and 2005. There were no missing data for reported last sexual activity in the 2010 survey.

Strengths

- The DHS are widely recognised as the most important source of data for health equity analysis in low and middle income countries. These surveys provide information on health and health-related outcomes as well as information on living standards or socioeconomic characteristics. In the context of Colombia

where vital statistics are scarce for certain regions and populations and data collection is very expensive and difficult to collect due to geographical barriers and social unrest, the DHS provide the best source of nationwide information on reproductive health and socioeconomic circumstances.

- Colombia stands out in the region as a country were the DHS have been implemented periodically for the past 24 years and have gained recognition as a standard source of national governmental statistics and recently as the main source of data for monitoring applicable targets of the MDGs.

- The DHS are designed to be nationally representative and have the advantage of more detailed information than is feasible in a census data collection. The core questionnaires focus on demographic, socioeconomic and health factors using basic indicators standardised across countries. In the case of Colombia, the DHS are the best available source of data on use of contraception and women's exposure to gender-based violence.

- In low and middle income countries like Colombia where monitoring health inequalities has become a central policy objective, for example in the context of the 2015 MDGs, a multidimensional approach using the DHS provides locally sound and theory-driven use of existing survey asset data that moves beyond a one-dimensional measure of SEP to provide understanding into the effects of multiple dimensions of SEP on health inequalities.

Disadvantages

- The DHS surveys may not be representative to subpopulations of interest specially groups who lack permanent household residence due to socioeconomic or political circumstances. For the Colombia context, the results from the analyses with the DHS should be carefully interpreted for the Colombian population as some groups such as the internally displaced, homeless and ethnic minorities are likely to be underrepresented in the sample.

- Women who are victims of gender-based violence particularly in the context of conflict may be more likely to underreport information on the nature and extent of the violence. The DHS interviews were conducted in conditions of complete privacy nevertheless underreporting should be considered when interpreting the data.

- The use of quintiles is common in social epidemiology and health economics studies in order to compare the health outcomes of wealth groups. Skewed household distribution of physical and public assets restricts the number of feasible SEP categories e.g. Public capital is best described with a tertile split due to clumping of many households into the same category. Refinement of the distribution could be improved by collecting complimentary asset information to classify households into socioeconomic groups e.g. access to gas, internet connection.

- Community-level data has been implemented recently in DHS data collection but this type of information is not yet collected in the Colombian questionnaires. This limitation has been balanced out by aggregating individual-level data to derive community indicators or proxies for cultural norms and living conditions e.g. women's approval of wife's beating and household connected to sewage respectively. However this methodology carries its own limitations particularly by introducing measurement bias [119].

Software

Data management, cleaning and statistical analyses were carried out using Stata versions 11.0 and 12.0. Maps were created using ArcGIS version 10.

Chapter 4:

Descriptive characteristics Colombian DHS 1986-2010

4. Descriptive characteristics Colombian DHS 1986-2010

Introduction

The objective of this chapter is to provide a description of the sample data used in this study. Results are summarised into two sections and presented at the national level and by urban and rural place of residence. The first section summarises demographic characteristics for all women of reproductive age (15-49 years old) and material characteristics of their households. The second section is restricted to the main analytical sample of interest in this study (see Methods page 72) and is presented in two separate sub-sections. The first one describes changes in women's expectations and behaviours with respect to their reproductive life. The second describes women's socioeconomic circumstances using four measures of SEP of interest in this study: level of education, HWI, Physical and Public capital.

4.1. *Demographic characteristics for all women of reproductive age*

National samples

Between 1986 and 2010, six waves of DHS data collection took place in Colombia. Over the years, the sample size was increased to improve representativeness (see methods section 55). In the latest DHS, the sample size for all women of reproductive age (15-49 years old N=49,562) is more than nine times larger than the first DHS conducted in the country back in 1986 (N=5,318).

Table 4.1 shows the distribution of women for each survey wave at the national level by selected demographic characteristics (age, fertility rates, marital status and place of residence). In the period from 1986 until 2010 Colombia underwent demographic changes typical of demographic transitional societies. There was a gradual increase in the mean age of women of reproductive age (15-49 years old) and a shift in the distribution of women from younger to older age groups. Despite this, the relatively younger adolescent group of 15 to 19 year old women remained the largest five year age group.

Total fertility rate (TFR) is an indicator of the number of children per women. In Colombia, for women 15-49 years old the TFR decreased from 3.2 in 1986 to 2.4 births per woman in 2005, remaining above population replacement levels until 2010 when it dropped to 2.1 births per woman. A TFR of 2.1 is similar to replacement levels in

industrialised countries and below the global replacement fertility rate of 2.33 and was the wanted total fertility rate (WTFR) for women in Colombia back in 1986. The gap between real and desired fertility remained throughout the period of study.

For each survey wave, more than 70% of women and up to almost 80% in 2010 lived in urban areas. The proportion of women in marital union (married or cohabiting) remained relatively stable in this 25-year period while the proportion of widowed, separated and divorced women increased.

Urban and rural place of residence

National averages overlook differences in the distribution of demographic characteristics by urban and rural place of residence (Table 4.2). Larger proportions of women in urban areas reported being single, widowed or separated compared to women in rural areas of whom more than 60% reported being in some form of marital union (married or cohabiting)from 1986 until 2010.

With respect to fertility levels, different stages of fertility transition were observed among women in urban vs. rural areas. From 1986 until 2010 TFR decreased in general. In 2010 the TFR was 2.0 births per woman in urban areas which is below population replacement level (2.1 births per woman),while in rural areas the TFR was 2.8 births per woman, slightly higher than the figure observed back in 1986 for women in urban areas (2.6 births per woman). The WTFR in urban areas back in 1986 was 1.9 which was the WTFR among women in rural areas in 2010.

Table 4.1 Distribution of women of reproductive age by demographic characteristics 1986-2010

	1986	1990	1995	2000	2005	2010
N	5318	8633	11137	11582	38143	49562
Mean age Years (SD)	28.1 (9.5)	28.4 (9.3)	29.4 (9.7)	29.8 (9.8)	30.2 (10.1)	30.5 (10.2)
5 year age group % (n)						
15-19	22.6 (1209)	21.0 (1805)	19.4 (2171)	19.5 (2265)	18.0 (7096)	18.3 (9354)
20-24	20.2 (1071)	19.8 (1686)	17.4 (1938)	17.2 (1993)	16.5 (6389)	15.6 (7752)
25-29	17.0 (899)	17.3 (1548)	16.3 (1823)	14.9 (1734)	14.7 (5647)	14.7 (7387)
30-34	13.8 (734)	14.1 (1295)	14.7 (1645)	14.0 (1629)	13.3 (5198)	13.6 (6740)
35-39	11.2 (591)	11.3 (979)	12.5 (1406)	13.5 (1567)	13.5 (5120)	12.6 (6255)
40-44	8.0 (430)	8.7 (735)	11 (1198)	11.5 (1320)	12.4 (4570)	13.0 (6307)
45-49	7.2 (384)	7.9 (585)	8.7 (956)	9.3 (1074)	11.4 (4123)	12.2 (5767)
Total fertility rate[1]	3.2	2.8	3.0	2.6	2.4	2.1
Wanted fertility rate[2]	2.1	2.1	2.2	1.8	1.7	1.6
Marital status % (n)						
Single	37.2 (1975)	36.5 (3094)	32.2 (3547)	34.0 (3836)	32.9 (12029)	31.6 (14439)
Married/cohabiting	53.7 (2853)	52.5 (4542)	54.7 (6130)	51.2 (6026)	51.5 (20087)	52.7 (27346)
Widowed/separated	9.1 (490)	11.0 (1004)	13.0 (1460)	14.7 (1720)	15.6 (6027)	15.8 (7777)
Place of residence % (n)						
Urban	72.1 (3826)	74.5 (7554)	74.6 (8290)	77.4 (8799)	77.8 (29337)	78.8 (36164)
Rural	27.9 (1492)	25.5 (1079)	25.4 (2847)	22.6 (2783)	22.2 (8806)	21.2 (13398)

[1] Calculated by Profamilia Colombia and DHS Macro defined as realised fertility (the final number of children per woman). [2] Calculated by Profamilia Colombia and DHS Macro corresponds to reported total desired fertility (the reported preferred number of children per woman).

Table 4.2Distribution (%) of women of reproductive age by demographic characteristics in urban and rural place of residence 1986-2010

Survey year	Urban						Rural					
	1986	**1990**	**1995**	**2000**	**2005**	**2010**	**1986**	**1990**	**1995**	**2000**	**2005**	**2010**
N	3826	7554	8290	8799	29337	36164	1492	1079	2847	2783	8806	13398
5 year age group % (n)												
15-19	22.5	21.4	19.5	19.3	17.5	17.7	22.8	19.7	19.3	20.4	19.6	20.4
20-24	20.6	20.0	17.5	17.9	16.7	16.0	19.2	19.3	17.3	14.8	16.1	14.1
25-29	18.1	17.0	16.8	14.8	14.9	14.8	14.0	18.0	14.8	15.4	14.1	14.3
30-34	14.0	14.6	14.9	14.1	13.1	13.5	13.3	12.6	14.1	13.7	14.1	14.0
35-39	10.9	11.7	12.3	13.3	13.4	12.5	11.8	10.1	13.2	14.4	14.2	13.2
40-44	7.7	8.0	10.6	11.4	12.5	13.0	9.0	10.7	12.1	11.9	11.9	12.9
45-49	6.1	7.3	8.5	9.2	11.8	12.5	9.9	9.7	9.2	9.5	10.0	10.9
Total fertility rate[1]	2.6	2.5	2.5	2.3	2.1	2.0	4.7	3.6	4.3	3.8	3.4	2.8
Wanted fertility rate[2]	1.9	2.0	1.9	1.6	1.5	1.5	2.8	2.3	2.8	2.3	2.1	1.9
Marital status (%)												
Single	39.6	38.5	34.4	36.2	34.7	33.2	31.0	30.7	25.7	26.7	26.3	25.3
Married/cohabiting	50.3	49.4	51.2	47.6	48.3	49.8	62.5	61.5	65.2	63.7	62.9	63.6
Widowed/separated	10.1	12.1	14.4	16.2	17.0	17.0	6.5	7.7	9.2	9.5	10.9	11.2

[1] Calculated by Profamilia Colombia and DHS Macro defined as realised fertility (the final number of children per woman). [2] Calculated by Profamilia Colombia and DHS Macro corresponds to reported total desired fertility (the reported preferred number of children per woman).

4.2. Household characteristics for all women of reproductive age

The multidimensional household wealth approach used in this study measures relative socioeconomic position of the household based on ownership of physical assets e.g. consumer durables such as radio, TV or refrigerators, structural components of the dwelling like building materials, and public assets e.g. amenities such as electricity and sewage system. Together Physical and Public forms of capital make up the composite measure of the HWI. This section describes the household distribution of these assets to provide a picture of the material characteristics per households among women of reproductive age between 1986 and 2010.

National samples

Table 4.3 shows the distribution of the sets of assets collected in the Colombian DHS and used in the construction of the HWI, the Physical and Public capital measures of SEP for all households at the national level. Overall, the national figures show an increase in ownership of all forms of assets reported in the households from 1986 until 2010. The most widely owned durable asset is television sets with more than 90% of all households reporting ownership. Phone ownership appears to decrease for the year 2010, which is explained by changes in the 2010 questionnaire with the introduction of separate questions for landline and mobile phone. For comparability with the previous waves only the response for landline phone ownership is presented in Table 4.3. Mobile phone technology in Colombia was introduced in 1994, so information reported between 1995 and 2005 is ambiguous as to which of the two types of phone access was reported. With respect to Public capital assets, access to electricity is almost universal at the national level (97%) and toilet connection to sewage facilities is the least reported amenity (75%).

Table 4.3 Distribution % (No.) of assets reported in Colombian households DHS 1986-2010

	1986		1990		1995		2000		2005		2010	
	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.
Households(n) [1]	100.0	(4873)	100.0	(7412)	100.0	(10112)	100.0	(10907)	100.0	(37211)	100.0	(51447)
Phone	25.0	(1068)	30.3	(2619)	35.5	(3472)	51.5	(5372)	55.5	(17804)	40.6	(15137)
Radio	84.6	(3611)	84.2	(6375)	87.9	(8810)	87.4	(9441)	71.0	(24988)	77.4	(36950)
TV set	67.0	(2860)	71.3	(5815)	81.2	(8168)	82.7	(8973)	85.0	(30705)	91.2	(44932)
Fridge	44.9	(1918)	53.2	(4419)	59.3	(5935)	63.7	(6818)	67.8	(24289)	75.7	(36493)
Floor materials [2]	84.2	(3592)	77.6	(5974)	84.1	(8445)	87.1	(9433)	86.7	(31620)	90.1	(43908)
Electricity	83.8	(3579)	90.0	(6952)	91.6	(9245)	95.3	(10635)	96.8	(35742)	97.4	(48878)
Piped water	63.9	(2729)	71.2	(6203)	70.3	(7092)	77.9	(8505)	74.0	(24239)	83.9	(37067)
Toilet [3]	61.6	(2626)	67.3	(5866)	67.2	(6740)	70.1	(7514)	75.4	(25887)	75.0	(34298)

1 DHS Household sample size: assets are reported per household by household head respondent.

2 Finished materials e.g. cement, gravel, parquet, marble, carpet vs. natural or rudimentary materials.

3 Toilet connected to sewage.

Urban and rural place of residence

Asset ownership by urban and rural place of residence (Table 4.4)shows that households in rural areas have disproportionately less physical assets, especially phones with less than 15% of households reporting access since 2005 and fridge ownership reported by little more than 50% of households in 2010. Use of finished flooring materials e.g. cement, gravel, parquet or marble is more common in urban areas. In rural areas use of finished floor materials decreased from 89.6% in 1986 to 75.4% in 2010. Lack of finished construction materials may be related to lower access to amenities at the household in urban and rural areas.

Access to public assets in urban households was almost universal in all survey waves with levels of access greater than 90% for electricity, piped water and toilet since 1995. Households in rural areas reached 91% access to electricity in 2010 although it is not possible to ascertain from the survey questionnaire if access is provided through a legal connection in either urban or rural place of residence. In rural areas, access to piped water increased dramatically and the largest change is observed from 2005 to 2010 when access to piped water more than doubled, but connection to sewage remained low in 2010 with 22% of households connected compared to 13% in 1986.

Table 4.4 Distribution % (No.) of household[1] assets by urban-rural place of residence 1986-2010

	1986		1990		1995		2000		2005		2010	
	%	**No.**	**%**	**No.**	**%**	**No.**	**%**	**No.**	**%**	**No.**	**%**	**No.**
Urban areas	66.7	(3248)	85.5	(6340)	70.1	(7090)	71.9	(7839)	74.7	(27794)	70.8	(36412)
Phone	35.4	(1022)	41.1	(2573)	49.0	(3333)	66.7	(5061)	68.7	(16339)	51.6	(14438)
Radio	88.7	(2565)	87.4	(5577)	91.4	(6440)	90.4	(7026)	73.5	(19161)	80.0	(27341)
TV set	82.6	(2388)	81.6	(5300)	91.2	(6424)	90.5	(7055)	91.2	(24616)	95.6	(34274)
Fridge	58.7	(1696)	63.7	(4118)	72.2	(5044)	74.1	(5712)	76.3	(20405)	82.7	(29220)
Floor materials [2]	93.3	(2696)	83.2	(5326)	94.8	(6677)	95.0	(7412)	92.9	(25406)	94.7	(33704)
Electricity	97.1	(2810)	98.0	(6225)	99.2	(7020)	99.5	(7787)	99.3	(27522)	99.4	(36084)
Piped water	90.4	(2615)	94.3	(5981)	94.9	(6710)	96.5	(7567)	91.1	(22055)	91.6	(29635)
Toilet [3]	84.7	(2444)	89.3	(5653)	90.0	(6321)	90.7	(7026)	92.0	(23475)	91.8	(31286)
Rural areas	33.4	(1625)	14.5	(1072)	29.9	(3022)	28.1	(3068)	25.3	(9417)	29.2	(15035)
Phone	3.3	(46)	4.5	(46)	3.7	(139)	10.3	(311)	15.5	(1465)	5.6	(699)
Radio	75.9	(1046)	76.7	(798)	79.6	(2370)	79.5	(2415)	63.6	(5827)	69.4	(9609)
TV set	34.2	(472)	47.0	(515)	57.7	(1744)	61.8	(1918)	66.4	(6089)	77.1	(10658)
Fridge	16.1	(222)	28.3	(301)	29.0	(891)	35.4	(1106)	41.9	(3884)	53.5	(7273)
Floor materials [2]	50.8	(291)	46.2	(298)	58.8	(1768)	65.6	(2021)	68.1	(6214)	75.4	(10204)
Electricity	55.8	(769)	71.0	(727)	73.7	(2225)	83.9	(2578)	89.2	(8220)	91.1	(12794)
Piped water	8.3	(114)	15.9	(222)	11.9	(382)	27.3	(938)	22.2	(2184)	59.4	(7432)
Toilet [3]	13.2	(182)	15.3	(213)	13.4	(419)	14.3	(488)	25.3	(2412)	21.8	(3012)

[1] DHS Household sample size: assets are reported per household by household head respondent.
[2] Finished materials e.g. cement, gravel, parquet, marble, carpet vs. natural or rudimentary materials.
[3] Toilet connected to sewage.

4.3. Summary of main findings and discussion

Main findings

- In the period from 1986 until 2010, women of reproductive age in Colombia experienced demographic and socioeconomic changes. National averages over time show that a larger proportion of women lived in urban areas, more women achieved higher levels of education, and a lower proportion of women reported being in some form of marital union (married/cohabiting). These population dynamics were accompanied by a decrease in fertility levels from around 3.2 births per woman in 1986 down to 2.1 births per woman reaching population replacement levels in 2010.

- National averages mask differences between urban and rural areas, whereby women in rural areas have higher fertility rates, lower achieved levels of education and a larger proportion reported being in marital union than women in urban areas.

- Household living conditions measured through reported asset ownership show substantial improvements in living conditions through increased ownership of physical and public assets over the period of interest at the national level. Disaggregated information by place of residence indicate that households in rural areas have relatively less physical assets and remain relatively underserved with respect to public assets than households in urban areas.

Discussion

Colombia has experienced in the past 24 years major population dynamics that pose new challenges for policy-makers. Women's urbanisation trends accompanied by higher achieved levels of education and lower fertility levels can be explained by changes in cultural norms regarding fertility as well as access and availability to contraceptive methods. Findings suggest the need to introduce national agendas like the MDGs to within-country goals by key social determinants like urban and rural place of residence that could improve regional monitoring of socioeconomic inequalities in health and health-related outcomes.

Improvement of material living conditions is partly reflected in higher reported ownership of physical assets e.g. TV, radio, refrigerator among others and better building materials e.g. wall and floor materials among Colombian households.

However, these types of assets are more suitable for measuring living conditions among urban populations which partly explains the skewed distribution of assets among households in rural areas. The DHS were not designed for collecting information on assets, and although the indicators included cover a wide range of assets, information on other type of assets, such as livestock and land ownership, relevant for assessing SEP in rural areas are absent from the data. These restrictions on asset data for the construction of the asset-based measures of SEP are potential limitations for the measurement of SEP in the Colombian context.

The 2015 MDG7 targets for environmental sustainability serve as a framework to evaluate the distribution of piped water and sewage separately by urban and rural Colombian households. With respect to urban households access to piped water and sewage is lagging a few percentage points behind, 7.8% and 5.8% respectively of the 99.4% and 97.6% threshold. In rural areas, current levels are more than 20% points behind of the 81.6% target for piped water and 50% points behind the 70.9% target for access to sewage. Information on the use of alternative forms of household toilet facilities suitable in isolated rural areas may not be captured with the household questionnaire and could partly explain persistent lower levels of government provision of sewage connection.

4.4. **Descriptive characteristics of the analytical sample**

This section presents information about the changes in women's expectations and behaviours with respect to their reproductive life. The main analytical sample of interest is women of reproductive age (15-49 years old) 'at risk of pregnancy' defined as fecund women (not pregnant, amenorrheic or menopausal) in marital union (married or cohabiting) and single women sexually active in the interview month. The Methods chapter section describes the procedure for sample restrictions (see page 72).

Women's fertility expectations and behaviours

National levels

Women's reported fertility expectations and behaviours in Colombia have changed over the past 24 years (Table 4.5).There is a shift over time towards smaller family sizes (two or less children) with almost 50% of women reporting having up to two children in 2010 compared to 39.7% in 1986. These figures match the trend in women's reported reproductive preference for smaller families and the country's observed decline in fertility (Table 4.1).

Despite current lower fertility levels women's knowledge of their fertile period in 2010 is almost the same as the level reported back in 1986 (36%). Knowledge of a woman's fertile period is used as an indicator of basic knowledge of reproductive physiology and indirectly as an indicator of women's exposure to sex education.

Information on reported unintended pregnancy is available only for women who had a live birth within the five years preceding the survey. There was a slight decrease in the proportion of women who reported wanting the pregnancy -'wanted then'-. Women who reported unintended pregnancies -'wanted no more'- have remained stable in the period of study. Mistimed pregnancies 'wanted later' have increased slightly. Reported terminated pregnancies including spontaneous terminations and abortions decreased in 1990 and have increased gradually ever since, but not back to levels observed in 1986.

Urban and rural place of residence

Women's fertility expectations and behaviours reported over time varied by place of residence (Table 4.6).The transition to lower fertility preferences and levels observed at the national level was found in both urban and rural areas of residence. In 2010, most women in urban and rural areas reported desired family size of up to two children,

67.1% and 57.1% respectively, but women in rural areas reported higher cumulative parity and more living children than women in urban areas.

Changes by 2010 vs. 1986 levels show different patterns by place of residence with respect to women's knowledge of their fertile period, reported desire of latest pregnancy and termination of pregnancy. Women's knowledge of the ovulatory cycle increased in rural areas but decreased in urban areas. Reported intended pregnancy by women who had a live birth within the last five years preceding the survey indicates that less women in urban areas desired their last birth (57.0% in 1986 vs. 50.8% in 2010) particularly there is a higher unmet need for spacing (27.3% in 2010 vs. 22.8% in 1986). In contrast, unintended pregnancies among women in rural areas have remained stable (47.1%) but there has been an increase in unmet need to limit pregnancies (27.1% in 1986 vs. 28.2% in 2010).

Table 4.5 National distribution fecund married/cohabiting and single sexually active women by fertility related characteristics 1986-2010

	1986	1990	1995	2000	2005	2010
Sample size	**2117**	**3722**	**5286**	**5598**	**20023**	**28077**
Knowledge of fertile period						
Yes	35.5 (748)	39.4 (1526)	49.5 (2570)	47.2 (2536)	39.1 (7482)	37.5 (9510)
Children ever born						
None	7.7 (161)	9.1 (341)	9.8 (502)	12.7 (676)	14.5 (2670)	16.6 (4248)
1-2	39.7 (843)	44.1 (1702)	45.2 (2392)	46.9 (2596)	46.8 (9125)	49.6 (13282)
3 or >	52.7 (1113)	46.9 (1679)	44.9 (2392)	40.4 (2326)	38.7 (8228)	33.8 (10547)
Living children						
None	7.9 (165)	9.2 (347)	10.1 (515)	12.9 (683)	14.7 (2723)	16.8 (4306)
1-2	41.5 (880)	45.6 (1760)	46.8 (2480)	48.7 (2699)	48.4 (9467)	51.1 (13718)
3 or >	50.6 (1072)	45.3 (1615)	43.1 (2291)	38.5 (2216)	36.9 (7833)	32.0 (10053)
Ideal number of children						
None	1.3 (27)	1.5 (46)	2.3 (124)	2.5 (133)	2.8 (549)	3.7 (936)
1-2	46.6 (993)	51.8 (1959)	55.4 (2929)	64.4 (3526)	66.5 (12673)	64.9 (17616)
3 or >	50.0 (1055)	46.0 (1692)	41.6 (2195)	32.7 (1914)	30.2 (6626)	31.1 (9398)
Non-numeric	2.1 (41)	0.8 (23)	0.7 (38)	0.4 (25)	0.5 (175)	0.4 (127)
Wanted last child[1]						
Intended pregnancy	54.3 (610)	62.0 (1149)	54.5 (1351)	49.2 (1133)	47.0 (3616)	49.8 (4426)
Wanted later	23.5 (271)	17.1 (352)	22.9 (569)	27.2 (633)	25.5 (1928)	26.6 (2389)
Wanted no more	22.3 (255)	21.0 (1872)	22.5 (563)	23.5 (543)	27.5 (2018)	23.6 (2398)
Ever had a terminated pregnancy						
Yes	N/A	22.0 (844)	20.7 (1113)	23.1 (1333)	23.2 (4671)	24.4 (6851)

Note: Reported by women who had a live birth within the five years preceding the survey 1986 (N= 1150), 1990 (N=1873), 1995 (N=2486), 2000 (N=2311), 2005 (N=7562) and 2010 (N=9213).

Table 4.6 Distribution of fecund married/cohabiting and single sexually active women by fertility related characteristics by place of residence 1986-2010

	Urban						Rural					
	1986	**1990**	**1995**	**2000**	**2005**	**2010**	**1986**	**1990**	**1995**	**2000**	**2005**	**2010**
Sample size	1544	3232	3883	4186	15147	20260	573	489	1403	1412	4876	7817
Knowledge of fertile period												
Yes	41.9	45.1	55.5	51.3	42.7	40.8	18.5	23.9	32.2	34.0	27.4	25.9
Children ever born												
None	8.0	10.3	11.5	15.2	16.8	18.7	6.9	5.8	5.2	4.9	6.8	9.2
1-2	44.4	47.2	49.4	50.0	49.6	51.7	27.0	35.5	33.5	36.8	37.6	42.2
3 or >	47.7	42.5	39.1	34.9	33.6	29.6	66.1	58.7	61.4	58.3	55.6	48.6
Living children												
None	8.2	10.4	11.8	15.3	17.0	18.9	6.9	5.8	5.2	4.9	7.1	9.4
1-2	46.1	48.7	50.6	51.6	51.3	53.2	29.4	36.9	35.9	39.0	39.1	44.0
3 or >	45.7	40.8	37.5	33.1	31.7	27.9	63.8	57.4	58.8	56.1	53.8	46.6
Ideal number of children												
None	1.3	1.1	2.4	2.6	3.0	4.1	1.3	2.5	2.0	2.2	2.0	2.4
1-2	50.3	55.4	58.5	67.3	69.8	67.1	36.8	41.6	46.7	54.7	55.7	57.1
3 or >	47.0	42.7	38.7	29.6	26.8	28.5	57.9	55.0	49.9	42.7	41.2	39.6
Non-numeric[1]	1.3	0.8	0.5	0.5	0.4	0.3	4.1	0.8	1.3	0.4	1.0	0.8
Wanted last child[2]												
Intended pregnancy	57.0	62.6	56.8	49.1	48.1	50.8	47.9	60.5	49.4	49.6	44.2	47.1
Wanted later	22.8	20.0	23.8	29.9	26.3	27.3	25.0	10.1	21.0	19.8	23.6	24.7
Wanted no more	20.1	17.5	19.4	21.0	25.6	21.9	27.1	29.3	29.5	30.6	32.2	28.2
Ever had a terminated pregnancy												
Yes	N/A	22	20.2	23.2	23.3	25.1	N/A	21.8	22.0	23.0	23.0	22.1

[1]An example of non-numeric answers includes 'God's will'. [2]Reported by women who had a live birth within the five years preceding the survey 1986 (N= 1150), 1990 (N=1873), 1995 (N=2486), 2000 (N=2311), 2005 (N=7562) and 2010 (N=9213).

Women's contraceptive behaviour

This section presents information about changes over time in women's contraceptive behaviour with respect to knowledge, current and lifetime use and unmet need of contraceptive methods. The section finishes by presenting the main outcome of interest of this study 'current non-use of modern contraception' by five year age groups from 1986 to 2010.

National levels

Consistent with the transition observed in women's fertility preferences and behaviours, patterns of contraceptive behaviour in Colombia changed over time for women 'at risk of pregnancy' (Table 4.7).From 1986,there is a gradual shift towards higher uptake of modern methods of contraception and by 2010 lifetime use (ever-use) of modern contraception is almost universal.

In each consecutive survey wave, more nulliparous women reported uptake of any form of contraception from 17% in 1986 to 52% by 2010. Nulliparous first time users were more likely to be younger women who want to delay and/or limit pregnancy. This shift over time suggests a cohort change in parity at first use of contraception where younger cohorts are delaying first childbirth and older cohorts first used contraception to limit or space childbirths. Five year age groups disaggregated patterns of median age at first use of modern contraception, sexual intercourse, marital union and birth (see Appendix 3) indicate a cohort change whereby younger cohorts of women in Colombia over time initiated their sexual lives and used contraception at earlier ages than older cohorts.

Current non-use of modern contraception is the main outcome of interest in this study. Colombia set two contraceptive prevalence rate (CPR) targets for the 2015 MDG5. The first target aims to achieve 75% national-level prevalence of modern contraceptive use among sexually active women (15-49 years old) and the second target aims to achieve 65% national-level prevalence of modern contraceptive use among adolescents (15-19 years old). The national level prevalence of modern contraceptive use increased over time until the year 2000 when it stagnated and then increased again in 2005 surpassing the country's target of 75% uptake for the 2015 MDGs.

Table 4.7 Distribution of fecund married/cohabiting and single sexually active women by fertility regulation outcomes 1986-2010

	1986	1990	1995	2000	2005	2010
Sample size	**2117**	**3722**	**5286**	**5598**	**20023**	**28077**
Knowledge of any method of contraception						
Knows no method or only folk/traditional	0.1 (2)	0.1 (4)	0.0 (2)	0.0 (1)	0.0 (18)	0.0 (75)
Knows modern method	99.9 (2115)	99.9 (3718)	100.0 (5284)	100.0 (5597)	100.0 (20005)	100.0 (28002)
Current use						
No method	15.8 (341)	17.8 (631)	12.8 (691)	9.9 (565)	11.4 (2558)	14.7 (4532)
Traditional	15.6 (320)	14.9 (527)	15.2 (796)	16.3 (915)	12.0 (2419)	6.9 (1973)
Modern	68.6 (1456)	67.3 (2564)	72.1 (3799)	73.8 (4118)	76.6 (15046)	78.4 (21572)
Ever use of any method						
Never used	6.8 (145)	7.3 (241)	3.8 (206)	2.1 (130)	1.6 (380)	1.3 (488)
Used only traditional	7.8 (161)	7.1 (243)	6.4 (338)	5.0 (281)	3.1 (641)	1.4 (482)
Used modern method	85.4 (1811)	85.6 (3238)	89.8 (4742)	92.9 (5187)	95.3 (19002)	97.3 (27107)
Children at first use of contraception						
0	17.3 (366)	25.1 (992)	36.8 (1869)	44.0 (2378)	45.5 (8737)	51.8 (13634)
1	35.0 (716)	36.1 (1407)	37.8 (2026)	39.5 (2244)	37.3 (7402)	33.1 (9407)
2	15.9 (331)	12.6 (473)	10.9 (595)	8.3 (474)	8.8 (1889)	7.9 (2409)
3	8.5 (180)	6.2 (239)	4.9 (264)	2.9 (174)	3.7 (833)	3.4 (1062)
4+	16.4 (345)	12.7 (366)	5.8 (319)	3.1 (190)	3.1 (782)	2.5 (1074)
Never used	6.9 (145)	7.3 (241)	3.8 (206)	2.1 (130)	1.6 (380)	1.3 (488)
Unmet need for contraception						
Unmet need to space	N/A	3.4 (94)	2.2 (121)	1.9 (112)	2.7 (606)	3.0 (939)
Unmet need to limit	N/A	6.8 (220)	4.5 (242)	3.6 (209)	3.8 (842)	4.5 (1463)
Using to space	N/A	25.0 (870)	26.4 (1369)	28.3 (1578)	25.9 (5093)	25.8 (6984)
Using to limit	N/A	58.8 (2006)	60.9 (3226)	61.9 (3455)	63.3 (12372)	59.4 (16561)
Wants to become pregnant (next two years)	N/A	6.0 (211)	6.0 (326)	4.3 (236)	4.3 (936)	5.5 (1672)

Urban and rural place of residence

Differences in women's contraceptive behaviour by urban and rural place of residence show a mixed picture (Table 4.8).Inequalities in current use of modern contraception by both urban and rural place of residence narrowed and seem to disappear by 2010 with women in both areas reporting 78.4% current use of contraception. Similarly, lifetime use (ever-use) of modern methods of contraception narrowed reaching almost universal levels for women in urban areas and slightly lower levels for women in rural areas.

In contrast, reported unmet need for contraception decreased from 1990 until 1995 and increased gradually from 2000 onwards in both urban and rural areas. By 2010, 8% of women in both urban and rural areas reported unmet need for contraception compared to 9% in 1986 for women in urban areas and 14% in 1986 in rural areas. Overall, levels of unmet need for contraception in Colombia remain similar to other Latin American countries and lower than levels in African countries.

Similar to national averages, over time more nulliparous women in both urban and rural areas of residence reported uptake of any form of contraception. First lifetime uptake after first birth is similar for women in both urban and rural areas while after two or more births is higher for women in rural areas than in urban areas consistent with larger actual and desired family size among women in rural areas.

Table 4.8 Distribution (%) of women by fertility regulation outcomes by urban and rural place of residence 1986-2010

	Urban						Rural					
	1986	**1990**	**1995**	**2000**	**2005**	**2010**	**1986**	**1990**	**1995**	**2000**	**2005**	**2010**
Sample	1544	3232	3883	4186	15147	20260	573	489	1403	1412	4876	7817
Knowledge of any method of contraceptive												
Knows no method or only folk/traditional	0.1	0.1	0.0	0.0	0.0	0.0	0.2	0.0	0.2	0.1	0.2	0.1
Knows modern method	99.9	99.9	100.0	100.0	100.0	100.0	99.8	100.0	99.8	99.9	99.9	99.8
Current use												
No method	14.0	16.7	12.3	9.8	11.4	15.0	20.7	20.8	14.1	10.2	11.4	13.9
Traditional	14.5	14.2	14.1	15.0	11.6	6.7	18.5	16.8	18.3	20.5	13.4	7.7
Modern	71.5	69.1	73.6	75.2	77.0	78.4	60.8	62.4	67.6	69.3	75.2	78.4
Ever use of any method												
Never used	5.2	6.3	3.2	2.1	1.3	1.0	11.2	9.9	5.4	2.2	2.5	2.2
Used only traditional	6.2	6.0	4.8	3.8	2.6	1.1	12.0	10.3	11.1	8.9	5.0	2.1
Used modern method	88.6	87.7	92.0	94.1	96.2	97.8	76.8	79.8	83.5	88.9	92.5	95.7
Children at first use of contraception												
0	20.8	28.8	42.1	48.6	50.5	56.4	7.9	15.0	21.9	29.2	29.1	35.6
1	38.1	38.0	37.9	37.6	36.6	31.9	26.8	30.9	37.5	45.7	39.5	37.4
2	16.1	12.2	9.9	7.7	7.3	6.8	15.4	13.7	13.8	10.2	13.7	11.7
3	7.9	5.8	3.7	2.4	2.6	2.6	10.0	7.4	8.2	4.7	7.1	6.3
4+	11.8	8.9	3.1	1.6	1.6	1.3	28.5	23.1	13.1	8.0	7.9	6.8
Unmet need for contraception												
Unmet need to space	N/A	3.3	2.4	1.9	2.8	3.1	N/A	3.6	1.6	2.1	2.5	2.6
Unmet need to limit	N/A	5.4	3.6	3.1	3.6	4.4	N/A	10.5	7.1	5.0	4.3	5.0
Using to space	N/A	26.7	28.8	30.8	28.1	27.2	N/A	20.7	19.6	20.1	19.0	20.9
Using to limit	N/A	58.5	59.0	59.5	61.2	57.8	N/A	59.7	66.3	69.7	70.1	65.1
Wants to become pregnant (next two years)	N/A	6.2	6.2	4.7	4.3	5.6	N/A	5.6	5.5	3.1	4.0	5.3

Current non-use of modern contraception by age group

National levels

Over the past two and a half decades in Colombia, patterns of current non-use of contraception varied by age (Figure 6).Contraceptive behaviour by five year age group shows a sharp decline at the national level from 1990to 2010 for the younger cohorts (15-19 years old). Current non-use of contraception converges around 20% in 2010 for women aged 20 to 44 at the national level surpassing the MDG of 75% current use. The two extreme age groups, 15 to 19 and 45 to 49, reported slightly lower levels of use converging around 30%.

Figure 6 Women's current non-use (%) of modern contraceptive methods by age groups 1986-2010
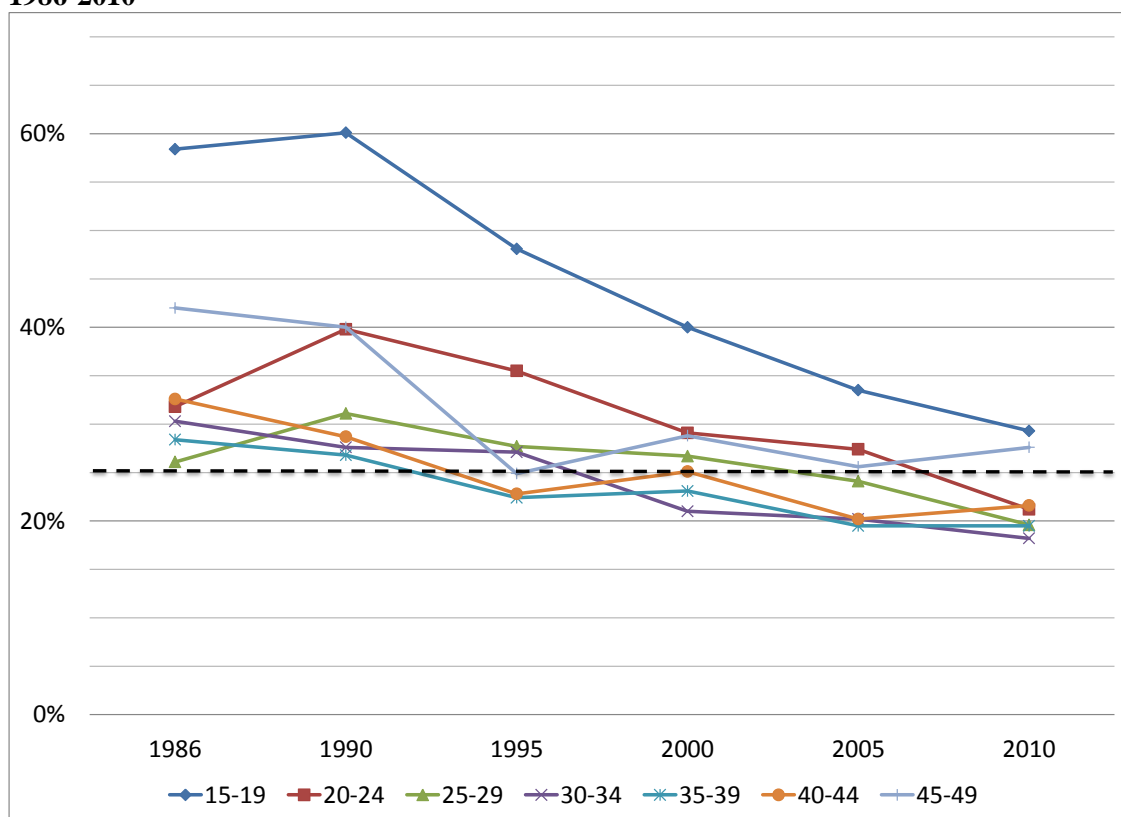
Note: Dashed lines indicate 2015 MDG CPR target.

Urban and rural place of residence

Differences by age groups between women in urban and rural areas have narrowed but persist by 2010 (Figure 7). As expected, young women (15-19 years old) in urban and rural areas reported less use of contraception than older groups who have achieved the 25% target of non-use, except women with reduced fertility at the end of their reproductive life (40-49 years old).

Figure 7 Women's current non-use (%) of modern contraceptive methods by five year age groups in urban (left) and rural (right) place of residence 1986-2010
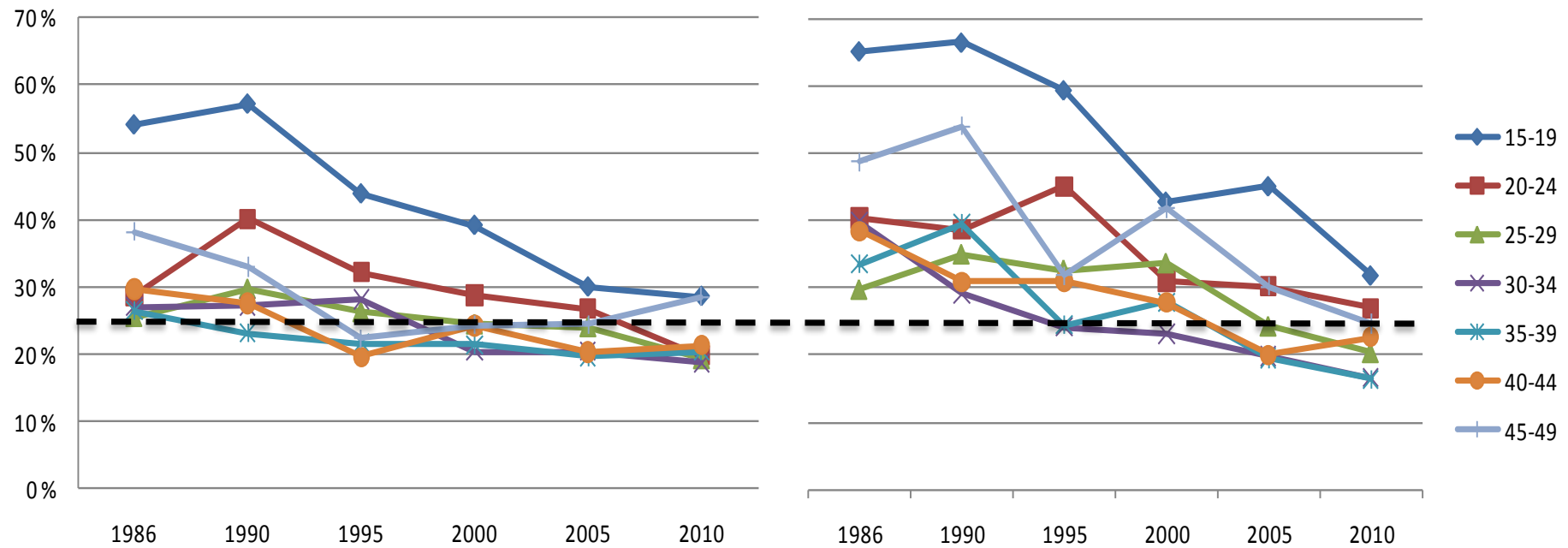
Note: Dashed lines indicate 2015 MDG CPR target.

4.5.   *Summary of main findings and discussion*

Main findings

- Family size has fallen steadily over the past 25 years accompanied by reported growing motivation to have smaller families among fecund sexually active women at the national level. This transition was also observed by urban and rural place of residence, but women in rural areas reported relatively larger cumulative parity and desired fertility.

- As of 2010, almost 80% of fecund sexually active women reported use of a modern method of contraception at the national level by urban and rural place of residence. CPR by age groups is consistent with U patterns observed around the world.

- Reported levels of unintended pregnancies (i.e. wanted at a later time or not wanted at all) remained relatively high and stable between 1986 and 2010 at the national level and by urban and rural place of residence. Almost 50% of women at the national level and in urban areas reported their last birth was mistimed or unwanted compared to 53% in rural areas.

Discussion

Colombia has reached proposed CPR levels ahead of the MDGs deadline and this positive balance can be attributed to changes in factors related to women's fertility preferences and behaviours accompanied by family planning programmes' efforts. This CPR level is relatively high for the Latin American region (CPR 64%). However, country averages ignore social disparities in women's use of modern contraception by key social determinants such as women's place of residence and socioeconomic position (see results chapter 5) that may be linked to the reported increment in unmet need for contraception to space and limit pregnancies since 1995, which indicates a gap between women's fertility preferences and actions. Differences in family size before first lifetime uptake of contraception by place of residence is consistent with reported preference for smaller family sizes in urban areas where women are more likely to start limiting earlier than women in rural areas. These findings are consistent with urbanisation trends that provide women in urban areas with higher levels of education and more formal or informal forms of employment opportunities that delay age at first union (married/ cohabiting) and may provide women with more economic independence.

Women's age is an important determinant of contraceptive behaviour as women entering different age groups throughout their reproductive life years will have different biological and social needs and preferences. As expected, younger women (15-19 years old) in Colombia reported less use of contraception, consistent with international patterns of contraceptive use by age, whereby use is lower for adolescents and increases in the 20-24 age group who are closer to attain their desired family size, and then further increases and is maintained for women aged between 25 to 39 years old who are spacing and/or have presumably attained family size, declining again for older reproductive ages (40-49) with decreased fecundity.

Reported prevalence levels of unwanted pregnancies are very high with notable very little difference between urban and rural areas of residence. These findings are consistent with official statistics that suggest that despite notable gains in use of contraception over the past 24 years, unintended and unplanned births are a widespread phenomenon in the country. In this context prevention of unwanted pregnancies through effective and consistent voluntary use of contraception is a concern for women of reproductive age and policy-makers.

Information on women's experience of terminated pregnancies should be interpreted with caution. Women may underreport this type of information because it is indirectly related with perceptions and behaviours about abortion. Since 2006, despite strong opposition from the Catholic Church and pro-life organisations, abortion procedures were legalised for three circumstances: if the mother's life is in danger, if the foetus is badly deformed or if the pregnancy results from rape. This legal instrument has been recently under review by the Colombian Congress (since October 2011) due to strong opposition from the conservative party and the Catholic Church. Abortion in any other circumstance remains illegal and punishable by up to three years in jail for the woman and for the doctor performing the procedure. In this context, statistics about women's experience regarding abortion is prone to information bias.

4.6. Socioeconomic circumstances of women in the analytical sample

This section describes the socioeconomic circumstances of the analytical sample using four measures of SEP: level of education, Household wealth (HWI), Physical and Public capital. As described in the methods section, level of education is defined as the highest achieved level of education, and HWI, Physical and Public capital are asset based measures constructed using information on durable assets, material characteristics and connection to public amenities at the household level (see methods section page 59). This section presents the crude distribution of women of reproductive age according to each measure of SEP, the extent of inequalities using the Gini coefficients and Lorenz curves and level of independence between SEP variables using Spearman correlations.

Distribution of socioeconomic characteristics

National samples

The distribution of women in the analytical sample by measures of SEP at the national level is presented in Table 4.9. Women's distribution by reported level of education shows that over time more women achieved higher/secondary levels of education from 40% in 1986 to 73% in 2010 while the proportion of women with up to primary level more than halved to25% in 2010. With respect to measures of household SEP a larger proportion of women lived in households with higher levels of HWI (53-56%), Physical (53-68%)and Public capital (63-68%), yet the prevalence of the latter increased slightly while HWI and Physical capital decreased gradually over time.

Urban and rural place of residence

Disaggregated information on socioeconomic circumstances by place of residence in Table 4.10 shows a different picture of the country compared to national averages provided in Table 4.9. Large urban-rural inequalities are observed, with rural women being poorer, less educated and with lower levels of access to public capital in their households. Differences by level of education show that only in 2010 women in rural areas achieved a similar distribution by educational attainment to levels achieved back in 1986 by women residing in urban areas.

Table 4.9 Distribution % (n) of women by SEP dimensions at the national level 1986-2010

	1986	1990	1995	2000	2005	2010
N	2117	3722	5286	5598	20023	28077
Level of education						
Higher/Secondary	39.1	50.4	56.4	60.9	76.6	72.7
Primary	55.3	44.9	39.6	35.5	21.9	25.4
None	5.6	4.7	4.0	3.6	1.5	1.9
Household wealth						
Richer	56.1	56.4	55.6	57.5	19.3	16.8
Quartile 2	43.9	43.6	44.4	42.5	23.4	22.8
Quartile 3					30.4	31.0
Poorer					27.0	29.4
Physical capital						
Richer	67.8	59.6	62.3	54.6	22.5	19.4
Quartile 2	32.2	40.4	37.7	45.4	21.8	21.6
Quartile 3					34.2	33.3
Poorer					21.6	25.7
Public capital						
Richer	62.8	66.9	67.1	69.7	57.7	55.0
Quartile 2	37.2	33.1	32.9	30.3	13.5	13.0
Poorer					28.8	32.1

Note: The main analytical sample is women of reproductive age (15-49 years old) 'at risk of pregnancy' defined as fecund women (not pregnant, amenorrheic or menopausal) in marital union (married/cohabiting) and women not in union but sexually active in the interview month.

Table 4.10 Distribution (%) of women by SEP dimensions in urban and rural areas of residence 1986-2010

	Urban						Rural					
Level of education (%)	**1986**	**1990**	**1995**	**2000**	**2005**	**2010**	**1986**	**1990**	**1995**	**2000**	**2005**	**2010**
Higher/Secondary	48.2	62.0	68.3	72.3	76.6	80.6	14.7	18.9	22.7	24.4	33.9	44.8
Primary	47.5	35.3	29.8	25.8	21.9	18.3	76.2	70.9	67.3	66.8	59.3	50.5
None	4.3	2.7	1.8	2.0	1.5	1.0	9.1	10.2	10.0	8.8	6.9	4.7
Household wealth (%)												
Richer	73.7	73.6	73.2	72.9	66.4	66.0	8.8	9.5	5.8	7.8	7.5	6.2
Poorer	26.3	26.4	26.8	27.1	33.6	34.0	91.2	90.5	94.2	92.2	92.5	93.8
Physical capital (%)												
Richer	80.8	70.2	62.3	66.9	64.5	63.7	33.0	30.5	74.9	15.1	15.4	14.5
Poorer	19.2	29.8	37.7	33.1	35.5	36.3	67.0	69.5	25.1	84.9	84.6	85.5
Public capital (%)												
Richer	83.7	87.7	88.4	87.7	86.6	85.5	6.6	10.2	7.0	11.5	12.7	9.7
Poorer	16.3	12.3	11.6	12.3	13.4	14.5	93.4	89.8	93.0	88.5	87.3	90.3

Note: The main analytical sample is women of reproductive age (15-49 years old) 'at risk of pregnancy' defined as fecund women (not pregnant, amenorrheic or menopausal) in marital union (married/cohabiting) and women not in union but sexually active in the in the interview month.

Inequalities in socioeconomic characteristics

Among women in the analytical sample, Gini coefficients for the distribution of all measures of SEP at the national level indicate that inequalities have persisted over the years (Table 4.11). A Gini coefficient varies between 0 which reflects complete equality and 1 which indicates complete inequality (see Methods page 71). The size of the coefficient is relatively similar at the national level across the four measures of SEP and ranged between 0.19 and 0.35. Over time there was a slight decrease in the size of asset-based inequalities particularly for Public capital, while a relatively similar size persisted for women's level of education.

The size of the Gini coefficients in urban areas suggest lower levels of inequality relatively stable over time from 1986 until 2010. In rural areas a different situation was observed whereby the size of inequalities are stronger and have increased with respect to the distribution of women's achieved levels of education but have decreased slightly for the HWI, Physical and Public capital.

Table 4.11 Gini coefficients of SEP variables 1986-2010

	1986	1990	1995	2000	2005	2010
National						
Level of education	0.26	0.30	0.28	0.28	0.28	0.27
HWI	0.30	0.35	0.31	0.30	0.28	0.27
Physical capital	0.30	0.33	0.30	0.30	0.29	0.27
Public capital	0.25	0.26	0.23	0.21	0.20	0.19
Urban						
Level of education	0.25	0.26	0.23	0.23	0.23	0.23
HWI	0.19	0.25	0.21	0.21	0.20	0.19
Physical capital	0.21	0.26	0.23	0.23	0.23	0.22
Public capital	0.10	0.10	0.08	0.08	0.08	0.08
Rural						
Level of education	0.23	0.29	0.31	0.32	0.34	0.34
HWI	0.38	0.40	0.35	0.35	0.34	0.32
Physical capital	0.44	0.44	0.40	0.37	0.36	0.34
Public capital	0.35	0.46	0.33	0.37	0.33	0.29

The Lorenz curves in Figure 8 provide a visual representation of the inequality by level of education, HWI, Physical and Public capital among women in the analytical sample. A Lorenz curve for each survey year is superimposed to show the way in which each SEP measures has been distributed across the sample at various points in time. Inequality at the national level based on the Lorenz curves overlap for all measures of SEP which indicates that inequalities remained but there were not significant changes between survey years.

Figure 8 Lorenz curves national distribution of SEP characteristics 1986-2010
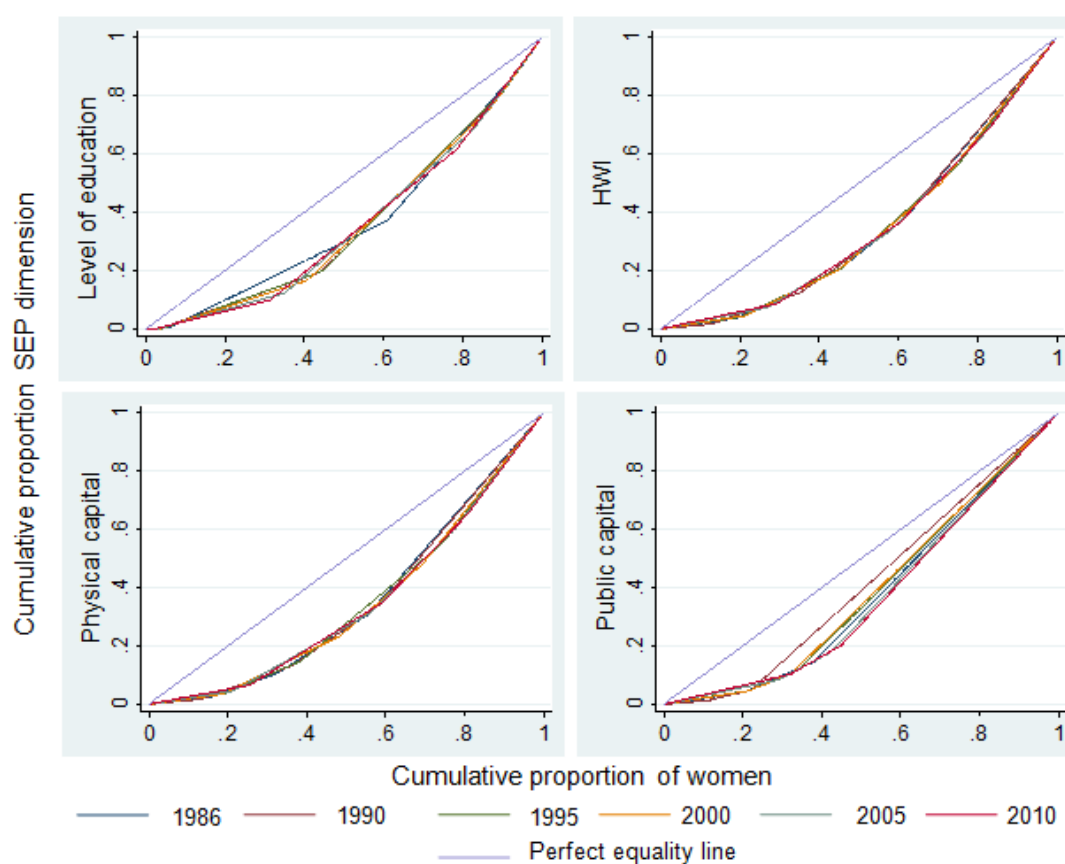
Note: The Lorenz curve maps the cumulative share of the SEP variable of interest (low to high) on the vertical axis against the distribution of the population on the horizontal axis. If each individual had the same level of education, or total equality, the education level distribution curve would be the straight line in the graph – the perfect equality line. The coloured lines that bow away from the line of absolute equality are the Lorenz curves; the further they deviate from the perfect equality line the more unequal the distribution by each measure of SEP.

Independence of socioeconomic dimensions

This study is based on a multidimensional approach to the measurement of women's SEP, whereby different dimensions of SEP are measured separately. To determine the independence of these dimensions, Spearman's rank order correlations were calculated between all measures of SEP for each survey at the national level and by urban and rural place of residence.

National level

At the national level, Spearman rank correlations (ρ) between the SEP variables (Table 4.12) indicate that the socioeconomic dimensions measured in this study were relatively independent of each other. The exception to this pattern is observed between HWI and Physical and Public capitals as these dimensions are contained in the HWI variable. The association between HWI and Physical capital is the strongest followed by HWI and Public capital. Over time the strength of this dependence increased for HWI and Physical capital (ρ=0.77 in 1986 vs. ρ=0.86 in 2010) while it decreased between HWI and Public capital (ρ=0.74 in 1986 vs. ρ=0.56 in 2010).

Correlations between Physical and Public capital were less strong and varied over time (ρ=0.37-0.49). The correlation between level of education and Physical capital remained strong and relatively stable (ρ=0.29-0.40) while it decreased between level of education and Public capital (ρ=0.33 in 1986 vs. ρ=0.25 in 2010). A similar pattern was observed with the population weighted SEP variables, but the strength of the dependence between variables was larger (Table 4.12).

Urban and rural place of residence

The correlation between the SEP variables (Table 4.13) indicate that these dimensions of women's SEP, as constructed in this study, were relatively independent in urban and rural areas. Over time, the level of independence has increased particularly between level of education and Public capital in urban areas more than in rural areas. Women's achievement of higher levels of education in younger cohorts became less dependent of access to publicly provided services at the household level.

The only minor deviation from this pattern was observed in rural areas between the population weighted Physical and Public capital variables for the years 1990 and 1995 with relatively higher correlations of ρ=0.48 and ρ=0.46 respectively.

Table 4.12 Correlation of categorical and population weighted measures of SEP at the national level 1986-2010

	Categorical SEP			Population weighted SEP		
	Level of education	HWI	Physical capital	Level of education	HWI	Physical capital
1986						
HWI	0.35	-	-	0.41	-	-
Physical Capital	0.29	0.77	-	0.36	0.89	-
Public capital	0.33	0.74	0.46	0.34	0.80	0.55
1990						
HWI	0.38	-	-	0.46	-	-
Physical Capital	0.36	0.81	-	0.44	0.93	-
Public capital	0.32	0.60	0.39	0.34	0.64	0.45
1995						
HWI	0.44	-	-	0.52	-	-
Physical Capital	0.40	0.81	-	0.48	0.92	-
Public capital	0.41	0.72	0.48	0.43	0.77	0.57
2000						
HWI	0.41	-	-	0.50	-	-
Physical Capital	0.39	0.80	-	0.48	0.92	-
Public capital	0.36	0.68	0.49	0.38	0.72	0.53
2005						
HWI	0.32	-	-	0.42	-	-
Physical Capital	0.32	0.86	-	0.42	0.89	-
Public capital	0.23	0.51	0.37	0.26	0.66	0.43
2010						
HWI	0.31	-	-	0.44	-	-
Physical Capital	0.31	0.86	-	0.43	0.90	-
Public capital	0.25	0.56	0.42	0.29	0.71	0.49

Note: Categorical SEP variables correspond to quartiles for HWI and Physical capital, and tertiles for Public capital.

Table 4.13 Correlation of measures of SEP at the national level and by urban and rural place of residence 1986-2010

	Categorical SEP						Population weighted SEP					
	Urban			Rural			Urban			Rural		
	Level of education	HWI	Physical capital	Level of education	HWI	Physical capital	Level of education	HWI	Physical capital	Level of education	HWI	Physical capital
1986												
HWI	0.23			0.16			0.30	-	-	0.20	-	-
Physical Capital	0.19	0.81		0.16	0.40		0.29	0.90	-	0.19	0.79	-
Public capital	0.17	0.56	0.26	0.14	0.53	0.17	0.18	0.57	0.28	0.13	0.65	0.41
1990												
HWI	0.30			0.19			0.39	-	-	0.31	-	-
Physical Capital	0.30	0.82		0.27	0.52		0.39	0.95	-	0.30	0.77	-
Public capital	0.20	0.47	0.30	0.11	0.51	0.16	0.21	0.48	0.34	0.20	0.75	0.48
1995												
HWI	0.28			0.27			0.37	-	-	0.36	-	-
Physical Capital	0.27	0.86		0.28	0.43		0.37	0.95	-	0.32	0.80	-
Public capital	0.14	0.51	0.29	0.25	0.74	0.27	0.16	0.49	0.33	0.34	0.69	0.46
2000												
HWI	0.26			0.18			0.38	-	-	0.24	-	-
Physical Capital	0.28	0.79		0.19	0.48		0.39	0.94	-	0.22	0.72	-
Public capital	0.09	0.48	0.30	0.16	0.64	0.23	0.11	0.47	0.31	0.14	0.58	0.27
2005												
HWI	0.23			0.20			0.31	-	-	0.28	-	-
Physical Capital	0.24	0.87		0.21	0.65		0.33	0.92	-	0.28	0.69	-
Public capital	0.05	0.39	0.26	0.15	0.35	0.16	0.06	0.51	0.29	0.20	0.57	0.26
2010												
HWI	0.23			0.14			0.33	-	-	0.27	-	-
Physical Capital	0.23	0.87		0.19	0.57		0.35	0.92	-	0.27	0.71	-
Public capital	0.07	0.41	0.27	0.09	0.43	0.18	0.07	0.51	0.31	0.14	0.57	0.30

Note: Population weighted variables weight the distribution of the population in each SEP group by calculating the midpoint of the proportion in each category.

4.7.   *Summary of main findings and discussion*

Main findings

- Achieved formal levels of education among fecund women in marital union (married or cohabiting) and single sexually active have increased from 40% to 73% at the national level. Differences by place of residence show striking gaps, whereby only in 2010 women in rural areas have reached a similar distribution by level of education as women in urban areas 24 years earlier.

- The distribution of women by asset based measures of SEP at the national level shows an increasing proportion of women in poorer households with respect to HWI and Physical capital. In contrast, the proportion of poorer households with respect to Public capital has decreased overtime. Findings were consistent by urban and rural place of residence.

- Socioeconomic circumstances among fecund women in marital union (married or cohabiting) and single sexually active measured through level of education and Physical and Public capital are relatively independent which means each constructed measure distinguishes a different SEP dimension of interest.

Discussion

Improvements in reported national achieved levels of education for women in Colombia over the past 24 years are promising but should be interpreted with caution with respect to quality of education and striking within-country inequalities by urban and rural place of residence. Women's access to formal education is widely considered a necessary condition for women's empowerment and for achieving more equal societies [49,116]. In Colombia, educational standards vary remarkably across the country especially between town-centres and rural areas and between private and public education which means there is a wide spectrum in terms of quality and curriculum. Due to these differences it is difficult to compare the quality and content of achieving primary level of education between regions. Policies in the past decade have addressed illiteracy and dropout rates in primary level but, secondary and higher levels of education remain a privilege of a relatively small population in urban areas. The social value given to education and the resources it provides to women vary greatly and may lead to very different job prospects. National statistics in 2010 indicate that women in Colombia earn less than men even when they have higher levels of education and women with up

to primary level of education had a lower chance of finding employment than women with secondary level. The ambiguity between a women's level of education and job stability and fair remuneration in the country is considered one of the reasons for high drop-out rates particularly in rural areas[9].

With respect to HWI, Physical and Public capital the skewed distribution of women between urban and rural areas of residence can be partly explained by an urban bias in the indicators used to construct the measures e.g. no inclusion of livestock or agricultural machinery. Use of better dwelling materials in urban areas is related to better dwelling specifications, nevertheless this sample may not include households in urban slums particularly those of displaced populations with temporary household infrastructure. Public capital infrastructure at the household level has increased but the vast majority of women in rural areas remain relatively underserved.

Inequality levels have persisted but need to be interpreted bearing in mind that even if the shape of the Lorenz Curve across surveys is not changing significantly, poorer women may still be better off in terms of what they can afford to buy but, they are relatively not better off compared to previous years. In terms of spending power, they may have the opportunity to purchase or acquire a wider range of assets e.g. mobile phones, refrigerator which may have been considered luxuries of the richest women in previous surveys.

In Latin America, the 'poor' have been traditionally characterised as those who lack enough money or income to satisfy 'basic needs' from a commodities perspective[83]. In contexts of economic growth as in Latin America, studies that examine the association between initial inequality and subsequent growth have found a stronger effect of land and human capital (defined as investment in education and work experience) inequality, compared to that by income inequality[29]. These studies suggest that for developing economies asset inequality matters more, and therefore a multidimensional asset-based approach provides a theoretical advantage in health inequalities research across different levels of transitional economies [29,83,125,126].

Chapter 5:

Multidimensional socioeconomic inequalities in current non-use of contraception 1986-2010

5. Multidimensional socioeconomic inequalities in current non-use of contraception 1986-2010

Introduction

The objective of this chapter is to examine absolute and relative socioeconomic inequalities in women's current non-use of modern contraceptive methods by four measures of women's SEP: level of education, HWI, Physical and Public capital. Three hypotheses guide the analytical strategy:

First, absolute and relative socioeconomic inequalities in women's current non-use of contraception in Colombia are greater in rural than urban areas. The rationale underlying this approach builds on evidence from Latin American countries where national improvements in health in the last decades have been accompanied by greater within country inequalities by place of residence [45,47,127,128].

Second, socioeconomic inequalities in current non-use of contraception are larger by Physical capital when compared to inequalities by women's level of education. The literature on the education-fertility relationship has consistently shown that the experience of education is associated with women's contraceptive behaviour. Findings from Colombia show that in addition to education, material living conditions are key determinants of use of contraception particularly in a context with economic barriers for accessing and acquiring contraceptive methods[129].

Third, there has been a decrease or no change at the national level that masks differences in socioeconomic trends within the country, whereby inequalities have stayed the same in urban areas but have increased in rural areas. The rationale for this hypothesis was based on the experience, during the 1990s, of family planning graduation programmes parallel to the health sector reform in Colombia, two factors that have been associated with an increase in national CPR levels, but important within country variations [130-133].

The main analytical sample is women of reproductive age (15-49 years old) 'at risk of pregnancy' defined as fecund women (not pregnant, amenorrheic or menopausal) in marital union (married/cohabiting) and women not in union but sexually active in the interview month (see methods page 72).This analytical sample follows international guidelines and is comparable to Colombia's guidelines for monitoring the contraceptive prevalence rate (CPR) 2015target of the MDGs. In addition, sensitivity analyses were carried out for women 'at risk of unintended pregnancy' excluding women who reported

intending to become pregnant at some point in the following two years to account for fertility desires (see methods page 77).

5.1. Absolute inequalities of current non-use of contraception

Two measures of absolute inequality are used in this section. The first one is age standardised prevalence rate by socioeconomic group according to each measure of SEP. The second is the Slope Index of Inequality (SII) a regression-based measure that weights the distribution of the population in each SEP group by calculating the midpoint of the proportion in each category (see methods page 76).

National age standardised prevalence rates

Prevalence rates were directly standardised to five year age groups using the pooled age distribution of the 1986 to 2010 Colombian DHS waves. Age standardised prevalence rates of women's current non-use of contraception by all measures of SEP at the national level were similar between 1986 and 1990 and relatively smaller between 1990 and 2010 (Table 5.1).

The overall national prevalence in current non-use of contraception in2010 was 22.9%, surpassing since 2005the 2015 MDG target for the country of 75% current-use of modern contraception. A similar pattern with respect to prevalence levels is observed by all measures of SEP with the exception of women with low Public capital at their households who by 2010 are at the borderline (25.7%) and women with no achieved level of formal education (36.8%), lagging more than 10 % points behind the MDG threshold.

Reported age standardised non-use rates were higher for poorer women than richer women with respect to HWI and Physical and Public capital measures in all survey waves. These absolute gaps decreased in each consecutive year. For example, the prevalence difference between women in poorer and richer households by Physical capital was 10.4% in 1986 and decreased to 3.6% by 2010. The same pattern was observed for the HWI and Public capital.

Changes over time from 1986 until 2010

Prevalence of current non-use of contraception in all levels of education remained relatively stable between 1986 and 1990, and started to decrease at different rates for each level of education from 1995. When comparing 1986 to 2010 levels, women with up to primary level of education experienced the largest change (30.1%) followed by

women with higher and secondary level of education (25.1%). Women with no achieved level of education were the exception experiencing no decrease between 1986 and 2010; on the contrary they experienced relatively stable higher prevalence levels over time and almost no change by 2010 when there was a 4% increase in current non-use of modern contraception in comparison to 1986.

Sensitivity analyses

Sensitivity analyses excluding women who reported intending to get pregnant in the following two years (Table 12.2 in Appendix 4, page 307) show that age standardised prevalence rates of current non-use of contraception were relatively smaller but in the same direction than the main analytical sample, except for prevalence levels in 1990 by level of education where women with primary level of education had the highest prevalence of non-use of contraception.

Urban and rural socioeconomic differences in age standardised prevalence rates

Table 5.2 shows age standardised prevalence of current non-use of contraception by measures of SEP (HWI, Physical and Public capital and level of education) for women 'at risk of pregnancy' defined as fecund women (not pregnant, amenorrheic or menopausal) in marital union (married/cohabiting) and women not in union but sexually active in the interview month in urban and rural areas. Age standardised prevalence of current non-use of contraception was significantly higher for women in rural than in urban areas for all survey waves. By 2010, the overall prevalence for women in urban and rural areas had reached the MDG target.

Prevalence levels of current non-use of contraception for the relatively poorer by HWI, Physical and Public capital were larger in rural areas than in urban areas, whereas the opposite pattern was found for the relatively richer with larger prevalence levels in urban areas than rural areas. The direction of these absolute inequalities increased from the richer to the poorer in both urban and rural areas. The prevalence by level of education generally increased from higher to lower levels of education with some deviations in urban areas where women with Higher/Secondary and primary level of education had very similar or sometimes the same prevalence levels e.g. 1986, 1995 and 2005.

Changes over time from 1986 until 2010

Levels in 2010 compared to 1986 show that women in rural areas experienced an overall larger decrease in reported current non-use of contraception with a 36.1% change, than women in urban areas who experienced a 25.7% change. Changes with respect to the HWI, Physical and Public capital also show that women in rural areas experienced larger percentage changes than their counterparts in urban areas.

Within rural areas, women in the richer group by HWI, Physical and Public capital experienced the largest changes. The opposite pattern was found among women in urban areas, where women in the poorer groups had the largest percentage change. With respect to level of education, women with primary level of education experienced the largest change in both urban (-29% change) and rural (-35% change) places of residence while women with no achieved level of education were the only two groups with higher current non-use of contraception by 2010 compared to 1986 levels in both urban (16.6% change) and rural (4.8% change) areas.

Sensitivity analyses

Sensitivity analyses (Table 12.3 in Appendix 4, page 308) show that age standardised prevalence rates of current non-use of contraception were in general relatively smaller, but in the same direction than the main analytical sample among women in urban and rural areas.

Table 5.1 Age standardised prevalence rate of current non-use of contraception for women in marital union (married or cohabiting) and single sexually active by measures of SEP 1986-2010

	1986		1990		1995		2000		2005		2010		2010 vs. 1986
	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	% change[1]
National	32.6	(2117)	31.1	(3722)	28.4	(5286)	26.5	(5598)	*24.8*	(20023)	*22.9*	(28077)	-29.8
Level of education													
Higher/Secondary	30.3	(829)	29.8	(2077)	27.0	(2929)	*24.7*	(3322)	*24.3*	(12969)	*22.7*	(19257)	-25.1
Primary	33.6	(1167)	32.3	(1509)	29.0	(2138)	27.7	(2064)	25.2	(6423)	*23.5*	(8133)	-30.1
None	35.4	(121)	38.6	(136)	40.1	(219)	44.7	(212)	37.8	(631)	36.8	(687)	4.0
HWI													
Richer	27.8	(1172)	28.9	(2406)	25.6	(2872)	*23.8*	(3087)	*22.3*	(8534)	*20.8*	(11108)	-25.2
Poorer	37.9	(945)	37.5	(1316)	31.6	(2414)	29.9	(2511)	26.6	(11489)	*24.2*	(16969)	-36.1
Physical capital													
Richer	29.0	(1433)	29.2	(2366)	25.4	(3245)	*23.6*	(2886)	*22.3*	(8860)	*20.7*	(11507)	-28.6
Poorer	39.4	(684)	37.0	(1356)	33.2	(2041)	29.7	(2712)	26.7	(11163)	*24.3*	(16570)	-38.3
Public capital													
Richer	28.7	(1312)	30.5	(2898)	26.4	(3497)	*24.4*	(3799)	*23.4*	(11555)	*20.7*	(15429)	-27.9
Poorer	38.5	(805)	36.4	(824)	32.4	(1789)	30.9	(1799)	26.7	(8468)	25.7	(12648)	-33.2

Note: Rates directly standardised to five year age groups using the pooled age distribution of the 1986 to 2010 waves. Figures in italics indicate prevalence rate at or surpassing the 2015 MDG of 75% current-use (25% current non-use) of modern contraception. [1]% change for each level of SEP= (1986 PR -2010PR)/ (1986 PR) *100

Table 5.2 Age standardised prevalence of current non-use of contraception for women in marital union (married or cohabiting) and single sexually active by measures of SEP in urban and rural areas DHS 1986-2010

		1986		1990		1995		2000		2005		2010		2010 vs.1986
		%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	% change
Urban		30.0	(1544)	30.9	(3233)	26.7	(3883)	*24.9*	(4186)	*24.1*	(15147)	*22.3*	(20260)	-25.7%
Rural		38.8	(573)	37.9	(489)	33.1	(1403)	31.2	(1412)	27.0	(4876)	*24.8*	(7817)	-36.1%
Difference p-value		<0.001		0.002		<0.001		<0.001		<0.001		<0.001		
	Level of education													
Urban	Higher/Secondary	29.6	(745)	30.0	(1987)	26.8	(2607)	*24.7*	(2974)	*24.3*	(11229)	*22.5*	(15774)	-24.0%
	Primary	30.1	(731)	30.4	(1158)	26.0	(1202)	*24.1*	(1121)	*24.1*	(3633)	*21.3*	(4203)	-29.2%
	None	26.5	(68)	40.3	(88)	*22.2*	(74)	38.3	(91)	*21.5*	(285)	30.9	(283)	16.6%
Rural	Higher/Secondary	34.7	(84)	25.8	(90)	28.2	(322)	*23.6*	(348)	*23.8*	(1740)	*23.6*	(3483)	-32.0%
	Primary	39.1	(436)	39.3	(351)	33.0	(936)	32.0	(943)	26.7	(2790)	25.4	(3930)	-35.0%
	None	39.5	(53)	38.8	(48)	44.0	(145)	44.7	(121)	48.2	(346)	41.4	(404)	4.8%
	HWI													
Urban	Richer	27.6	(1129)	28.8	(2351)	25.6	(2782)	*23.9*	(2968)	*22.4*	(8170)	*20.9*	(10763)	-24.3%
	Poorer	37.2	(415)	36.9	(882)	29.4	(1101)	27.2	(1218)	26.0	(6977)	*23.7*	(9497)	-36.3%
Rural	Richer	30.0	(43)	23.7	(55)	*24.2*	(90)	*21.1*	(119)	*20.2*	(364)	*18.6*	(345)	-38.0%
	Poorer	39.3	(530)	39.1	(434)	33.5	(1313)	32.2	(1293)	27.5	(4512)	*25.0*	(7472)	-36.4%
	Physical capital													
Urban	Richer	28.3	(1243)	28.9	(2225)	25.4	(2861)	*23.8*	(2689)	*22.4*	(8162)	*20.9*	(10654)	-26.1%
	Poorer	36.6	(301)	36.1	(1008)	30.4	(1022)	26.9	(1497)	26.0	(6985)	*23.6*	(9606)	-35.5%
Rural	Richer	33.1	(190)	34.0	(141)	25.1	(384)	*21.0*	(197)	*20.8*	(698)	*19.2*	(853)	-42.0%
	Poorer	41.9	(383)	39.7	(348)	35.9	(1019)	33.0	(1215)	28.0	(4178)	25.4	(6964)	-39.4%
	Public capital													
Urban	Richer	28.7	(1282)	30.6	(2833)	26.4	(3391)	*24.3*	(3627)	*23.5*	(10919)	*20.9*	(14826)	-27.2%
	Poorer	37.1	(262)	32.7	(400)	29.1	(492)	28.9	(559)	25.6	(4228)	26.0	(5434)	-29.9%
Rural	Richer	30.5	(30)	25.4	(65)	25.2	(106)	26.3	(172)	*20.9*	(636)	*16.7*	(603)	-45.2%
	Poorer	39.5	(543)	40.0	(424)	33.7	(1297)	31.7	(1240)	27.9	(4240)	25.5	(7214)	-35.4%

Note: Rates directly standardised to five year age groups using the pooled age distribution of the 1986 to 2010 waves. Figures in italics indicate prevalence rate at or surpassing the 2015 MDG of 75% current-use (25% current non-use) of modern contraception. [1]% change for each level of SEP= (1986 PR -2010PR)/ (1986 PR) *100.

Absolute inequalities in women's current non-use of contraception using the Slope Index of Inequality (SII)

The SII is a regression-based measure of inequality based on the assumption of a linear relationship between the measure of SEP and current non-use of contraception. The SII can be interpreted as the difference in women's current non-use of contraception between the two extreme hypothetical values (0 and 1) of the ranked scale of each measure of SEP from the richest to the poorest and highest to lowest in the case of level of education (see Methods page 76). A positive SII indicates that the direction of inequalities in current non-use of contraception increased with lower levels of level of education, HWI, Physical and Public capital and vice versa for a negative SII.

National level

National level absolute inequalities in women's current non-use of contraception using the SII are presented in Table 5.3. All models were adjusted for age (continuous and quadratic term) and for marital status (single/married or cohabiting). Compared to crude models adjustment for age (continuous and quadratic term) and marital status (single/married or cohabiting) increased slightly the size of absolute inequalities by each measure of SEP with the exception of level of education and Public capital in the year 2010 (Table 12.15 in Appendix 5, page 322).

Absolute inequalitylevelsby the HWI, Physical and Public capital were positive and of relatively similar size in each survey wave. For example the SII by HWI was 0.14 (95% CI 0.09-0.20) and represents the difference in current non-use of contraception between the two extremes of household wealth. The size of the SIIs in 1990 for Physical and Public capital was respectively 0.15 and 0.12.

The SIIs by level of education were consistently relatively the smallest and non-significant in all survey waves. The direction of these SIIs was positive which indicates current non-use of contraception increased for lower levels of education except in 2010 when the direction changed, but there was no evidence of inequalities.

Changes over time from 1986 until 2010

With respect to changes over time, absolute inequalities decreased homogeneously at the national level and remained significant by HWI, Physical and Public capital. Changes in inequalities by HWI were larger, decreasing from SII 0.20 (95% CI0.12-0.29) in 1986 to SII 0.09 (95% CI0.07-0.11) in 2010, a decrease of 55%. Changes by

Physical and Public capital were 53% and 52% respectively. There was a slight change in size and direction of absolute inequalities by level of education from 1986 vs. 2010 but these remained non-significant.

Sensitivity analyses

Sensitivity analyses (Table 12.4 in Appendix 4, page 309) show a different picture with respect to absolute inequalities by level of education, whereby there were significant absolute inequalities in all survey years and a 38% decrease from 1990 until 2010. Absolute inequalities by HWI, Physical and Public capital were consistent with findings for the main analytical sample.

Departure from linear trend

There was evidence of a linear relationship between current non-use of contraception and the socioeconomic rank by each measure of SEP in the earlier years (1986, 1990), but it was not found from 1995 until 2010 except for Public capital in 1990, 2000 and 2005.

Absolute inequalities by urban and rural place of residence

Absolute inequalities in women's current non-use of contraception using the SII by urban and rural place of residence are presented from 1986 to 2010 in Table 5.3. Adjustment for age (continuous and quadratic term) and for marital status (single/married or cohabiting) increased slightly the SII estimates between 1986 and 2000, with the exception of Public capital in rural areas in the year 1990 where the SII decreased slightly in adjusted models (Table 12.15 in appendix 5, page 322).

SIIs among women in rural areas were generally larger than in urban areas for all measures of SEP at all-time points. The only exception was observed for Public capital in the year 2000 when absolute inequalities in urban and rural areas were of a similar size, although non-significant in rural areas and borderline in urban areas.

Inequalities by women's level of education wererelativelysmaller than by HWI, Physical and Public capital in urban and rural areas with the exception of the year 2000 for rural areas with respect to Public capital. In urban areas the direction of the SIIs was negative except for 1990, suggesting a change of direction in absolute inequalities with higher educated women reporting less use of modern contraception, but only significant in 2010. In rural areas the direction was positive and significant only in 2000 and 2005.

Changes over time from 1986 until 2010

With respect to changes over time, absolute inequalities in urban areas decreased homogeneously from 1986 until 2010 and remained significant by HWI, Physical and Public capital. Changes in inequalities by Physical capital were larger, decreasing from SII 0.14 (95% CI 0.04-0.25) in 1986 to SII 0.07 (95% CI 0.05-0.09) in 2010, a decrease of 50%. Changes by Physical and Public capital were 53% and 52% respectively. There was a minor change in size of absolute inequalities by level of education from 1986 vs. 2010 and no change in direction whereby women with higher levels of education reported more non-use of contraception, but the associations were not statistically significant.

Sensitivity analyses

Sensitivity analysis provide similar evidence of size and direction in absolute inequalities by level of education, HWI, Physical and Public capital than results for the main analytical sample with minor exceptions in urban areas by level of education (2010), Public capital (1990, 2000) and in rural areas by level of education (2000, 2005), HWI (1995), Physical capital (1986) and Public capital (1986, 2000) (Table 12.4 in appendix 4, page 309).

Departure from linear trend

There was a near linear relationship between current non-use of contraception and the socioeconomic rank by each measure of SEP with some exceptions in urban areas by level of education (2005, 2010), HWI (2000, 2010) and Physical capital (2000), and in rural areas by level of education, HWI and Physical capital (1995, 2005, 2010) and by Public capital (2010) (Appendix 6, page 325).

Table 5.3National, urban and rural SII (95% CI) for current non-use of contraception among women in marital union (married or cohabiting) and single sexually active DHS 1986-2010

		Level of education		Household wealth		Physical capital		Public capital	
		SII (95% CI) p-value							
National	**N**								
1986	**2,117**	0.06 (-0.02-0.14)	0.13	0.20 (0.12-0.29)	<0.001	0.19 (0.11-0.27)	<0.001	0.21 (0.11-0.31)	<0.001
1990	**3,722**	0.05 (-0.01-0.11)	0.09	0.14 (0.09-0.20)	<0.001	0.15 (0.09-0.20)	<0.001	0.12 (0.05-0.20)	0.002
1995	**5,286**	0.04 (-0.01-0.09)	0.10	0.11 (0.06-0.15)	<0.001	0.12 (0.08-0.17)	<0.001	0.13 (0.08-0.18)	<0.001
2000	**5,598**	0.06 (0.01-0.11)	0.01	0.12 (0.08-0.16)	<0.001	0.12 (0.08-0.16)	<0.001	0.15 (0.09-0.20)	<0.001
2005	**20,023**	0.02 (-0.003-0.04)	0.09	0.10 (0.08-0.12)	<0.001	0.10 (0.08-0.13)	<0.001	0.08 (0.05-0.10)	<0.001
2010	**28,077**	-0.003 (-0.02-0.02)	0.74	0.09 (0.07-0.11)	<0.001	0.09 (0.07-0.11)	<0.001	0.10 (0.08-0.13)	<0.001
Urban									
1986	**1,544**	-0.004 (-0.09-0.08)	0.92	0.16 (0.05-0.27)	0.004	0.14 (0.04-0.25)	0.01	0.17 (0.01-0.33)	0.04
1990	**3,232**	0.02 (-0.04-0.08)	0.53	0.12 (0.06-0.19)	<0.001	0.12 (0.06-0.18)	<0.001	0.06 (-0.05-0.17)	0.31
1995	**3,883**	-0.02 (-0.08-0.04)	0.47	0.06 (0.001-0.12)	0.04	0.07 (0.02-0.13)	0.01	0.06 (-0.03-0.16)	0.19
2000	**4,186**	-0.01 (-0.07-0.04)	0.59	0.06 (0.01-0.12)	0.03	0.05 (0.001-0.10)	0.05	0.12 (0.02-0.21)	0.02
2005	**15,161**	-0.02(-0.05-0.004)	0.10	0.08 (0.06-0.11)	<0.001	0.08 (0.06-0.11)	<0.001	0.05 (0.02-0.08)	0.003
2010	**20,260**	-0.03 (-0.06-(-0.01)	0.004	0.09 (0.07-0.12)	<0.001	0.07 (0.05-0.09)	<0.001	0.12 (0.09-0.15)	<0.001
Rural									
1986	**573**	0.11 (-0.11-0.33)	0.33	0.27 (0.05-0.48)	0.01	0.17 (-0.002-0.35)	0.05	0.22 (-0.08-0.52)	0.15
1990	**489**	0.14 (-0.07-0.35)	0.18	0.44 (0.18-0.69)	0.001	0.26 (0.10-0.42)	0.001	0.27 (0.05-0.49)	0.01
1995	**1,403**	0.09 (-0.02-0.20)	0.12	0.14 (-0.02-0.30)	0.10	0.18 (0.06-0.30)	0.003	0.17 (0.002-0.34)	0.05
2000	**1,412**	0.16 (0.06-0.26)	0.002	0.25 (0.14-0.36)	<0.001	0.28 (0.18-0.38)	<0.001	0.10 (-0.02-0.23)	0.11
2005	**4,913**	0.11 (0.06-0.16)	<0.001	0.17 (0.11-0.23)	<0.001	0.19 (0.13-0.24)	<0.001	0.14 (0.08-0.19)	<0.001
2010	**7,817**	0.04 (-0.003-0.08)	0.07	0.17 (0.12-0.22)	<0.001	0.17 (0.13-0.22)	<0.001	0.19 (0.14-0.24)	<0.001

Note: All models adjusted for age (continuous and quadratic term) and marital status (single/married or cohabiting).

Relatively stronger socioeconomic determinants of absolute inequalities

To determine which socioeconomic dimensions were associated with relatively larger absolute inequalities in women's current non-use of contraception all models were adjusted for age (continuous and quadratic) and marital status(single/married or cohabiting) and mutually adjusted for all measures of SEP excluding the HWI in view of collinearity, as physical and public assets are included in the HWI (see Spearman rank correlations page 116).These models correspond to a hypothetical situation whereby inequalities in use of contraception by one dimension of SEP are adjusted for the equal distribution of the other SEP dimensions of interest e.g. level of education are adjusted for the distribution of Physical and Public capital socioeconomic circumstances within each level of education.

National level

National, urban and rural mutually adjusted absolute inequalities of current non-use of contraception are presented in Table 5.4. At the national level absolute inequalities summarised with the SII were largest by Physical capital in 1990, 1995 and 2005.The size of inequalities by Public capital was almost the same than by Physical capital in the years 1986, 2000 and 2010. Over time, inequalities by Physical and Public capital decreased 38% and 43% respectively. In contrast, inequalities by level of education were relatively smaller than by asset-based measures but non-significant in the analytical sample of interest across all survey waves.

Compared to univariate models (Appendix 5), mutually adjusted models are consistent in pointing at the same SEP measure as the relatively strongest for each survey wave, with a minor exception in 2010 when both Physical and Public capital had similar size in univariate models.

Urban and rural place of residence

In urban and rural areas the SII by Physical capital predicted stronger inequalities among women in rural than in urban areas except in 1986 when inequalities in rural areas were smaller and non-significant than in urban areas (Table 5.4). The absolute effect on contraceptive behaviour between the lowest level of education of level of education (highest (0) to lowest (1)) was non-significant at all survey points for women living in rural areas while for women in urban areas there was an inverse gradient whereby there were larger inequalities for women with higher levels of education in

1990, 2005 and 2010. Inequalities by Public capital were relatively small but non-significant from 1986 until 2005 in both urban and rural areas.

Compared to univariate models (Appendix 5), mutually adjusted models are consistent in pointing at the same SEP measure as the relatively strongest for each survey wave. There were minor exceptions in 1986 among women in urban areas and 1986 and 1990 in rural areas, when both Physical and Public capital, predicted absolute inequalities of relatively similar size.

Sensitivity analyses

Sensitivity analysis excluding women who reported intending to get pregnant in the following two years provided similar evidence at the national level and by urban and rural place of residence from 1990 until 2010 (Table 12.5 in appendix 4, page 310).

Table 5.4National, urban and rural mutually adjusted SII (95% CI) for current non-use of contraception among women in marital union (married or cohabiting) and single sexually active DHS 1986-2010

		SII (95% CI)					
National	**N**	**Level of Education**		**Physical capital**		**Public capital**	
1986	2,117	-0.04 (-0.12-0.04)	0.30	0.13 (0.04-0.23)	0.01	0.14 (0.03-0.25)	0.01
1990	3,722	-0.03 (-0.10-0.03)	0.32	0.14 (0.07-0.21)	<0.001	0.05 (-0.04-0.14)	0.25
1995	5,286	-0.06 (-0.11-0.001)	0.06	0.11 (0.05-0.17)	<0.001	0.08 (0.02-0.15)	0.02
2000	5,598	-0.02 (-0.08-0.03)	0.34	0.09 (0.04-0.14)	<0.001	0.10 (0.04-0.16)	0.002
2005	20,023	-0.04 (-0.06-(-0.02))	0.001	0.11 (0.08-0.13)	<0.001	0.04 (0.01-0.06)	0.01
2010	28,077	-0.07 (-0.09-(-0.04))	<0.001	0.08 (0.06-0.11)	<0.001	0.08 (0.05-0.10)	<0.001
Urban							
1986	1,544	-0.06 (-0.14-0.02)	0.16	0.14 (0.02-0.25)	0.02	0.13 (-0.04-0.30)	0.13
1990	3,232	-0.03 (-0.10-0.03)	0.34	0.13 (0.06-0.21)	<0.001	-0.01 (-0.13-0.11)	0.87
1995	3,883	-0.07(-0.13-(-0.004))	0.04	0.09 (0.03-0.16)	0.002	0.03 (-0.07-0.13)	0.57
2000	4,186	-0.04 (-0.10-0.01)	0.12	0.05 (-0.01-0.11)	0.08	0.10 (-0.0002-0.20)	0.05
2005	15,161	-0.06 (-0.09-(-0.03))	<0.001	0.10 (0.07-0.12)	<0.001	0.02 (-0.01-0.06)	0.22
2010	20,260	-0.07 (-0.09-(-0.04))	<0.001	0.07 (0.05-0.10)	<0.001	0.09 (0.06-0.13)	<0.001
Rural							
1986	573	0.07 (-0.15-0.29)	0.54	0.13 (-0.05-0.32)	0.16	0.13 (-0.17-0.43)	0.39
1990	489	0.02 (-0.21-0.25)	0.86	0.22 (0.04-0.41)	0.02	0.22 (-0.004-0.44)	0.06
1995	1,403	-0.003(-0.12-0.11)	0.96	0.17 (0.04-0.31)	0.01	0.02 (-0.17-0.21)	0.83
2000	1,412	0.07 (-0.03-0.17)	0.20	0.25 (0.14-0.37)	<0.001	0.01 (-0.10-0.12)	0.86
2005	4,913	0.04 (-0.01-0.10)	0.13	0.15 (0.09-0.21)	<0.001	0.06 (-0.003-0.12)	0.06
2010	7,817	-0.03 (-0.07-0.01)	0.11	0.15 (0.10-0.20)	<0.001	0.12 (0.07-0.18)	<0.001

Note: Mutually adjusted for level of education, Physical capital and Public capital, age (continuous and quadratic term) and marital status (married or cohabiting/single). The HWI was not included in this model in view of collinearity, as the Physical and Public capital assets are contained in the HWI.

5.2. Summary of main findings and discussion

Main findings

- The overall national prevalence in current non-use of contraception between 1986 and 2010 decreasedfrom32.6% to 22.9%, a decrease of 30% in two decades and surpassing since 2005the 2015 MDG target for the country of 75% current-use of modern contraception.

- Prevalence levels disaggregated by different dimensions of women's SEP and by place of residence show a different and more complex picture than national averages. Within country inequalities have persisted specially for women with no achieved levels of education, with current non-use of contraception prevalence of30.9% and 41.4% respectively in urban and rural areas.

Discussion

Both absolute measures of inequality used in this chapter provide evidence that inequalities in current non-use of contraception by HWI, Physical and Public capital were in general larger in rural areas than in urban areas consistent with the proposed hypothesis for the period of study. Findings were not consistent with respect to absolute inequalities by level of education from 1986 until 1995.Women with no level of formal education in 2010 were far from reaching the CPR 2015 MDG for the country and they were the only group in urban and rural areas to experience an increase in current non-use of contraception by 2010 vs. 1986.This finding highlights that low levels of human capital measured as achieved level of education is a key social determinant of inequalities in women's current non-use of contraception and suggests that the well-known effects of women's education on contraceptive behaviour were confirmed in this study, particularly for women with no achieved level of education. The literature on the education-fertility relationship has consistently shown that the experience of education has a lasting impact for women's lives that provides mechanism that influence women's reproductive desires and behaviour through information, social mobility and empowerment [64,66,96,104].

Results using the SII provide other piece of information and suggest that the educational gradient in current non-use of contraception took the expected direction of larger inequalities for lower levels of education, but was relatively the smallest gradient compared to the HWI, Physical and Public capital gradients. The SII is a regression-

based measure that reflects the experience of all women in the sample i.e. women across all achieved levels of education. While women with no level of education and particularly among rural areas have the highest age standardised prevalence rates of current non-use of contraception, the absolute gradient by level of education measured using the SII is smaller than by other SEP dimensions of interest in this study. In other words, the absolute difference of the hypothetical worst-off vs. best-off in the SEP hierarchy, was larger by household asset-based measures i.e. HWI, Physical and Public capital than by women's level of education. This finding indicates the need to target not only women with no achieved level of education, but to also tackle inequalities in current non-use of contraception through social determinants of women's household material living conditions.

Absolute inequalities in mutually adjusted models for level of education, Physical and Public capital provide evidence to support the hypothesis that inequalities in women's current non-use of contraception were larger by Physical capital than by level of education. These findings do not undermine the importance of level of education as an important factor associated with women's contraceptive behaviour as discussed above, instead it stresses how other SEP dimensions have an effect in women's current non-use of contraception based on the hypothetical situation in which inequalities in use of contraception by one dimension of SEP are adjusted for the equal distribution of the other SEP dimensions of interest. See general discussion chapter 10 page 265.

5.3. Relative inequalities of current non-use of contraception

Two methods were used to assess relative inequalities in women's contraceptive behaviour. The first method is the prevalence ratio (PR) provided for each group by all measures of SEP and the second method is the RII a regression-based measure that like the SII weights the distribution of the population in each SEP group by calculating the midpoint of the proportion in each category (see Methods page 75).

National prevalence ratios of women's current non-use of contraception

National PRs adjusted for age (continuous and quadratic term) and marital status (married or cohabiting/single) are provided by all measures of SEP in Table 5.5. There was evidence of strong associations between current non-use of contraception and all SEP dimensions of interest.

These associations were on the expected direction whereby women who lived in poorer households had higher PRs than those who lived in richer households with respect to the HWI, Physical and Public capital. PRs by level of education were higher for women with no achieved level of education than women with Higher or secondary level of education from 1986 until 2010. Women with primary level of education had higher PRs of current non-use of contraception than women with higher and secondary levels, but associations were significant only in the year 2000 and borderline in 2005.

The strength of these associations was similar in 1986 and 2000. Adjustment for age and marital status increased slightly the strength of these associations in all years except in 2010 with no change in PRs by HWI (Table 12.16 in appendix 5, page 323).

Changes over time from 1986 until 2010

Over time, disparities by HWI, Physical and Public capital narrowed down. With respect to level of education, by 2010 the PRs for women with no level of education increased to 1.51 (95% CI 1.35-169), a change of 35% with respect to a PR of 1.12 (95% CI 0.84-1.50) in 1986.

Sensitivity analyses

Sensitivity analysis to account for fertility desires by excluding women who reported intending to get pregnant in the following two years provide similar evidence than the analytical sample with respect to the direction of the association between women's current non-use of contraception and level of education, HWI, Physical and Public capital. The strength of the association was slightly stronger for all SEP dimensions in

the sensitivity sample than the main analytical sample with minor exceptions for PRs by Public capital in 1990 and 2005 (Table 12.7 in appendix 4, page 312).

Urban and rural differences in current non-use of contraception

PRs of current non-use of contraception by measures of SEP for women in urban and rural areas are shown in Table 5.6. Results took the expected direction of stronger PRs of current non-use of contraception among women with lower levels of SEP than those with higher levels of SEP with respect to education, HWI, Physical and Public capital. There were minor exceptions by primary level of education in 1995, 2005 and 2010 and no achieved level of education in 1986, whereby the association took the opposite direction but was not statistically significant.

PRs for women in poorer households by HWI, Physical and Public capital were higher among women in rural than in urban areas, with exceptions in 1986 (HWI), 1990 (Physical capital) and 2000 (Public capital). The strength of the association was relatively similar between primary and no achieved level of education with respect to women with secondary and higher levels of education respectively in urban and rural areas; these associations were stronger among women in rural than urban areas.

Changes over time from 1986 until 2010

With respect to changes over time, two patterns were observed when comparing women's current non-use of contraception in urban vs. rural areas. First, in terms of level of education women with primary level of education had relatively smaller PRs that remained stable over the period of study with non-significant levels in urban areas and with borderline significance in rural areas from 2000 until 2010. The association between current non-use of contraception and no level of education became stronger and significant over time. For example, the adjusted PR in 1986 for women with no level of education was 0.86 (95% CI 0.52-1.42) and increased in 2010 to 1.25 (95% CI 1.03-1.52), a 47% change; for women in rural areas the PR in 1986 was 1.33 (95% CI 0.87-2.05) and increased in 2010 to 1.70 (95% CI 1.47-1.98), a 28% change.

Second, the association between women's current non-use of contraception and the HWI and Physical capital decreased gradually over time for women in urban areas, but increased for women in rural areas. In contrast, the strength of the association between current non-use of contraception and Public capital decreased in the earlier years but increased by 2010 to almost the same size as back in 1986 for both urban and rural areas of residence.

Sensitivity analyses

Sensitivity analysis were consistent with findings for the main analytical sample with respect to the direction of the association between women's current non-use of contraception and level of education, HWI, Physical and Public capital. Some exceptions in the direction of the association by level of education in urban areas were not statistically significant. The strength of the associations was slightly stronger for all SEP dimensions in the sensitivity sample than the main analytical sample. These results were relatively similar to findings for the national level (Tables 12.7 and 12.8 in appendix 4).

Table 5.5 National level Prevalence Ratio (PR) (95% CI) of current non-use of contraception among women in marital union (married or cohabiting) and single sexually active DHS 1986-2010

	PR (95 % CI)					
	1986	**1990**	**1995**	**2000**	**2005**	**2010**
N	2117	3722	5286	5598	20023	28077
Level of education						
High/secondary	1	1	1	1	1	1
Primary	1.13 (0.98-1.30)	1.06 (0.96-1.18)	1.08 (0.98-1.19)	1.14 (1.04-1.26)	1.06 (1.00-1.12)	1.01 (0.96-1.07)
None	1.12 (0.84-1.50)	1.27 (1.01-1.59)	1.45 (1.21-1.74)	1.54 (1.25-1.90)	1.52 (1.34-1.73)	1.51 (1.35-1.69)
HWI						
Richer	1	1	1	1	1	1
Poorer	1.36 (1.18-1.56)	1.31 (1.19-1.44)	1.25 (1.15-1.36)	1.29 (1.18-1.42)	1.22 (1.16-1.29)	1.17 (1.12-1.23)
Physical capital						
Richer	1	1	1	1	1	1
Poorer	1.36 (1.19-1.56)	1.27 (1.15-1.40)	1.32 (1.21-1.44)	1.30 (1.19-1.42)	1.23 (1.17-1.29)	1.18 (1.12-1.23)
Public capital						
Richer	1	1	1	1	1	1
Poorer	1.37 (1.19-1.57)	1.20 (1.07-1.34)	1.25 (1.14-1.37)	1.32 (1.20-1.46)	1.17 (1.11-1.23)	1.25 (1.19-1.31)

Note: Models adjusted for age (continuous and quadratic term) and marital status (single/married or cohabiting).

Table 5.6 Prevalence Ratio (95% CI) of current non-use of contraception among women in marital union (married or cohabiting) and single sexually active DHS 1986-2010 in urban and rural areas

	1986	1990	1995	2000	2005	2010
Urban areas N						
Level of education						
High/secondary	1	1	1	1	1	1
Primary	1.03 (0.88-1.20)	1.02 (0.91-1.15)	0.97 (0.86-1.10)	1.00 (0.88-1.13)	0.99 (0.93-1.07)	0.95 (0.89-1.01)
None	0.86 (0.52-1.42)	1.30 (0.98-1.73)	1.10 (0.74-1.65)	1.27 (0.89-1.80)	1.03 (0.83-1.07)	1.25 (1.03-1.52)
HWI						
Richer	1	1	1	1	1	1
Poorer	1.27 (1.05-1.53)	1.24 (1.11-1.38)	1.15 (1.04-1.28)	1.16 (1.04-1.30)	1.19 (1.12-1.26)	1.15 (1.09-1.21)
Physical capital						
Richer	1	1	1	1	1	1
Poorer	1.25 (1.03-1.50)	1.20 (1.07-1.34)	1.20 (1.08-1.34)	1.15 (1.04-1.28)	1.19 (1.12-1.26)	1.14 (1.08-1.20)
Public capital						
Richer	1	1	1	1	1	1
Poorer	1.27 (1.03-1.57)	1.10 (0.93-1.29)	1.09 (0.93-1.28)	1.24 (1.07-1.43)	1.10 (1.03-1.17)	1.25 (1.18-1.32)
Rural areas N						
Level of education						
High/secondary	1	1	1	1	1	1
Primary	1.12 (0.81-1.56)	1.22 (0.83-1.79)	1.11 (0.92-1.33)	1.24 (1.03-1.51)	1.15 (1.03-1.27)	1.09 (1.00-1.19)
None	1.33 (0.87-2.05)	1.30 (0.77-2.19)	1.48 (1.14-1.91)	1.63 (1.21-2.21)	1.94 (1.65-2.29)	1.70 (1.47-1.98)
HWI						
Richer	1	1	1	1	1	1
Poorer	1.19 (0.74-1.90)	1.37 (0.90-2.08)	1.37 (0.84-2.23)	1.57 (1.13-2.19)	1.36 (1.09-1.70)	1.30 (1.04-1.61)
Physical capital						
Richer	1	1	1	1	1	1
Poorer	1.28 (1.01-1.63)	1.20 (0.90-1.59)	1.44 (1.15-1.79)	1.64 (1.23-2.19)	1.34 (1.15-1.56)	1.31 (1.13-1.51)
Public capital						
Richer	1	1	1	1	1	1
Poorer	1.41 (0.83-2.38)	1.47 (0.94-2.28)	1.37 (0.92-2.05)	1.17 (0.91-1.50)	1.38 (1.17-1.62)	1.52 (1.27 -1.83)

Note: Models adjusted for age (continuous and quadratic term) and marital status (single/married or cohabiting).

Relatively stronger socioeconomic determinants of relative inequalities

To determine which socioeconomic dimensions were associated with relatively larger relative inequalities in women's current non-use of contraception all models were adjusted for age (continuous and quadratic) and marital status (single/married or cohabiting) and mutually adjusted for all SEP measures of interest excluding the HWI in view of collinearity, as physical and public assets are included in the HWI (see Spearman rank correlations page 116). As mentioned in the previous section (page 132) these models correspond to a hypothetical situation whereby inequalities in use of contraception by one dimension of SEP are adjusted for the equal distribution of the other SEP dimensions of interest e.g. PRs by level of education are adjusted for the distribution of Physical and Public capital socioeconomic circumstances within each level of education.

National levels

Results in Table 5.7 indicate that the relatively strongest socioeconomic indicator of inequalities in contraceptive behaviour varied over the period of study. In 1986, women in households with poorer Public capital PR 1.26 (95% CI 1.08-1.47) had the highest probability of current non-use of contraception with little difference from women in households with poorer Physical capital PR 1.24 (95% CI 1.07-1.43). In 1990, PRs for Public capital narrowed to non-significant levels while Physical capital remained relatively stable until 1995 as the strongest determinant of current non-use of contraception. In the last three survey years (2000, 2005 and 2010) the strongest association with current non-use of contraception was found among women with no level of formal education when compared to those with higher/secondary level.

Urban and rural place of residence

In urban areas, the strength of the association between current non-use of contraception and Physical and Public capital were relatively similar in 1986. Afterwards, Physical capital associations were stronger in 1990, 1995 and 2005. In2000 and 2010 Public capital was the strongest predictor. Over time, level of education remained non-significant.

In rural areas, the effect of Public capital was strongest in the earlier surveys (1986-1990) shifting to Physical capital between 1995 and 2000, but in the two latest surveys (2005, 2010) the strongest association of current non-use of contraception was for

women with no level of formal education when compared to those with Higher/Secondary level of education.

Sensitivity analyses

Sensitivity analysis provide similar evidence than the analytical sample with respect to the direction of the association between women's current non-use of contraception and level of education, Physical and Public capital. The strength of the association was slightly stronger for all SEP dimensions in the main analytical sample than the sensitivity sample with minor exceptions for PRs by Primary level of education (National and urban level) and by Public capital in urban and rural areas (Table 12.9 in appendix 4, page 314).

Table 5.7 Mutually adjusted prevalence ratio (PR) (95% CI) for women exposed to the risk of pregnancy by SEP measures in national, urban and rural areas 1986-2010

| | PR (95% CI) | | | | | |
	Higher/Secondary	Primary	None	Richer	Poorer	Richer	Poorer
		Level of education			Physical capital		Public capital
National							
1986	1	0.97 (0.84-1.12)	0.95 (0.72-1.24)	1	1.24 (1.07-1.43)	1	1.26 (1.08-1.47)
1990	1	0.96 (0.86-1.08)	1.08 (0.86-1.37)	1	1.24 (1.11-1.39)	1	1.09 (0.96-1.24)
1995	1	0.96 (0.87-1.06)	1.17 (0.96-1.42)	1	1.25 (1.14-1.38)	1	1.12 (1.01-1.24)
2000	1	1.02 (0.93-1.13)	1.29 (1.04-1.59)	1	1.17 (1.06-1.29)	1	1.20 (1.07-1.33)
2005	1	0.99 (0.93-1.04)	1.37 (1.20-1.56)	1	1.18 (1.11-1.24)	1	1.09 (1.03-1.15)
2010	1	0.94 (0.89-0.99)	1.35 (1.20-1.51)	1	1.09 (1.04-1.15)	1	1.20 (1.15-1.27)
Urban							
1986	1	0.96 (0.81-1.13)	0.79 (0.49-1.27)	1	1.22 (1.00-1.48)	1	1.24 (1.00-1.55)
1990	1	0.94 (0.83-1.06)	1.13 (0.85-1.49)	1	1.24 (1.10-1.41)	1	1.00 (0.84-1.19)
1995	1	0.92 (0.81-1.05)	0.97 (0.64-1.47)	1	1.22 (1.09-1.37)	1	1.02 (0.86-1.20
2000	1	0.96 (0.84-1.09)	1.13 (0.79-1.62)	1	1.12 (1.00-1.25)	1	1.18 (1.01-1.37)
2005	1	0.94 (0.88-1.01)	0.95 (0.76-1.18)	1	1.19 (1.12-1.26)	1	1.05 (0.98-1.12)
2010	1	0.91 (0.85-0.97)	1.14 (0.94-1.39)	1	1.11 (1.04-1.17)	1	1.22 (1.15-1.29)
Rural							
1986	1	1.04 (0.75-1.43)	1.20 (0.79-1.81)	1	1.25 (0.99-1.58)	1	1.30 (0.80-2.11)
1990	1	1.16 (0.78-1.73)	1.20 (0.69-2.09)	1	1.11 (0.83-1.51)	1	1.42 (0.91-2.21)
1995	1	1.04 (0.87-1.24)	1.31 (1.02-1.70)	1	1.35 (1.08-1.69)	1	1.17 (0.79-1.71)
2000	1	1.17 (0.97-1.42)	1.52 (1.13-2.04)	1	1.57 (1.15-2.13)	1	0.98 (0.78-1.22)
2005	1	1.09 (0.98-1.21)	1.80 (1.52-2.12)	1	1.22 (1.05-1.43)	1	1.27 (1.07-1.50)
2010	1	1.05 (0.96-1.15)	1.62 (1.39-1.88)	1	1.19 (1.03-1.38)	1	1.44 (1.20-1.73)

Note: Models mutually adjusted for level of education, Physical and Public capital, age (continuous and quadratic term) and marital status (married-cohabiting/single).The HWI was not included in this model in view of collinearity, as the Physical and Public capital items are contained in the HWI.

Relative inequalities in women's current non-use of contraception using the Relative index of inequality (RII)

The RII is a regression-based measure of inequality based on the assumption of a linear relationship between the measure of SEP and current non-use of contraception. The RII measures the ratio of current non-use of contraception of the hypothetically most disadvantaged (x=1) to the most advantaged (x=0). A large score on the RII implies large socioeconomic inequalities of current non-use of contraception behaviour by the specific SEP measure (see methods page 76).

National level

National level relative inequalities in women's current non-use of contraception summarised using the RII are presented from 1986 until 2010 in Table 5.8. All models were adjusted for age (continuous and quadratic term) and for marital status (single/married or cohabiting). Both levels of adjustment increased slightly the size of inequalities (Table 12.17 in appendix 5, page 324).

Relative inequality levels by the HWI, Physical and Public capital were positive and in general of relatively similar size by survey wave. For example, in the year 2000 the RII by HWI was 1.67 (95% CI 1.40-1.99) whereas the size for Physical and Public capital were RII 1.66 (95% CI 1.40-1.96) and 1.75 (95% CI 1.43-2.14) respectively. RIIs for level of education were positive and relatively smaller than by asset-based measures of SEP, but remained non-significant except for years 2000 RII 1.34 (95% CI 1.11-1.61) and 2005 RII 1.13 (95% CI 1.02-1.26).

Changes over time from 1986 until 2010

Overall, there was a decrease in the size of inequalities in women's current non-use of contraception in 2010 vs. 1986. The largest change was by HWI from RII 2.02 (95% CI 1.56-2.60) to RII 1.54 (95% CI 1.42-1.68), a 24% change, followed by an 18% change for Physical and Public capital. With respect to inequalities by level of education the size of inequalities decreased from RII 1.25 (95% CI 0.96-1.62) in 1986 to 1.01 (95% CI 0.92-1.11) in 2010, a change of 19%, although the size of inequalities at both time points was not statistically significant with relatively larger confidence intervals in 1986.

Sensitivity analyses

Results from sensitivity analyses from 1990 until 2010 were consistent in direction but stronger in size with respect to findings for the main analytical sample by HWI, Physical and Public capital. Inequalities bywomen'slevel of education were relatively stronger with positive direction, but were significant from 1995 until 2010 which was not the case with the analytical sample (Table 12.10 in appendix 4, page 315).

Departure from linear trend

There was evidence of a linear relation between current non-use of contraception and level of education, HWI and Physical capital socioeconomic rank in 1986 and 1990 and by Public capital in 1986, 1995, 2000 and 2005 (Appendix 6, page 325).

Urban and rural areas

Relative inequalities in women's current non-use of contraception using the RII by urban and rural area of residence from 1986 until 2010 are presented in Table 5.8. In general, adjustment for age (continuous and quadratic term) and for marital status (single/married or cohabiting) decreased slightly inequalities by HWI, Physical and Public capital and increased slightly inequalities by level of education (Table 12.17 in appendix5, page 324).

Relative inequalities among women in rural areas were larger than in urban areas from 1986 until 2010 by all measures of SEP, with minor exceptions by Physical capital in 1986 and by Public capital in the year 2000 when inequalities were larger among women in urban areas (Table 5.8).

Among women in urban areas inequalities by level of education were relatively smaller than by HWI, Physical and Public capital. The RII took the expected direction of larger inequalities for lower levels of education (RII greater than 1) from 1986 until 2000 and there was a reverse in the gradient in 2005 and 2010. The size of these inequalities in current non-use of contraception by level of education was statistically significant in 2010 RII 0.87 (95% CI 0.78-0.97) which indicates higher current non-use of contraception for women with higher levels of education.

Changes over time from 1986 until 2010

Similar to findings at the national level, in urban areas there was a decrease in the size of inequalities in women's current non-use of contraception in 2010 vs. 1986. The largest change was by Physical capital from RII 1.72 (95% CI 1.22-2.41) to RII 1.38 (95% CI 1.25-1.53), a 24% change, followed by an 17%, 14% and 12% change for HWI, level of education and Public capital respectively. With respect to inequalities in rural areas a different pattern was observed for changes in 2010 vs. 1986. There was a relatively minor decrease in inequalities by level of education and HWI of 9% and 6% respectively. Inequalities by Physical and Public capital developed overtime; while in 1986 confidence intervals were large and non-significant by 2010 the size of inequalities increased by 60% and 29% respectively and were statistically significant.

Sensitivity analyses

In sensitivity analysis there was no evidence of a reverse of the gradient by level of education in 2010 among women in urban areas; on the contrary there was evidence of inequalities by level of education in the expected direction RII 1.14 (95% CI 1.01-1.30) which indicates larger inequalities for women with lower levels of education. In rural areas, inequalities by level of education were consistent with respect to the direction but the size was relatively larger in the sensitivity sample than in the analytical sample.

Sensitivity results for HWI and Physical capital were consistent in direction but relatively larger than results for the analytical sample. A different pattern was observed for inequalities by Public capital whereby the direction was consistent but the size was relatively smaller in the sensitivity sample than among women in urban areas (1990 until 2010) and rural areas (1986) in the analytical sample.

Departure from linear trend

In urban and rural areas, a near linear relationship was observed between current non-use of contraception and the socioeconomic rank of each measure of SEP with exceptions by level of education (2010), HWI (2000, 2010), and in rural areas by level of education (1995, 2005, 2010), HWI (1990, 1995, 2005) and Physical (1995, 2005, 2010) and Public capital (2010).

Table 5.8 National, urban and rural RII (95% CI) of current non-use of contraception among women in marital union (married or cohabiting) and single sexually active DHS 1986-2010

		RII (95% CI) p-value							
		Level of education		Household wealth		Physical capital		Public capital	
National	**N**								
1986	**2,117**	1.25 (0.96-1.62)	0.10	2.02 (1.56-2.60)	<0.001	1.88 (1.46-2.42)	<0.001	1.94 (1.48-2.56)	<0.001
1990	**3,722**	1.20 (0.99-1.45)	0.06	1.61 (1.35-1.93)	<0.001	1.62 (1.35-1.94)	<0.001	1.48 (1.18-1.85)	0.001
1995	**5,286**	1.20 (1.00-1.45)	0.05	1.54 (1.30-1.82)	<0.001	1.62 (1.37-1.92)	<0.001	1.60 (1.34-1.90)	<0.001
2000	**5,598**	1.34 (1.11-1.61)	0.003	1.67 (1.40-1.99)	<0.001	1.66 (1.40-1.96)	<0.001	1.75 (1.43-2.14)	<0.001
2005	**20,023**	1.13 (1.02-1.26)	0.02	1.56 (1.42-1.71)	<0.001	1.59 (1.44-1.74)	<0.001	1.39 (1.25-1.53)	<0.001
2010	**28,077**	1.01 (0.92-1.11)	0.76	1.54 (1.42-1.68)	<0.001	1.54 (1.41-1.68)	<0.001	1.59 (1.46-1.74)	<0.001
Urban									
1986	**1,544**	1.01 (0.75-1.35)	0.97	1.84 (1.28-2.64)	0.001	1.72 (1.22-2.41)	0.002	1.86 (1.15-3.01)	0.01
1990	**3,232**	1.13 (0.91-1.39)	0.27	1.46 (1.18-1.80)	<0.001	1.41 (1.15-1.72)	0.001	1.25 (0.89-1.75)	0.20
1995	**3,883**	0.93 (0.74-1.17)	0.52	1.25 (1.01-1.56)	0.04	1.31 (1.07-1.60)	0.01	1.24(0.89-1.73)	0.20
2000	**4,186**	1.00 (0.80-1.26)	0.98	1.35 (1.08-1.69)	0.01	1.28 (1.04-1.56)	0.02	1.61 (1.17-2.22)	0.04
2005	**15,161**	0.93 (0.83-1.05)	0.23	1.44 (1.28-1.60)	<0.001	1.42 (1.28-1.58)	<0.001	1.21 (1.06-1.38)	0.004
2010	**20,260**	0.87 (0.78-0.97)	0.01	1.52 (1.37-1.69)	<0.001	1.38 (1.25-1.53)	<0.001	1.63 (1.46-1.83)	<0.001
Rural									
1986	**573**	1.40 (0.76-2.59)	0.28	2.54 (1.00-6.49)	0.05	1.57 (0.88-2.79)	0.13	2.11 (0.78-5.68)	0.14
1990	**489**	1.47 (0.72-3.00)	0.29	2.98 (1.24-7.16)	0.02	1.90 (1.07-3.37)	0.03	2.43 (1.00-5.93)	0.05
1995	**1,403**	1.50 (1.01-2.22)	0.04	2.06 (0.95-4.48)	0.07	2.09 (1.24-3.52)	0.01	1.99 (1.02-3.89)	0.04
2000	**1,412**	1.71 (1.12-2.59)	0.01	2.27 (1.41-3.67)	0.001	2.81 (1.78-4.41)	<0.001	1.39 (0.87-2.21)	0.17
2005	**4,913**	1.67 (1.30-2.13)	<0.001	2.55 (1.84-3.54)	<0.001	2.40 (1.84-3.15)	<0.001	1.93 (1.47-2.53)	<0.001
2010	**7,817**	1.27 (1.04-1.56)	0.02	2.40 (1.81-3.18)	<0.001	2.50 (1.99-3.15)	<0.001	2.72 (1.97-3.75)	<0.001

Note: All models adjusted for age (continuous and quadratic term) and marital status (married or cohabiting/single).

Relatively stronger socioeconomic determinants of relative inequalities (RII)

Consistent with previous sections, to determine which socioeconomic dimensions were associated with relatively larger relative inequalities in women's current non-use of contraception all models were adjusted for age (continuous and quadratic) and marital status (single/married or cohabiting) and mutually adjusted for all SEP measures of interest excluding the HWI in view of collinearity, as physical and public assets are included in the HWI (see Spearman rank correlations page 116). As mentioned before, these models correspond to a hypothetical situation whereby inequalities in use of contraception by one dimension of SEP are adjusted for the equal distribution of the other SEP dimensions of interest e.g. PRs by level of education are adjusted for the distribution of Physical and Public capital socioeconomic circumstances within each level of education.

National level

Mutually adjusted models for level of education, Physical and Public capitals indicate that the strongest socioeconomic indicator of inequalities in current non-use of contraception summarised using the RII varied over time, similar to results presented using PRs (page 142).

At the national level (Table 5.9), Physical and Public capital were both similarly strong predictors of inequalities in current non-use of contraception in 1986, 2000 and 2010, but at all other time points Physical capital was relatively a stronger than Public capital. A woman's level of education predicted relatively smaller inequalities in use of modern contraception in the opposite direction to HWI, Physical and Public capital. This reverse of the gradient by level of education was statistically significant in 2005 and 2010, and hypothetically indicates that inequalities in current non-use of contraception by level of education adjusted for the distribution of Physical and Public capital increased for women with higher levels of education. Compared to univariate models (Table 12.17 in appendix 5, page 324), mutually adjusted models are consistent in pointing at the same SEP measure as the relatively strongest socioeconomic determinant for each survey wave.

Urban and rural place of residence

Compared to findings at the national level, mutually adjusted models among women in urban areas had a similar pattern (Table 5.9), whereby Physical (1986, 1990, 1995 and

2005) and Public capital (2000 and 2010) were relatively stronger predictors of inequalities in current non-use of contraception. A reverse of the gradient was found by level of education which was relatively smaller than at national levels and significant in 2005 and 2010 only. An exception was the RII for Public capital in 1990 where the direction of the RII was opposite to national levels, but was not statistically significant. Mutually adjusted models among women in rural areas indicate that Physical (1995, 2000, 2005 and 2010) and Public capital (1986 and 1990) were relatively stronger predictors of inequalities in current non-use of contraception. In contrast to national and urban estimates, the RIIs for level of education took the expected gradient from 1986 until 2005, although significant in 2005 only. In 2010 there was some evidence of a reverse of the gradient but it was relatively smaller and not statically significant.

Compared to univariate models (Table 12.17 in appendix 5, page 324), mutually adjusted models for each survey year were consistent in pointing at the same SEP measure as the relatively strongest socioeconomic determinant of inequalities in current non-use of contraception among women in urban areas and rural areas, except for 1986 in urban areas and 2010 in rural areas.

Sensitivity analyses

Sensitivity analyses provide similar evidence with respect to size and direction at the national level and by urban and rural place of residence from 1990 until 2010. National and rural estimates for Physical capital were relatively larger than for the analytical sample (Table 12.11 in appendix 4, page 316).

Table 5.9 National, urban and rural mutually adjusted RII (95% CI) of current non-use of contraception among women in marital union (married or cohabiting) and single sexually active DHS 1986-2010

National	N	RII (95% CI)					
		Level of Education		Physical capital		Public capital	
1986	2,117	0.89 (0.68-1.16)	0.40	1.55 (1.14-2.11)	0.01	1.53 (1.11-2.12)	0.01
1990	3,722	0.92 (0.74-1.14)	0.44	1.58 (1.27-1.96)	<0.001	1.18 (0.91-1.52)	0.21
1995	5,286	0.88 (0.72-1.08)	0.22	1.49 (1.22-0.61)	<0.001	1.32 (1.07-1.61)	0.01
2000	5,598	1.00 (0.82-1.22)	0.98	1.41 (1.16-1.71)	<0.001	1.43 (1.15-1.79)	0.001
2005	20,023	0.89 (0.80-0.99)	0.03	1.56 (1.41-1.74)	<0.001	1.17 (1.05-1.30)	0.004
2010	28,077	0.77 (0.70-0.85)	<0.001	1.47 (1.33-1.62)	<0.001	1.41 (1.28-1.56)	<0.001
Urban							
1986	1,544	0.79 (0.59-1.07)	0.13	1.69 (1.18-2.42)	0.004	1.61 (0.96-2.67)	0.07
1990	3,232	0.91 (0.73-1.14)	0.41	1.54 (1.22-1.95)	<0.001	0.99 (0.70-1.42)	0.97
1995	3,883	0.81 (0.63-1.03)	0.09	1.39 (1.10-1.74)	0.01	1.09 (0.76-1.55)	0.65
2000	4,186	0.90 (0.71-1.14)	0.37	1.24 (1.00-1.54)	0.05	1.47 (1.06-2.05)	0.02
2005	15,161	0.79 (0.70-0.89)	<0.001	1.51 (1.34-1.70)	<0.001	1.06 (0.93-1.22)	0.37
2010	20,260	0.74 (0.66-0.83)	<0.001	1.39 (1.24-1.55)	<0.001	1.49 (1.32-1.68)	<0.001
Rural							
1986	573	1.20 (0.65-2.23)	0.56	1.35 (0.75-2.45)	0.32	1.65 (0.66-4.15)	0.29
1990	489	1.15 (0.54-2.45)	0.71	1.59 (0.86-2.92)	0.14	1.97 (0.84-4.60)	0.12
1995	1,403	1.04 (0.71-1.53)	0.84	1.95 (1.17-3.25)	0.01	1.18 (0.61-2.28)	0.62
2000	1,412	1.40 (0.92-2.13)	0.11	2.64 (1.61-4.33)	<0.001	0.92 (0.60-1.42)	0.72
2005	4,913	1.30 (1.02-1.65)	0.04	2.03 (1.54-2.67)	<0.001	1.53 (1.17-1.99)	0.002
2010	7,817	0.99 (0.80-1.21)	0.89	2.17 (1.73-2.72)	<0.001	2.07 (1.49-2.86)	<0.001

Note: All models mutually adjusted for level of education, Physical and Public capital, age (continuous and quadratic term) and marital status (married-cohabiting/single). The HWI was not included in these models in view of collinearity, as the physical and public assets are contained in the HWI.

5.4.   Summary of main findings and discussion

Main findings

- In general, there were strong associations (PR 95% CI) between current non-use of contraception and all SEP dimensions of interest at the national level and by urban and rural place of residence. These associations were on the expected direction whereby women who lived in poorer households with respect to HWI, Physical and Public capital and women with lower levels of education had higher PRs than those who lived in richer households and had higher achieved levels of education respectively.

- Over time, the strength of the association between current non-use of contraception and HWI, Physical and Public capital became smaller at the national level and in general in urban areas, whereas it increased in rural areas. The association between current non-use of contraception and no level of education became stronger and significant over time at the national level and among women in urban and rural areas.

- There was evidence of inequalities in current non-use of contraception by all four measures of SEP summarised using the RII. The size of these inequalities was larger among women in rural areas than in urban areas from 1986 until 2010 by all measures of SEP, with minor exceptions.

- Mutually adjusted models for level of education, Physical and Public capital indicate that the strongest socioeconomic predictor of inequalities in contraceptive behaviour varied over time and between urban and rural areas. In general, relative inequalities were stronger by Physical and Public capital.

Discussion

Findings from this section provide evidence that relative socioeconomic inequalities in women's current non-use of contraception by household asset-based measures and women's level of education have persisted in Colombia over the past 24 years. Findings at the national level mask hypothesized differences in the size of inequalities between women in urban vs. rural areas. Both measures of inequality used in this section, the PR and the RII, provide evidence consistent with the hypothesis that inequalities were larger among women in rural than urban areas. Possible mechanisms for these differences in the magnitude of inequalities have been discussed in previous chapter by

stressing differences in women's reported realized and wanted fertility rates in urban vs. rural areas, which are inextricably linked with educational opportunities, empowerment and social mobility associated with higher use of contraception and lower fertility levels.

These findings should be interpreted bearing in mind that both measures provide complementary information about the magnitude of these relative inequalities. A disadvantage of the PR measure is that it does not include information about all the SEP categories, but only on the two opposing groups e.g. no level of education compared to higher/secondary level of education (reference group). The use of the RII overcomes this limitation as it summarizes inequalities using information across all SEP groups by taking into account the relative position and size of the educational groups, which allows sound comparisons between groups e.g. urban and rural women and time trends. In this section these measurement characteristics translate into the observed relatively stronger PRs for women with no-level of education in relationship to women with higher/secondary levels of education which persisted over time and increased in general at the national and rural level, while the RII indicates that the educational gradient across all levels of education persisted and was significantly stronger particularly in rural areas.

Similar to the previous section on absolute inequalities, relative inequalities in mutually adjusted models for level of education, Physical and Public capital support the hypothesis that inequalities in women's current non-use of contraception were relatively larger by Physical capital than by level of education, except for PRs among women in rural areas with no level of education in 2005 and 2010.Measurement issues could lead to misinterpretation of these results. Small samples and skewed distribution of women particularly in rural areas could lead to biased resultsandalthough the RII takes into account the size and distribution of women by SEP categories, results should be interpreted with caution as in theory women with lower levels of education are more likely to be clustered in households with poorer access to physical and public assets. The purpose of this mutually adjusted model was to identify which socioeconomic dimensions are relatively more important for women with respect to their contraceptive behaviour, Results suggest that all three dimensions of SEP: level of education (Human capital), Public and Physical capital identified inequalities in current non-use of contraception at different points in time and differently by urban and rural place of residence (see general discussion chapter 10 page 265).

5.5. *Trends in socioeconomic inequalities of current non-use of contraception*

This section examines trends in absolute and relative socioeconomic inequalities of current non-use of contraception by women's level of education, HWI, Physical and Public capital. The SII and RII are used to present population weighted estimates of absolute and relative inequalities respectively over the period from 1986 until 2010. It was hypothesised that there has been a decrease or no change in non-use of contraception at the national level that masked differences in socioeconomic trends within the country, whereby inequalities between 1986 and 2010 stayed the same in urban areas but increased in rural areas. The rationale for this hypothesis was based on the experience, during the 1990s, of family planning graduation programmes parallel to the health sector reform in Colombia, two factors that have been associated with an increase in national CPR levels, but important within country variations [130-133].

National level

National level trends in absolute and relative socioeconomic inequalities in women's current non-use of contraception from 1986 until 2010 are presented in Figure 9.Confidence intervals for absolute and relative estimates narrowed over time with the increase of sample size in each consecutive survey. All models were adjusted for age (continuous and quadratic term) and marital status (single/married or cohabiting) with an interaction term between each measure of SEP and survey year.

The test for linear trend for this period suggests there were no changes in absolute inequalities by level of education while there was a decrease by HWI (p-value=0.002) and Physical capital (p-value=0.001) and borderline evidence by Public capital (p=0.07). With respect to trends in relative inequalities there was no evidence of a linear time trend in current non-use of contraception by any of the measured socioeconomic dimensions.

Sensitivity analysis

Sensitivity analyses excluding women who reported intending to become pregnant in the following two years from the time of survey (Tables 12.4-12.10in appendix 4, page 309 and 315) were consistent with the main analytical sample except for borderline evidence of a decrease in absolute inequalities by HWI (p=0.07) and a decrease in relative inequalities by level of education (p-value=0.04).

Figure 9 Trends in absolute and relative socio economic inequalities in women's current non-use of contraception at the national level1986-2010

Absolute inequalities SII (95 % CI)   vs.   Relative Inequalities RII (95% CI)

p-value for linear trend=0.22

p-value for linear trend=0.52

p-value for linear trend=0.002

p-value for linear trend=0.20

p-value for linear trend=0.001

p-value for linear trend=0.17

p-value for linear trend=0.07

p-value for linearity=0.64
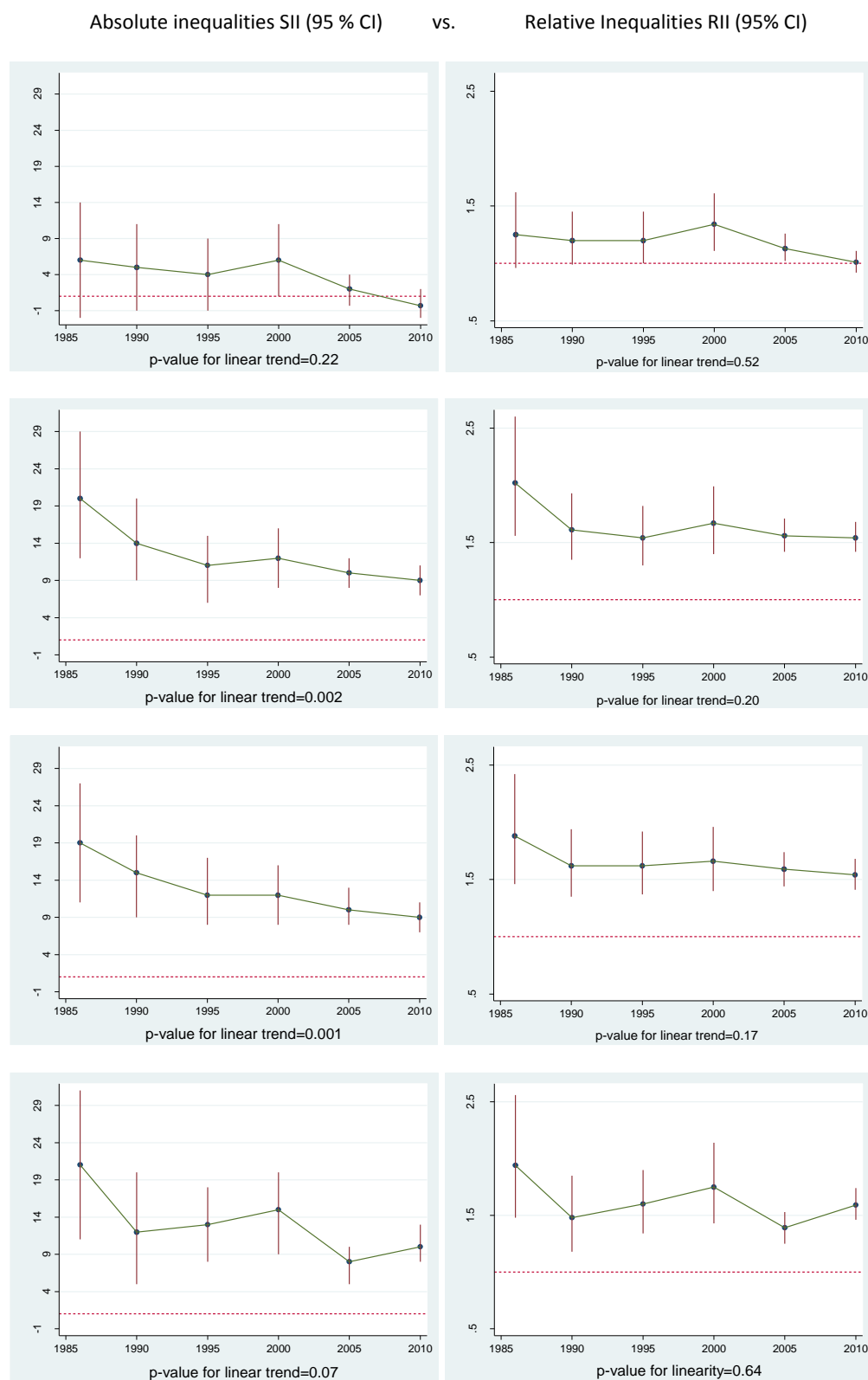
Urban and rural areas

Trends in absolute and relative socioeconomic inequalities in women's current non-use of contraception from 1986 until 2010 are presented for urban and rural areas in Figure 10 and 11 respectively. Confidence intervals around absolute and relative inequalities estimates are wide particularly for 1986 and 1990 in both urban and rural areas.

Among women in urban areas (Figure 10), there was no evidence of a linear time trend in absolute and relative inequalities by level of education. With respect to inequalities by household asset based measures, absolute and relative inequalities by HWI and Physical capital decreased gradually from 1986 until 1995 and thenincreasedslightly until 2010. In contrast, absolute and relative inequalities by Public capital show a zigzag pattern. The test for linear time trend suggests a linear decrease in absolute inequalities by Physical capital only (p-value=0.02).

Among women in rural areas (Figure 11), absolute inequalities by all measures of SEP were smaller in 2010 but there was no evidence of a linear time trend.Relativeinequalitiesseem to increase by Physical and Public capital, but there was no evidence of a linear time trend.

Sensitivity analyses

Among women in urban areas, sensitivity analysis from 1990 until 2010 provide evidence of a linear increase in absolute (p-value=0.04) and relative inequalities (p-value=0.03) by level of education and borderline evidence of an increase in relative inequalities by Public capital (p-value=0.06) which is consistent with findings for the main analytical sample. Among women in rural areas, sensitivity analyses were consistent with no evidence of a linear time trend in absolute and relative inequalities in the main analytical sample with the exception of relative inequalities by Public capital (p-value=0.03)(Tables 12.4-12.10 in appendix 4 page309).

Figure 10 Trends in absolute and relative socioeconomic inequalities in women's current non-use of contraception in urban areas 1986-2010

Absolute inequalities SII (95 % CI)   vs.   Relative Inequalities RII (95% CI)
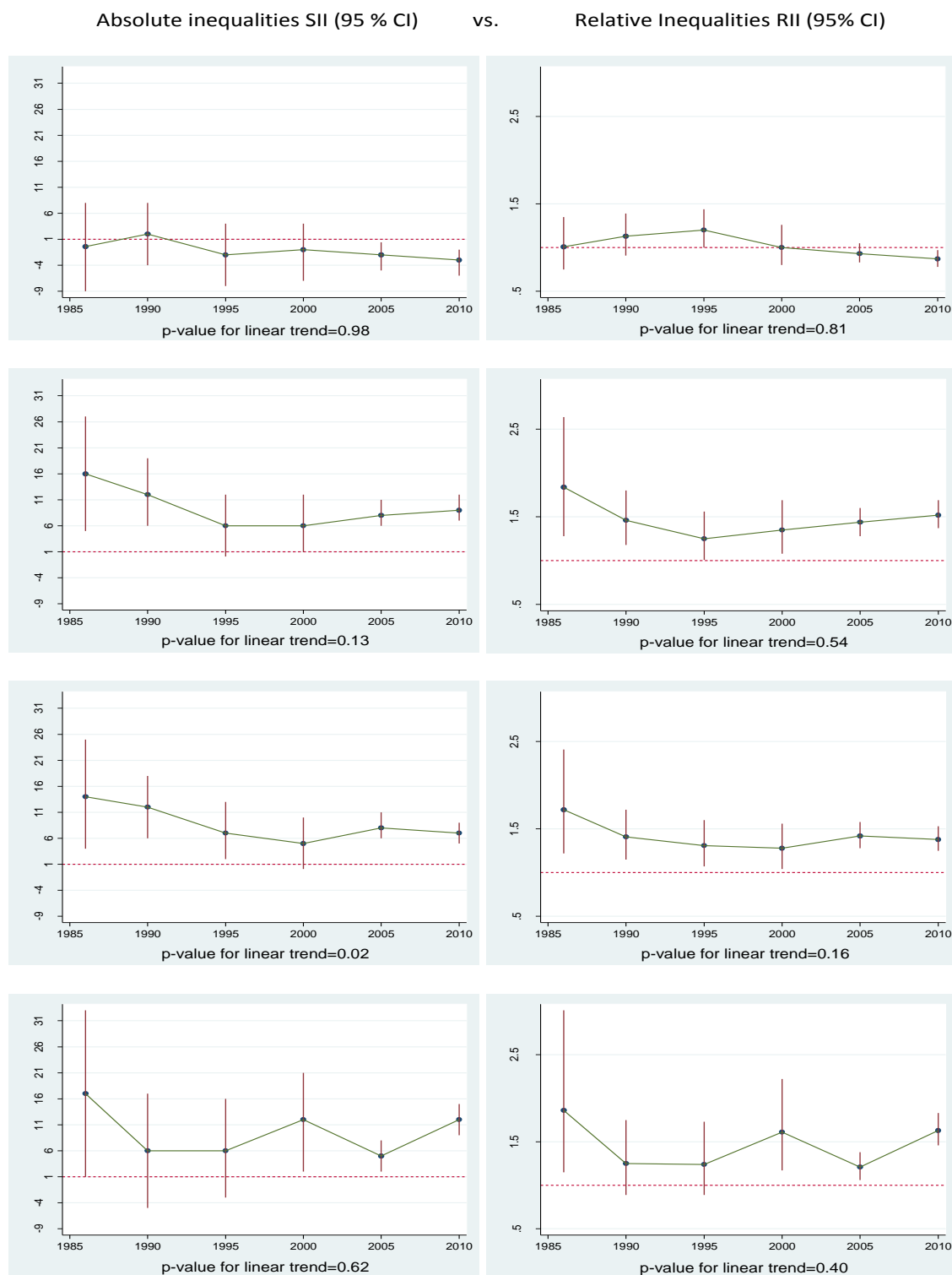
**Figure 11 Trends in absolute and relative socioeconomic inequalities in women's current non-use of contraception in rural areas 1986-2010**

Absolute inequalities SII (95 % CI) vs. Relative Inequalities RII (95% CI)
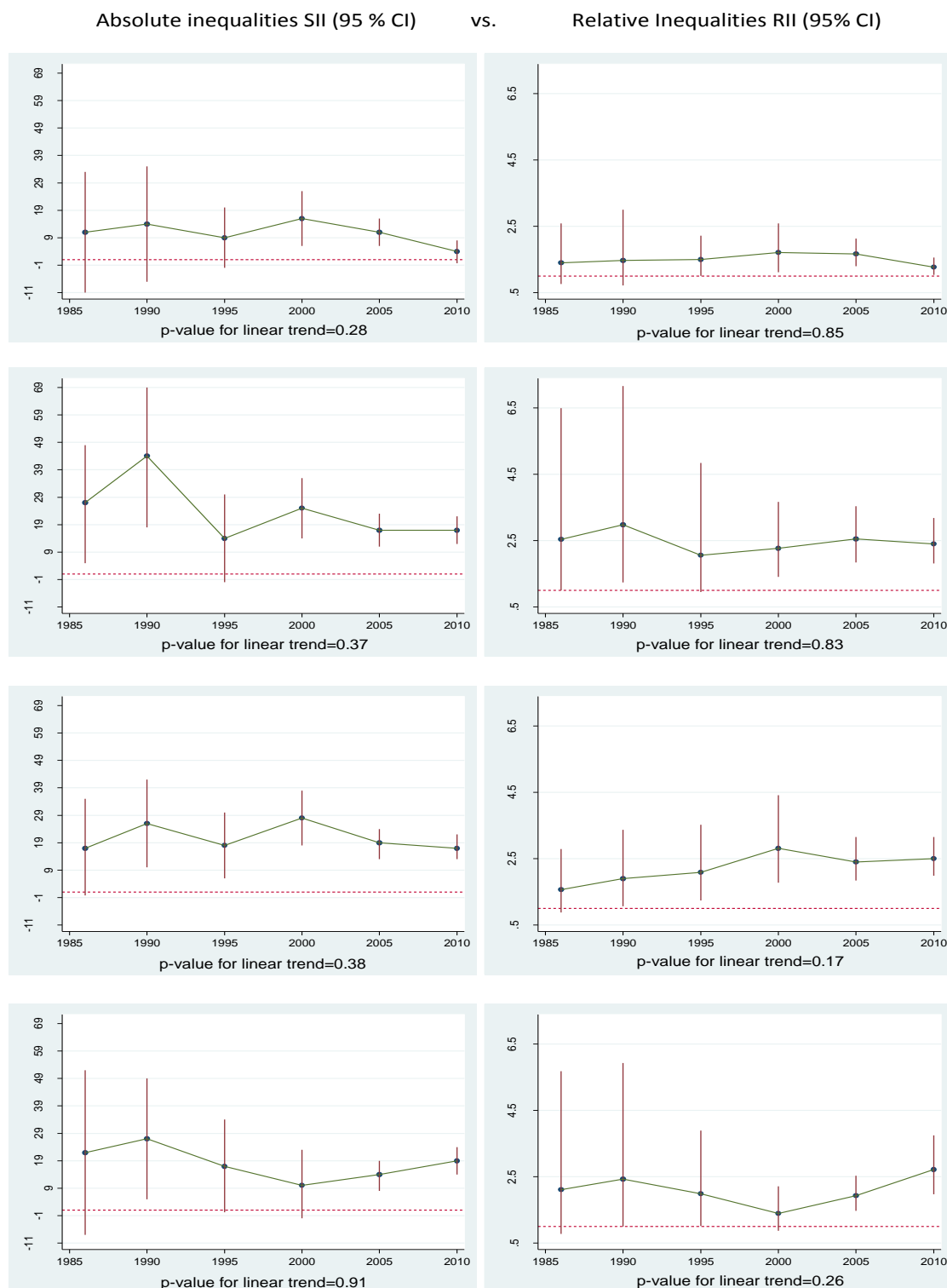
5.6.   Summary of main findings and discussion

Main findings

- Over the past 25 years in Colombia, national absolute socioeconomic inequalities in women's contraceptive behaviour by HWI and Physical capital have narrowed, while relative inequalities have remained stable. This pattern masks differences by urban and rural place of residence.

- Among women in urban areas, absolute socioeconomic inequalities by Physical capital in women's contraceptive non-use narrowed, but stayed relatively the same by level of education, HWI and Public capital. Relative inequalities remained stable by all SEP dimensions of interest.

- Among women in rural areas, absolute and relative socioeconomic inequalities in women's contraceptive behaviour remained the same by all SEP dimensions of interest.

Discussion

From the point of view of monitoring health inequalities and evaluating efforts towards achieving the MDGs, it is important to estimate both absolute and relative differences, as relative inequalities may remain constant while absolute inequalities increase [134,135]. Findings in this section are an example of the complimentary information provided by absolute and relative measures of socioeconomic inequalities with respect to women's current non-use of contraception in Colombia over the past 24 years and in the context of monitoring the CPR target of the MDG5. Further, these results stress the importance of disaggregating by urban and rural place of residence to monitor both national and within country socioeconomicinequalities [123,136,137].

Results at the national level suggest that although user rates of modern contraception have gone up substantially over the past two and a half decades; socioeconomic disadvantages have not been targeted successfully by public health policies. A similar pattern was observed among women in urban areas whereas in rural areas both absolute and relative inequalities by all SEP dimensions have remained constant over time. These findings are consistent with the proposed hypothesis that trends at the national level mask constant inequalities in urban areas, but there was no evidence to support that inequalities have increased in rural areas. Measurement differences between absolute and relative measures of inequality should be considered. The SII as an

absolute measure of inequality is sensitive to changes in the mean level of population health or changes in the frequency of the health problem under study. If the mean level of health increases in the same proportion in all the SEP categories, the SII will increasewhereasthe relative differences will remain constant [138,139]. Previous studies have shown that the magnitude of both absolute and relative inequalities in health outcomes is empirically related to the prevalence level of the outcome [138,140,141]. Changes over time in the prevalence level of current non-use of contraception in Colombia should be taken into account when monitoring socioeconomic health inequalities [142], particularly as these changes have not been homogeneous across SEP groups e.g. prevalence of non-use increased for women with no achieved level of education while it decreased for women with primary level of education.

Another measurement issue that needs to be taken into account when examining trends in socioeconomic inequalities is the comparability of the SEP dimensions. For example, women's level of education has presumably changed over the past 24 years in Colombia. First, changes in quality, content and information provided to women limits comparability of the mechanisms through which education operates with relationship to current non-use of contraception e.g. quality standards are expected to be better in 2010 than back in 1986 after reforms on the education system and the introduction of mandatory sexual education in schools in 1993 could have an impact on the way education operates in relationship to women's health. Second, the social value attributed to women's educational opportunities and the hypothesised benefits that it provides to women with respect to empowerment and social mobility are subject to cultural norms, political context and vary between urban and rural places of residence (see general discussion chapter 10 page 268).

Chapter 6:

The effect of women's level of education on current non-use of contraception by household level of Public capital

1986-2010

6. The effect of women's level of education on current non-use of contraception by household level of Public capital 1986-2010

Introduction

The objective of this chapter is to examine the interplay between different kinds of social inequality through the identification of interactions between socioeconomic dimensions. Studies in Peru, Brazil and Colombia have found that access to public assets has different effects depending on women's level of education [80,82,143]. This interaction indicates that women's level of education and Public capital may complement or substitute for each other. The main hypothesis in this chapter is that provision of Public capital compensates for low levels of education such that the education gradient in contraceptive behaviour is smaller among women in households with high Public capital than low Public capital. The rationale underlying this hypothesis is that women in households with higher Public capital i.e. public provision of infrastructure are better served areas with respect to family planning services through higher availability of health services and pharmacies independent.

This chapter is divided into two sections. The first section presents the absolute and relative effect of women's level of education on current non-use of contraception interacting with Public capital using the SII (95% CI) and RII (95% CI). The second section provides predicted probabilities of the effect of each level of education interacting with both levels of Public capital to aid interpretation of the interaction results.

All models are presented at the national level and by urban and rural place of residence. The main analytical sample is women of reproductive age (15-49 years old) 'at risk of pregnancy' defined as fecund women (not pregnant, amenorrheic or menopausal) in marital union (married/cohabiting) and women not in union but sexually active in the interview month. Sensitivity analyses were carried out excluding women who reported intending to become pregnant at some point in the following two years to account for fertility desires (Tables 12.12-12.14in appendix 4, page 317).

6.1. Absolute and relative education gradients by level of Public capital on women's current non-use of contraception

National level

Table 6.1 shows results for the hypothesis that provision of Public capital compensates for low levels of women's education with respect to current non-use of contraception at the national level. The first model (adjusted 1Table 6.1) estimates the effect of women's level of education on current non-use of contraception in households with low and high Public capital by fitting an interaction term between level of education (population weighted score) and Public capital (High/Low) adjusted for age (continuous and quadratic term) and marital status (single/married or cohabiting) from 1986 until 2010.

Three main characteristics were observed for the first level of adjustment. First, with respect to the size of inequalities results provide evidence of larger absolute and relative inequalities by level of education among women in households with low Public capital than high Public capital. For example, absolute inequality by level of education in current non-use of contraception in 1990 among women in households with low Public capital summarised using the SII was 0.19 (95% CI 0.04-0.33) vs. -0.01 (95% CI -0.08-0.05) among women in households with high Public capital. In the case of relative inequalities by level of education, the RII in 1990 among women in households with low Public capital was 1.71 (95% CI 1.09-2.67) larger and in opposite direction than an RII of 0.98 (95% CI 0.78-1.23) among women in households with high Public capital. Over time, the size of absolute and relative inequalities among women in households with low Public capital decreased.

Second, among women in households with low Public capital inequalities were statistically significant from 1990 until 2005, but the direction of the absolute and relative gradient was not clearin1986 and 2010. In contrast, among women in households with high Public capital absolute and relative inequalities in use of contraception by level of education were not statistically significant, except in years 2005 and 2010 when there was borderline evidence of an educational gradient in the opposite direction.

Third, there was evidence of interaction between level of education and level of Public capital at the national level from 1990 until 2005 suggesting that the absolute and relative effect of a woman's level of education on current non-use of contraception was

statistically different among women in households with low Public capital vs. high Public capital.

Adjustment for household wealth differences

The second level of adjustment (adjusted 2Table 6.1) takes account of household wealth differences in the form of Physical capital e.g. ownership of durable assets and household construction materials. Households with higher Public capital were wealthier than households with lower Public capital with respect to Physical capital. For example, households with high Public capital in 1986 were 0.85 standard deviations (SD) wealthier in physical capital score and respectively for each year: 1990=1.05 SD, 1995=1.15 SD, 2000=1.13 SD, 2005=0.83 and 2010=0.93 SD (unpaired t test p-value <0.001 for all years). Adjustment for this dimension explained the absolute and relative gradients observed among women in households with low Public capital from 1990 until 2005. In 2010 the gradient by level of education took the opposite direction but interactions remained.

Sensitivity analyses

Sensitivity analyses for the first level of adjustment are consistent with those found for the main analytical sample. In contrast to results for the main analytical sample, adjustment for Physical capital (adjusted 2) among women in the sensitivity sample attenuated the absolute and relative gradient in current non-use of contraception by level of education in households with low Public capital at the national level from 1990 until 2005 and explained absolute and relative gradients in 2010. There was evidence of interaction between level of education and Public capital at the national level from 1990 until 2010. These interactions remained after adjustment for Physical capital except in 2010 where there was borderline evidence of an interaction (p-value for interaction=0.06) (Table 12.12 in appendix 4).

Table 6.1National absolute (SII 95% CI) and relative (RII 95% CI) effect of women's level of education on current non-use of modern contraception in households with low and high Public capital

	SII (95% CI)		RII (95% CI)	
	Public capital		**Public capital**	
	High	**Low**	**High**	**Low**
1986				
Adjusted 1	-0.03 (-0.11-0.06)	0.07 (-0.09-0.22)	0.92 (0.68-1.11)	1.23 (0.77-1.96)
Interaction		*0.32*		*0.30*
Adjusted 2	-0.06 (-0.14-0.02)	0.02 (-0.15-0.20)	0.82 (0.61-1.11)	1.03 (0.64-1.67)
Interaction		*0.39*		*0.41*
1990				
Adjusted 1	-0.01 (-0.08-0.05)	0.19 (0.04-0.33)	0.98 (0.78-1.23)	1.71 (1.09-2.67)
Interaction		*0.01*		*0.03*
Adjusted 2	-0.06 (-0.13-0.01)	0.13 (-0.01-0.27)	0.83 (0.65-1.05)	1.46 (0.93-2.29)
Interaction		*0.02*		*0.03*
1995				
Adjusted 1	-0.05 (-0.11-0.01)	0.12 (0.02-0.22)	0.82 (0.64-1.05)	1.54 (1.10-2.15)
Interaction		*0.003*		*0.003*
Adjusted 2	-0.10 (-0.16-(-0.04))	0.08 (-0.02-0.18)	0.69 (0.54-0.90)	1.35 (0.97-1.90)
Interaction		*0.002*		*0.002*
2000				
Adjusted 1	-0.02(-0.07-0.04)	0.10 (0.01-0.20)	1.01 (0.79-1.27)	1.44 (1.03-2.00)
Interaction		*0.03*		*0.08*
Adjusted 2	-0.06 (-0.11-0.001)	0.07 (-0.02-0.17)	0.86 (0.67-1.10)	1.31 (0.94-1.82)
Interaction		*0.02*		*0.04*
2005				
Adjusted 1	-0.03 (-0.06-(-0.01))	0.05 (0.01-0.09)	0.89 (0.78-1.02)	1.29 (1.11-1.50)
Interaction		*0.001*		*<0.001*
Adjusted 2	-0.07 (-0.10-(-0.04))	0.004 (-0.03-0.04)	0.74 (0.65-0.86)	1.08 (0.93-1.27)
Interaction		*0.001*		*<0.001*
2010				
Adjusted 1	-0.03 (-0.06-(-0.01))	-0.02 (-0.05-0.01)	0.87 (0.77-0.99)	0.95 (0.83-1.08)
Interaction		*0.45*		*0.38*
Adjusted 2	-0.07 (-0.09-(-0.04))	-0.06 (-0.09-(-0.03))	0.75 (0.65-0.85)	0.81 (0.71-0.92)
Interaction		*0.64*		*0.39*

Adjusted 1: adjusted for age (continuous and quadratic term) and marital status (single/married or cohabiting); Adjusted 2: adjusted 1 + Physical capital (population weighted variable). Analytical sample corresponds to women of reproductive age (15-49 years old) 'at risk of pregnancy' defined as fecund women (not pregnant, amenorrheic or menopausal) in marital union (married/cohabiting) and women not in union but sexually active in the interview month.

Urban areas

Urban and rural differences in the effect of women's level of education on current non-use of contraception interacting with household level of Public capital are presented in Table6.2and 6.3. Stratification by place of residence shows a different picture compared to national estimates in Table 6.1. Among women in urban areas (Table 6.2) the absolute and relative effect of achieved level of education (highest (0) to lowest (1)) on current non-use of contraception was stronger for women living in households with low Public capital than high Public capital, with minor exceptions in absolute inequalities in 2005 and by relative inequalities in 2010. There was no statistically significant evidence of absolute and relative inequalities by level of education among women in either high or low Public capital households from 1986 until 2005with the exception of absolute inequalities in 1990 among women in households with low Public capital SII 0.21 (95% CI 0.01-0.40) and there was some of evidence of a change of direction in the absolute and relative gradients in 2010. There was evidence of interaction between level of education and Public capital in urban areas for absolute inequalities in 1990 only (interaction p-value=0.03).

Adjustment for household wealth differences

Among urban areas, households with higher Public capital were wealthier than households with lower Public capital with respect to Physical capital. Similar to national levels, households with high Public capital in 1986 were 0.76 standard deviations (SD) wealthier in physical capital score and respectively for each survey wave:1990=1.03 SD, 1995=1.00 SD, 2000=0.94 SD, 2005=0.62, 2010=0.67 SD wealthier on Physical capital score (unpaired t test p-value <0.001 for all years).

Adjustment for Physical capital (adjusted 2 Table 6.2) attenuated the SII and RII coefficients among women in households with low Public capital with some exceptions in 2005 and 2010, while it increased the coefficients in households with high Public capital. The absolute gradient observed in 1990 among women in households with low Public capital was fully explained and there was a reverse of the relative gradient in 1995 among women in households with high Public capital RII 0.74 (95% CI 0.57-0.97) and for the absolute and relative gradients in 2005 in both high and low Public capital households.

Sensitivity analyses

Results from sensitivity analyses (Table 12.13 in appendix 4) differ with respect to the main analytical sample in four ways. First, the size of the absolute and relative gradient by level of education was larger among women in households with low Public capital than high Public capital in all years for the first level of adjustment although the absolute and relative gradients were very similar in 2010. Second, the absolute and relative gradient by level of education in 1990 was significant and the effect was attenuated after adjustment for Physical capital but remained significant. Third, there was evidence of interaction between level of education and level of Public capital in 1990 (borderline p-value for relative inequalities for first level of adjustment) and 1995 which remained after adjustment for Physical capital (adjusted 2). Fourth, the reverse of the gradient by level of education was not found in 2010.

Table 6.2 Absolute (SII 95% CI) and relative (RII 95% CI) effect of women's level of education on current non-use of modern contraception in households with low and high Public capital in urban areas 1986-2010

| | | SII (95% CI) | | | | | | RII (95% CI) | | | |
| | | Public capital | | | Interaction | | | Public capital | | | Interaction |
	n	High	n	Low	p-value	n	High	n	Low	p-value
1986											
Adjusted 1	1282	-0.04 (-0.13-0.05)	262	0.07 (-0.20-0.34)	0.44	1282	0.88 (0.64-1.20)	262	1.22 (0.53-2.82)	0.47
Adjusted 2		-0.07 (-0.16-0.01)		0.04 (-0.23-0.31)	0.43		0.76 (0.56-1.04)		0.98 (0.43-2.24)	0.57
1990											
Adjusted 1	2833	-0.01 (-0.08-0.06)	400	0.21 (0.01-0.40)	0.03	2833	1.04 (0.83-1.31)	400	1.60 (0.86-2.95)	0.21
Adjusted 2		-0.05 (-0.12-0.02)		0.15 (-0.05-0.34)	0.05		0.85 (0.67-1.09)		1.48 (0.82-2.68)	0.09
1995											
Adjusted 1	3391	-0.05 (-0.11-0.02)	492	0.10 (-0.09-0.29)	0.15	3391	0.84 (0.65-1.09)	492	1.42 (0.75-2.70)	0.14
Adjusted 2		-0.09 (-0.15-(-0.02))		0.07 (-0.13-0.26)	0.14		0.74 (0.57-0.97)		1.30 (0.69-2.47)	0.11
2000											
Adjusted 1	3627	-0.03 (-0.09-0.02)	559	0.04 (-0.12-0.19)	0.42	3627	0.94 (0.73-1.20)	559	1.20 (0.71-2.05)	0.40
Adjusted 2		-0.05 (-0.11-0.01)		0.02 (-0.13-0.17)	0.40		0.86 (0.66-1.12)		1.13 (0.66-1.92)	0.36
2005											
Adjusted 1	10919	-0.03 (-0.06-0.003)	4228	-0.02 (-0.07-0.03)	0.71	10919	0.91 (0.79-1.04)	4228	0.95 (0.77-1.18)	0.71
Adjusted 2		-0.06 (-0.09-(-0.03))		-0.05 (-0.10-(-0.004))	0.79		0.78 (0.67-0.90)		0.81 (0.65-1.01)	0.77
2010											
Adjusted 1	14826	-0.03 (-0.06-(-0.01))	5434	-0.06 (-0.10-(-0.01))	0.36	14826	0.87 (0.77-1.00)	5434	0.81 (0.67-0.97)	0.48
Adjusted 2		-0.06 (-0.09-(-0.03))		-0.09 (-0.14-(-0.04))	0.30		0.77 (0.67-0.88)		0.71 (0.58-0.86)	0.45

Adjusted 1: adjusted for age (continuous and quadratic term) and marital status (single/married or cohabiting); Adjusted 2: Adjusted 1 + Physical capital (population weighted variable). Analytical sample corresponds to women of reproductive age (15-49 years old) 'at risk of pregnancy' defined as fecund women (not pregnant, amenorrheic or menopausal) in marital union (married/cohabiting) and women not in union but sexually active in the interview month.

Rural areas

Among women in rural areas results from the first level of adjustment (adjusted 1Table 6.3) indicate that the absolute and relative effect of level of education (highest (0) to lowest (1)) on current non-use of contraception was stronger for women living in households with low Public capital than high Public capital, with exceptions in absolute and relative inequalities in 2000. There was statistically significant evidence of absolute and relative inequalities by level of education among women in households with low Public capital for absolute inequalities in 2000 and absolute and relative inequalities in 2005. Differences in the absolute and relative effect of education between low and high Public capital were statistically significant in 2005 and there was borderline evidence in 1995 for absolute inequalities only. Estimates for 1986 are not reliable due to small sample size of high Public capital in rural areas.

Adjustment for household wealth differences

In rural areas, households with higher Public capital were wealthier than households with lower Public capital with respect to Physical capital. Households with high Public capital in 1986 were 0.93 standard deviations (SD) wealthier in physical capital score and respectively for each survey wave: 1986=0.93 SD, 1990=0.40 SD, 1995=1.34 SD, 2000=0.86 SD, 2005=0.60 and 2010=0.85 SD wealthier on Physical capital score (unpaired t test p-value <0.001 for 1990 until 2010 and unpaired t test p-value=0.003 for 1986).

Adjustment for Physical capital (adjusted 2Table 6.3) explained the absolute gradient in 2000 and attenuated the absolute and relative gradient in 2005. There was some evidence of a reverse of the gradient among women in households with high Public capital for absolute inequalities in 1995 and relative inequalities in 2005. The evidence for interaction in 1995 and 2005 became stronger after adjustment for Physical capital.

Sensitivity analyses

Results from sensitivity analysis differed with respect to findings for the main analytical sample for both levels of adjustment (Table 12.14 in appendix 4). For the first level of adjustment (adjusted 1), there was evidence of statistically significant absolute and relative gradients among women in households with low Public capital from 1995 until 2010 whereas for the main analytical sample there was evidence in 2000 (absolute inequalities) and 2005 only.

The size of these gradients was larger than among women in households with high Public capital with the exception of relative inequalities in 2010. In contrast to the main analytical sample, sensitivity results provide evidence of interaction only for absolute inequalities in 2005 after adjustment for Physical capital. Adjustment for Physical capital (adjusted 2) explained the absolute and relative gradient in 1995 and absolute gradient in 2000, whereas it attenuated the relative gradient in 2000 and both absolute and relative gradients in 2005 and 2010.

Table 6.3 Absolute (SII 95% CI) and relative (RII 95% CI) effect of women's level of education on current non-use of modern contraception in households with low and high Public capital in rural areas 1986-2010

		SII (95% CI)						RII (95% CI)			
		Public capital			Interaction			Public capital			Interaction
	n	High	n	Low	p-value	n	High	n	Low	p-value
1986											
Adjusted 1	30	N.C	543	N.C.	-	30	14.7 [0.59-364.8]	543	1.23 (0.66-2.28)	0.14
Adjusted 2		N.C		N.C.	-		12.3 [0.49-306.3]		1.12 (0.59-2.13)	0.16
1990											
Adjusted 1	65	-0.01 (-0.63-0.61)	424	0.14 (-0.09-0.37)	0.66	65	0.93 (0.09-10.03)	424	1.46 (0.69-3.10)	0.73
Adjusted 2		-0.05 (-0.70-0.59)		0.01 (-0.22-0.24)	0.86		0.88 (0.08-9.64)		1.19 (0.54-2.64)	0.81
1995											
Adjusted 1	106	-0.19 (-0.46-0.08)	1297	0.10 (-0.02-0.21)	0.06	106	0.58 (0.17-2.01)	1297	1.50 (1.00-2.24)	0.39
Adjusted 2		-0.31 (-0.54-(-0.07))		0.03 (-0.09-0.15)	0.02		0.36 (0.11-1.15)		1.16 (0.77-1.76)	0.06
2000											
Adjusted 1	172	0.15 (-0.05-0.36)	1240	0.15 (0.03-0.27)	0.97	172	2.69 (0.89-8.14)	1240	1.53 (0.97-2.40)	0.35
Adjusted 2		0.05 (-0.16-0.27)		0.07 (-0.03-0.18)	0.85		1.70 (0.52-5.57)		1.37 (0.88-2.13)	0.74
2005											
Adjusted 1	636	-0.06 (-0.18-0.06)	4240	0.14 (0.08-0.19)	0.004	636	0.58 (0.26-1.29)	4240	1.78 (1.38-2.30)	0.008
Adjusted 2		-0.12 (-0.24-0.005)		0.09 (0.03-0.15)	0.002		0.44 (0.20-0.99)		1.48 (1.14-1.91)	0.005
2010											
Adjusted 1	603	0.003 (-0.10-0.10)	7214	0.03 (-0.01-0.08)	0.60	603	1.17 (0.54-2.56)	7214	1.22 (0.99-1.51)	0.92
Adjusted 2		-0.05 (-0.15-0.05)		-0.03 (-0.07-0.02)	0.64		0.94 (0.43-2.03)		1.00 (0.81-1.24)	0.86

Note: N.C. = no convergence of binomial or Poisson family model possibly due to small sample size. Adjusted 1: adjusted for age (continuous and quadratic term) and marital status (single/married or cohabiting); Adjusted 2: Adjusted 1 + Physical capital (population weighted variable). Analytical sample corresponds to women of reproductive age (15-49 years old) 'at risk of pregnancy' defined as fecund women (not pregnant, amenorrheic or menopausal) in marital union (married/cohabiting) and women not in union but sexually active in the interview month.

6.2. *Predicted probabilities of the effect of education on women's current non-use of contraception by level of Public capital*

The objective of this section is to aid the interpretation of the effect of women's level of education on current non-use of contraception interacting with level of Public capital. Model based predicted probabilities (PP 95% CI) are presented to show the interaction effect of each level of education among women in households with low Public capital and high Public capital. All models are fitted with an interaction term between level of education (Higher or secondary/primary/none) and level of Public capital (high/low) adjusted for age (continuous and quadratic term), marital status (single/married or cohabiting) and Physical capital.

National level

At the national level (Figure 12), predicted probabilities of women's current non-use of modern contraception by level of education show a clear gradient among women in households with low Public capital, particularly from 1990 until 2005, which was not observed among women in households with high Public capital. In line with results from the previous chapter (page 163) there was evidence of change in the direction of the education gradient from 1995 until 2005.

The effect of higher/secondary levels of education was of similar size among both low and high Public capital households except for 1986 and 1990, whereas the effect of primary and no achieved level of education predicted larger probabilities among women in households with low Public capital than high Public capital.

Sensitivity analyses

Predicted probabilities for the sensitivity sample were consistent with findings for the main analytical sample, but the gradient is slightly steeper among women in households with low Public capital especially in 1990 and 1995 and flatter for women in households with high Public capital (Figure 23 in appendix 4).

Figure 12 Predicted probabilities (95% CI): effect of women's level of education by level of Public capital on current non-use of contraception at the national level DHS 1986-2010
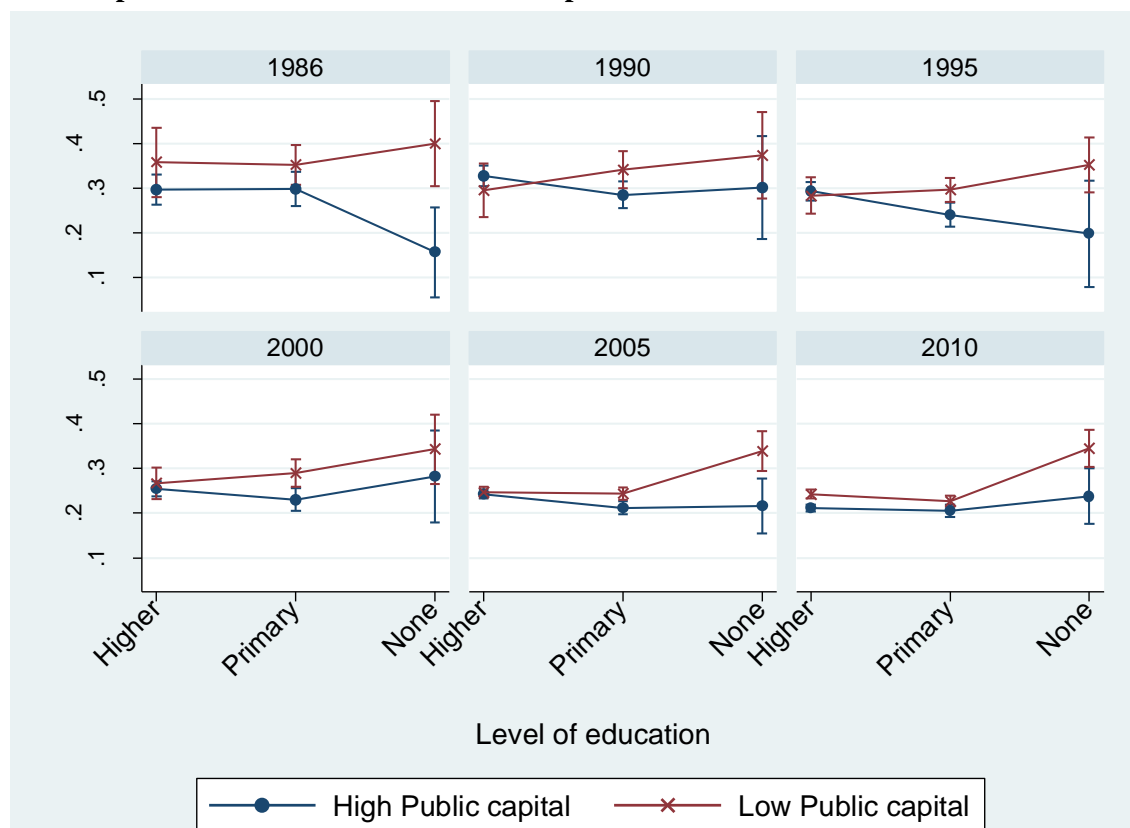
Note: Analytical sample corresponds to women of reproductive age (15-49 years old) 'at risk of pregnancy' defined as fecund women (not pregnant, amenorrheic or menopausal) in marital union (married/cohabiting) and women not in union but sexually active in the interview month. Higher level of education refers to reported achieved secondary and higher levels of education.

Urban and rural areas

Predicted probabilities of current non-use of contraception among women in urban areas (Figure 13) show a similar picture than results for the national level (Figure 12). There was evidence of a gradient in current non-use of contraception by women's level of education among households with low Public capital from 1990 until 2000, while a flat relationship by level of education was observed among households with high Public capital.

Predicted probabilities among women in rural areas show a different pattern than among women in urban areas (Figure 13). There was evidence of a gradient from 1986 until 2010 by level of education among households with low Public capital. Among women in households with high Public capital estimates are less reliable due to small sample size of women especially for those with no achieved level of education e.g. empty group in 1986, n=2 in 1990, n=1 in 1995, n=6 in 2000, n=14 in 2005 and n=17 in 2010.

Sensitivity analyses

Among women in urban areas, the sensitivity analysis was consistent with findings for the main analytical sample although predicted probabilities for women with no level of education were slightly smaller. In rural areas, findings from the sensitivity analysis were consistent with findings for the main analytical sample with respect to predicted probabilities among women in low Public capital households, but there was a clearer gradient among women in households with high Public capital with the exception of 1990 and 1995 due to small sample size (see Figure 24 in appendix 4).

Figure 13Predicted probabilities (95% CI): effect of women's level of education by level of Public capital on current non-use of contraception in urban (above) and rural (below) areas 1986-2010
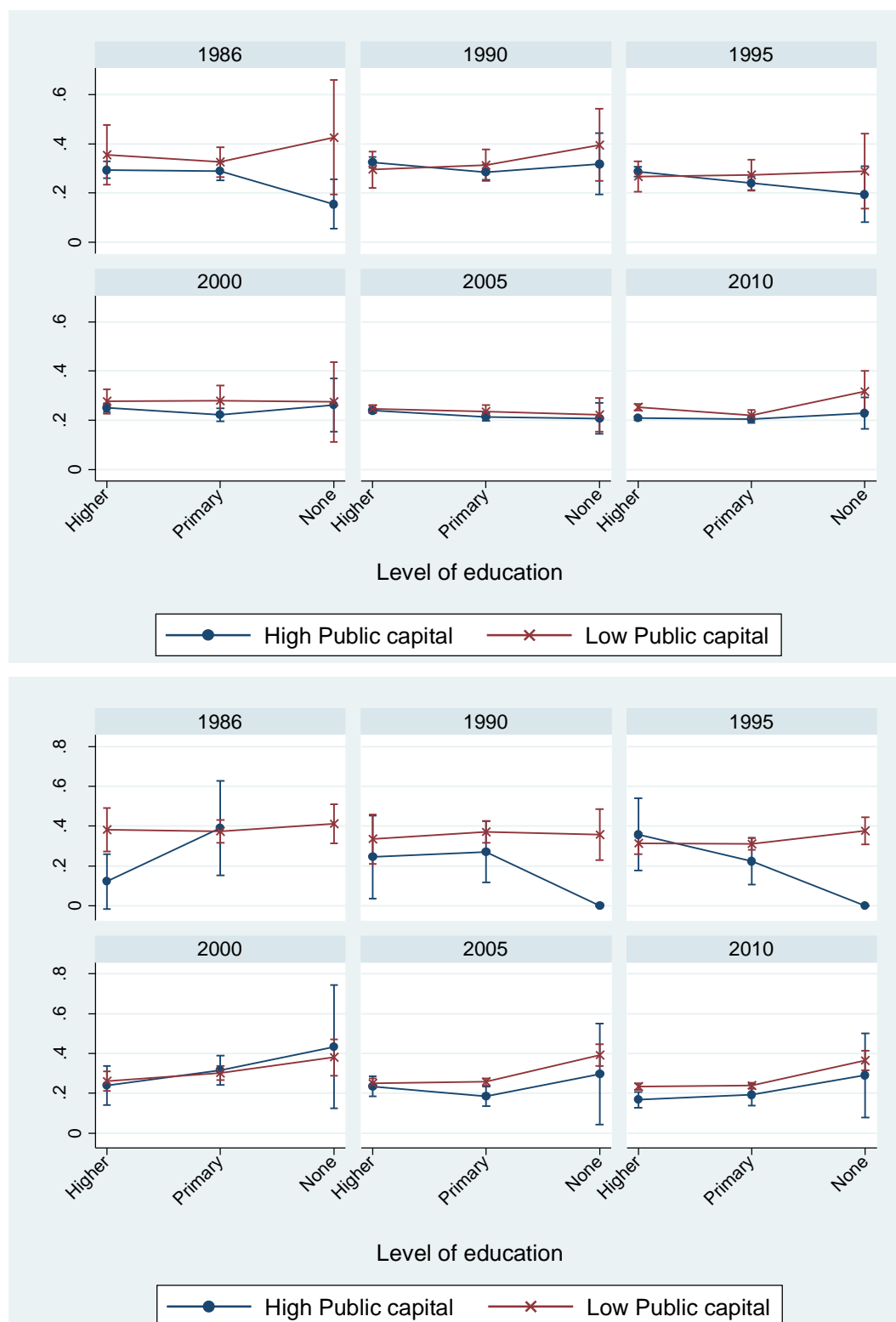
Note: Analytical sample corresponds to women of reproductive age (15-49 years old) 'at risk of pregnancy' defined as fecund women (not pregnant, amenorrheic or menopausal) in marital union (married/cohabiting) and women not in union but sexually active in the interview month. Higher level of education refers to reported achieved secondary and higher levels of education.

6.3. *Summary of main findings and discussion*

Main findings

- With some exceptions, the absolute and relative education gradients on current non-use of contraception were generally stronger among women in households with low Public capital than high Public capital. These differences were clearer at the national level.

- There was evidence of a gradient by level of education in predicted probabilities of current non-use of contraception among women in households with low Public capital. The evidence suggests a flatter relationship among women in households with high Public capital with some exceptions in rural areas due to small sample size.

Discussion

Population weighted inequalities measured using the SII and RII provide evidence to support the hypothesis that provision of Public capital compensates for low levels of education such that the absolute and relative education gradients in current non-use of contraception were smaller among women in households with high Public capital than low Public capital particularly at the national level.

A possible mechanism through which the effect of education operates in households with low and high Public capital could be through better living conditions which may influence contraceptive use through higher physical wealth and resources in the household. In Colombia, women face financial barriers to access contraceptive methods either through user fees in governmental or private hospitals and pharmacies[129]. However, after adjusting for household wealth (Physical capital) as a proxy for women's economic resources in the households, the interaction remained consistent with an independent effect of public services provision.

Results should be interpreted bearing in mind that the distribution of women by Public capital and level of education has changed over this period of time (see results page 111). In addition, the number of women with lower levels of education in households with High Public capital is relatively smaller particularly in rural areas which may bias the estimates. See general discussion chapter 10 page 271.

Chapter 7:

Individual, community and municipality descriptive characteristics

DHS 2005 and 2010

7. Individual, community and municipality-level descriptive characteristics DHS 2005 and 2010

Introduction

The objective of this chapter is to provide a description of the individual, community and municipality-level characteristics of the analytical sample data used in chapters 7, 8 and 9. Results are summarised into three sections corresponding to the three levels of interest: individual, community and municipality. The first section (7.1) summarises individual-level characteristics for the analytical samples, including demographic and socioeconomiccharacteristicsandwomen's fertility regulation factors. The second section (7.2) presents the distribution of community aggregated-level socioeconomic circumstances and family planning related characteristics of the analytical sample and the full samples. The third section (7.3) describes demographic and socioeconomic circumstances at the municipality level using available Census data.

The main analytical samples of interest were women 'at risk of pregnancy' defined as fecund women (not pregnant, amenorrheic or menopausal) in marital union (married/cohabiting) of reproductive age (15-49 years old). In contrast to chapters 5 to 7, single sexually active women were not included in the analytical samples as there was no information available from them about intimate partner violence (IPV) and family planning decision making, two psychosocial dimensions of interest in chapters 7 to 9.

7.1. Individual-level characteristics

Section 7.1 presents individual-level variables included in the multilevel models and related individual-level variables of interest for descriptive purposes. The two latest DHS surveys conducted in Colombia (2005 and 2010) were designed to be nationally representative and both provide the largest data samples available of women of reproductive age (15-49 years old) for the country (see methods section page 56).

Demographic and socioeconomic characteristics

National level

Table7.1 shows the distribution of the analytical sample for both surveys at the national level by selected demographic and socioeconomic characteristics (age, place of residence, level of education, HWI and Physical and Public capital). Among fecund women in marital union (married or cohabiting) there was a gradual shift in the distribution of women from younger (20-39) to older age groups (40-49). Women aged 30 to 39 remained as the largest ten year age group in both years. Overall, in 2010 compared to 2005, there was a larger proportion of women living in urban areas, women who achieved secondary and higher levels of education and a larger proportion of women living in richer households with respect toHWI, Physical and Public capital.

Urban and rural place of residence

The distribution of demographic and socioeconomic characteristics differed by urban and rural areas of residence (Table7.1). The distribution of women by age groups is fairly homogeneous for all groups, except for younger women age 15-19 who make up a larger proportion of women in marital union in rural areas compared to urban areas. Women in urban areas are in general wealthier with respect to HWI, Physical and Public capital than women in rural areas. A similar pattern was found in terms of achieved level of education with more women achieveing higher levels (Higher/secondary) of education in urban areas than in rural areas. By 2010, there was a larger proportion of women who achieved higher levels of education in both urban and rural areas. In rural areas the proportion of women living in households with poorer HWI, Physical and Public capital was higher in 2010 than in 2005.

Table 7.1 Married/cohabiting fecund women by demographic and socioeconomic characteristics % (n) DHS 2005 and 2010

		2005			2010		
		National	**Urban**	**Rural**	**National**	**Urban**	**Rural**
N		**9946**	**68.8% (7162)**	**31.2% (2784)**	**17400**	**71.4% (11509)**	**28.6% (5891)**
Age group							
	15-19	4.2 (469)	3.9 (323)	4.8 (146)	3.9 (777)	3.3 (3514)	5.2 (334)
	20-29	30.9 (3195)	31.6 (2350)	29.3 (845)	28.3 (5121)	28.3 (3361)	28.2 (1760)
	30-39	37.4 (3646)	36.8 (2590)	38.7 (1056)	36.8 (6352)	36.5 (4191)	37.4 (2161)
	40-49	27.5 (2636)	27.7 (1899)	27.2 (737)	31.1 (5150)	31.9 (3514)	29.2 (1636)
Level of education							
	Higher/ Secondary	57.5 (5870)	69.3 (4969)	31.5 (901)	66.5 (10949)	76.6 (8518)	41.1 (2431)
	Primary	38.8 (3711)	28.7 (2030)	61.3 (1681)	30.9 (5908)	21.9 (2776)	53.6 (3132)
	None	3.6 (365)	2.0 (7162)	7.2 (202)	2.6 (543)	1.5 (215)	5.3 (328)
HWI							
	Richer	41.1 (3618)	56.6 (3429)	6.9 (189)	44.5 (5724)	59.9 (5496)	5.8 (228)
	Poorer	58.9 (6328)	43.4 (3733)	93.1 (2595)	55.5 (11676)	40.1 (6013)	94.2 (5663)
Physical capital							
	Richer	42.0 (3779)	54.2 (3399)	14.9 (380)	45.1 (6000)	57.7 (5440)	13.4 (560)
	Poorer	58.0 (6167)	45.8 (3763)	85.1 (2404)	54.9 (11400)	42.3 (6069)	86.6 (5331)
Public capital							
	Richer	60.8 (5302)	83.1 (4985)	11.6 (317)	61.7 (8517)	82.6 (8073)	9.4 (444)
	Poorer	39.2 (4644)	16.9 (2177)	88.4 (2467)	38.3 (8883)	17.4 (3436)	90.6 (5447)

Women's fertility expectations and behaviours

National level

Between 2005 and 2010, there were few differences observed with respect to fertility expectations and behaviours among fecund women in marital union (married or cohabiting) at the national level (Table 7.2). Women's knowledge of their fertile period remained stable and lower than levels observed for women in marital union and single sexually active presented earlier (page 99).Reported desired future fertility within two years increased slightly as well as the proportion of women who were undecided about the timing of a future child, and the proportion of women who reported being sterilised. Some differences were observed between 2005 and 2010for reported number of children ever born and reported unintended pregnancy. In 2010, a larger proportion of women reported being nulliparous and more than half the sample had only one to two children compared to 2005. Reported unintended pregnancy information is available only for women who had a live birth within the five years preceding the survey (2005 N=4231; 2010 N=6573); there was a four per cent points increase in the proportion of women who reported wanting the pregnancy -'wanted then'- in 2010 (51.1%). Women who reported unintended pregnancies -'wanted no more'- decreased in the period of studywhereasmistimed pregnancies 'wanted later' increased slightly.

Urban and rural place of residence

Some differences were found between urban and rural areas (Table 7.2). More women in urban areas reported correct knowledge of a woman's fertile period, desired fertility within two years, families of one to two children and desire of last pregnancy. In 2010 compared to 2005, a larger proportion of women in both urban and rural areas reported family size of one to two children and desired pregnancies.

Table 7.2Married/cohabiting fecund women by fertility related characteristics % (n) DHS 2005 and 2010

	2005			2010		
	National	**Urban**	**Rural**	**National**	**Urban**	**Rural**
N	9946	68.8 (7162)	31.2 (2784)	17400	71.4 (11509)	28.6 (5891)
Knowledge of fertile period Yes	33.3 (3401)	36.6 (2669)	25.9 (732)	34.4 (5471)	38.3 (4094)	24.6 (1377)
Desired future fertility						
Within 2 years	10.0 (1040)	10.5 (779)	8.8 (261)	11.4 (1976)	12.0 (1391)	9.9 (585)
After 2 years	14.4 (1536)	15.2 (1169)	12.6 (367)	13.9 (2531)	14.1 (1677)	13.3 (854)
Wants, unsure timing	0.4 (56)	0.4 (39)	0.4 (17)	0.8 (129)	0.8 (92)	0.7 (37.0)
Undecided	1.5 (138)	1.7 (115)	0.9 (23)	1.3 (244)	1.3 (157)	1.4 (87)
Wants no more	34.4 (3389)	33.0 (2330)	37.7 (1059)	28.9 (5367)	27.4 (3259)	32.9 (2108)
Sterilised	39.3 (3787)	39.2 (2730)	39.6 (1057)	43.7 (7153)	44.4 (4933)	41.8 (2220)
Sexually active*						
Past 4 weeks	90.5 (9004)	89.8 (6449)	92.0 (2555)	89.7 (15516)	89.2 (10230)	91.0 (5286)
Not active-Not active/postpartum	9.3 (909)	0.3 (22)	0.4 (14)	10.3 (1884)	10.8 (1279)	9.0 (605)
Missing	0.2 (33)	0.3 (27)	0.2 (6)	N/A (N/A)	N/A (N/A)	N/A (N/A)
Children ever born						
None	5.4 (562)	6.2 (445)	3.7 (117)	6.3 (1115)	6.9 (827)	4.8 (288)
1-2	47.5 (4657)	51.8 (3606)	38.0 (1051)	52.0 (8498)	55.8 (6168)	42.4 (2330)
3 or >	47.1 (4727)	42.1 (3111)	58.2 (1616)	41.7 (7787)	37.3 (4514)	52.9 (3273)
Wanted last child						
Wanted then	47.1 (2031)	48.7 (1481)	43.6 (550)	51.1 (3221)	52.3 (2150)	48.4 (1071)
Wanted later	24.7 (1052)	25.1 (762)	23.8 (290)	25.2 (1621)	26.0 (1038)	23.5 (583)
Wanted no more	28.3 (1148)	26.1 (740)	32.6 (408)	23.7 (1731)	21.8 (964)	28.1 (767)

Contraceptive behaviour

National level

Contraceptive behaviour in 2005 and 2010 among fecund women in marital union (married or cohabiting) is presented in Table 7.3. Levels in 2010 have increased compared to 2005; particularly current use of any modern method reached an 81% prevalence which is 6% points higher than the 2015 MDG goal for Colombia and lifetime prevalence of use of contraception (ever use) increased reaching almost universal levels (97.7%) in 2010. More nulliparous women reported uptake of any form of contraception from 36.6% in 2005 to 43.6% in 2010.However, there was also an increase in the proportion of women reporting unmet need for contraception to limit and space pregnancies.

Urban and rural place of residence

There were urban and rural differences in women's use of contraception over the period of study (Table 7.3). Overall, women in rural areas reported lower levels of current use and ever use of any modern method of contraception, and higher unmet need for contraception to limit and space pregnancies. With respect to number of children at first use of contraception more nulliparous women reported uptake in urban areas than rural areas, but overtime there was an increase among women in both urban and rural areas.

Table 7.3 Married/cohabiting fecund women by contraceptive behaviour characteristics % (n) DHS 2005 and 2010

	2005			2010		
	National	**Urban**	**Rural**	**National**	**Urban**	**Rural**
N	9946	68.8 (7172)	31.2 (2801)	17400	71.4 (11509)	28.6 (5891)
Current use						
No method	9.3 (1044)	9.6 (757)	8.8 (287)	12.0 (2295)	11.9 (1461)	12.0 (834)
Traditional	12.0 (1169)	11.5 (805)	13.1 (364)	7.1 (1298)	6.7 (788)	8.1 (510)
Modern	78.7 (7733)	78.9 (5600)	78.1 (2133)	81.0 (13807)	81.4 (9260)	79.9 (4547)
Ever use of any method						
Never used	1.5 (168)	1.3 (102)	1.8 (66.0)	0.9 (224)	0.6 (83)	1.8 (141)
Used only traditional	3.1 (308)	2.4 (169)	4.9 (139)	1.4 (305)	1.1 (146)	2.0 (159)
Used modern method	95.4 (9470)	96.3 (6891)	93.3 (2579)	97.7 (16871)	98.4 (11280)	96.1 (5591)
Children at first use of contraception						
0	36.6 (3643)	40.8 (2873)	27.3 (770)	43.6 (7226)	48.2 (5377)	32.3 (1849)
1	42.4 (4099)	42.9 (2996)	41.2 (1103)	37.9 (6507)	37.6 (4332)	38.6 (2175)
2	10.5 (1065)	8.9 (684)	13.9 (381)	9.7 (1757)	8.5 (1006)	12.5 (751)
3	5.0 (503)	3.6 (284)	7.9 (219)	4.5 (820)	3.3 (407)	7.2 (413)
4+	4.1 (468)	2.4 (223)	7.9 (245)	3.4 (863)	1.8 (303)	7.5 (560)
Never used	1.5 (168)	1.3 (102)	1.8 (66)	0.9 (224)	0.6 (83)	1.8 (141)
Missing	N/A	N/A	N/A	0.0 (3)	0.0 (1)	0.1 (2)
Unmet need for contraception						
Unmet need to space	1.6 (189)	1.5 (134)	1.6 (55)	2.0 (408)	1.9 (254)	2.0 (154)
Unmet need to limit	3.1 (356)	2.9 (249)	3.4 (107)	4.1 (822)	3.9 (482)	4.6 (340)
Using to space	20.0 (2082)	21.3 (1594)	17.4 (488)	19.5 (3407)	20.2 (2338)	17.8 (1069)
Using to limit	70.6 (6820)	69.2 (4811)	73.9 (2009)	68.5 (11698)	67.9 (7710)	70.1 (3988)
Desire birth <2 years	4.7 (499)	5.1 (374)	3.8 (125)	5.9 (1065)	6.1 (725)	5.5 (340)

Family planning related characteristics

National level

Family planning related characteristics to women's contraceptive behaviour are presented in Table 7.4. Approval of use of contraception was almost universal amongst fecund women in marital union (married or cohabiting) in 2005 and 2010. Reported exposure to family planning messages at a health centre in the past 12 months decreased in 2010.Similarly women's perceptions of her partner's approval of family planning were high in 2005 (94%). Exposure to family planning messages in the media, including news, TV and radio, was high (86%). Amongst women who were currently using contraception, more than 70% reported that family planning was a joint decision with their partner, in 2010 this increased to 76%.

Urban and rural place of residence

Reported levels on family planning related characteristics by urban and rural place of residence were relatively more similar in 2005 than in 2010. Reported lack of information about family planning at health centres, and respondent and partner's approval of contraception were fairly similar among both women in urban and rural areas; in 2010 the differences widened. Among those using contraception, a larger proportion of women reported it was a 'joint decision' with their partner.

Table 7.4 Married/cohabiting fecund women by family planning related characteristics % (n) DHS 2005 and 2010

	2005			2010		
	National	**Urban**	**Rural**	**National**	**Urban**	**Rural**
N	9946	68.8 (7172)	31.2 (2801)	17400	71.4 (11509)	28.6 (5891)
Heard of FP[1] at health centre (past 12 months)						
No	45.2 (4575)	45.1 (3342)	45.3 (1233)	51.4 (8833)	53.1 (6127)	47.2 (2706)
Yes	36.0 (3519)	37.5 (2613)	32.6 (906)	24.8 (4179)	24.0 (2699)	26.8 (1480)
Not affiliated/Not visited	18.8 (1852)	17.4 (1207)	22.0 (645)	23.8 (4388)	22.9 (2683)	26.0 (1705)
Respondent approves of FP						
Yes	98.7 (9820)	98.9 (7087)	98.3 (2733)	98.4 (17039)	98.7 (11328)	97.5 (5711)
No	0.8 (79)	0.6 (43)	1.1 (36)	1.2 (269)	1.0 (135)	1.9 (134)
Does not know	0.5 (47)	0.5 (32)	0.6 (15)	0.4 (92)	0.3 (46)	0.7 (46)
Partner approves FP						
Yes	94.2 (9365)	94.5 (6769)	93.4 (2596)	86.1 (2994)	88.4 (2161)	79.0 (833)
No	3.4 (353)	3.2 (240)	4.0 (113)	8.9 (316)	7.7 (181)	12.5 (135)
Does not know	2.4 (228)	2.3 (153)	2.6 (75)	5.0 (186)	3.8 (107)	8.5 (79)
Decision maker for use of contraception						
Mainly respondent	25.1 (2224)	27.5 (1719)	19.8 (505)	21.1 (3149)	22.4 (2227)	17.6 (19)
Mainly partner	3.4 (291)	3.1 (192)	4.0 (99)	2.7 (406)	2.6 (254)	2.9 (3.6)
Joint decision	70.3 (6284)	68.3 (4423)	74.8 (1861)	75.5 (11223)	74.3 (7360)	78.5 (3863)
Other	1.2 (103)	1.1 (71)	1.4 (32)	0.7 (118)	0.6 (69)	1.0 (49)

[1]FP=Family planning, [2] Women's perception of partner's approval

Women's exposure to intimate partner violence (IPV)

National level

Women's exposure to intimate partner violence (IPV) is the main psychosocial dimension of interest (Table 7.5). Among fecund women in marital union (married or cohabiting) 36% and 33% in 2005 and 2010 respectively, reported some form of IPV (less severe, severe, and sexual). The most prevalent form of IPV reported by women was 'less severe' violence, which included being pushed, slapped, punched or kicked. Almost 35% in 2005 and 32% in 2010 reported exposure to this form of violence. Self-reported 'severe' and sexual IPV levels were relatively lower than 'less severe' violence in both 2005 and 2010.

Urban and rural place of residence

Some differences were observed between urban and rural areas of residence over the period of interest (Table 7.5). In 2005, levels of IPV were similar among women in urban and rural areas of residence with the exception of sexual violence which was more prevalent among women in rural areas. In 2010, there was a change in this pattern, whereby more women reported any form of IPV and 'less severe' violence' in urban than rural areas with the exception of sexual violence which remained higher in rural areas, and 'severe violence' which increased compared to 2005, but remained similar between urban and rural areas.

Table 7.5 Married/cohabiting fecund women by intimate partner violence characteristics % (n) DHS 2005 and 2010

	2005			2010		
	National	**Urban**	**Rural**	**National**	**Urban**	**Rural**
N	9946	68.8 (7172)	31.2 (2801)	17400	71.4 (11509)	28.6 (5891)
Any form of violence						
No	63.9 (6364)	64.1 (4597)	63.5 (1767)	67.2 (11730)	66.5 (7761)	68.9 (3969)
Yes	36.1 (3582)	35.9 (2565)	36.5 (1017)	32.8 (5670)	33.5 (3748)	31.1 (1922)
Less severe violence						
No	65.3 (6502)	65.6 (4701)	64.6 (1801)	68.2 (11884)	67.4 (7856)	70.1 (4028)
Yes	34.7 (3444)	34.4 (2461)	35.4 (983)	31.8 (5516)	32.6 (3653)	29.9 (1863)
Severe violence						
No	92.6 (9187)	93.1 (6638)	91.5 (2549)	89.0 (15437)	89.0 (10248)	88.8 (5189)
Yes	7.4 (759)	6.9 (524)	8.5 (235)	11.0 (1963)	11.0 (1261)	11.2 (702)
Sexual violence						
No	90.7 (9055)	91.3 (6563)	89.2 (2492)	93.3 (16256)	93.5 (10778)	92.7 (5478)
Yes	9.3 (891)	8.7 (599)	10.8 (292)	6.7 (1144)	6.5 (731)	7.3 (413)

7.2. Contextual community level characteristics

The objective of this section is to describe the distribution of community aggregated-level socioeconomic circumstances and family planning related characteristics of the analytical samples. This thesis assumes that based on geographical proximity a community of people are likely to share a common normative and socioeconomicenvironment. All community-level variables examined in this thesis, except for urban/rural place of residence, are aggregated proportions or means in the woman's community (primary sampling unit) of residence (see Methods section for description of community-level variables page 66). This section presents community-level indicators of interest for descriptive purposes and all community-level variables included in the multilevel models.

Demographic and socioeconomic characteristics

The distribution of women by communities in both 2005 and 2010 DHS ranged from five to seventeen women and corresponded to one or two blocks of houses in urban areas and small villages in rural areas (see methods section page 67).

At the national level there were 9,946 women nested in 1,487 communities in 2005 and 17,400 women nested in 2,498 communities in 2010. Table 7.6 shows the mean distribution of demographic and socioeconomic characteristics by communities at the national level and by urban and rural place of residence. Socioeconomic characteristics varied across communities in the 2005 and 2010 samples. For example, women's number of years of education varied from 0.1 to 15 with a mean of 7.8 and a standard deviation of 2.2 in 2005 and a similar pattern was found in 2010.

In general, communities in urban areas were richer with respect to Physical and Public capital and had smaller standard deviations than in rural areas with the exception of Physical capital in 2005. Women's mean age was very similar across urban and rural areas in comparison to the national level.

Table 7.6 Demographic and socioeconomic characteristics at the community level DHS 2005 and 2010

2005	Mean	Std. Dev.	Min	Max
National N=9946, communities=1487				
Mean age in years	33.1	3.8	19.3	46.5
Mean number of years of education	7.8	2.2	0.1	15.0
Mean level of household's Public capital (high to low)	0.6	0.8	0.0	4.4
Urban N=7162, communities=1085				
Mean age in years	33.1	3.8	20.8	46.5
Mean number of years of education	8.6	1.8	1.0	15.0
Mean level of household's Public capital (high to low)	0.3	0.5	0.1	3.5
Rural N=2784, communities=402				
Mean age in years	33.2	3.8	19.3	44.8
Mean number of years of education	5.7	1.7	0.1	11.4
Mean level of household's Public capital (high to low)	1.5	0.9	0.0	4.4
2010				
National N=17400, communities=2498				
Mean age in years	33.7	3.6	21.3	47.0
Mean number of years of education	8.0	2.7	0.0	17.8
Mean level of household's Public capital (high to low)	0.7	0.9	0.0	4.4
Urban N=11509, communities=1679				
Mean age in years	34.0	3.7	21.3	47.0
Mean number of years of education	9.1	2.4	0.9	17.8
Mean level of household's Public capital (high to low)	0.3	0.4	0.0	3.3
Rural N=5891, communities=819				
Mean age in years	33.3	3.6	21.3	45.3
Mean number of years of education	6.0	2.1	0.0	14.8
Mean level of household's Public capital (high to low)	1.7	0.9	0.0	4.4

Women's fertility expectations and behaviours

Table 7.7 shows community means and proportions of fertility related characteristics for the 2005 and 2010 samples. Women's mean age at first marriage and mean children ever born is very similar at the national level and urban areas particularly in 2005 when the mean age at first marriage was 19.7 at the national level with a standard deviation of 2.3 and ranged from as young as 13.3 to 30.8. As expected, the mean number of children ever born and corresponding standard deviations were higher in rural areas for both samples.

Reported approval of family planning by women and women's perception of husband/partner's approval was almost universal and homogeneous at the national level and across urban and rural areas with relatively smaller standard deviations for the respondents than for their perception of husband/partner's approval. There was no comparable information available for husband/partner approval of family planning in the 2010 sample.

Table 7.7 Fertility related characteristics at the community level DHS 2005 and 2010

2005	Mean	Std. Dev.	Min	Max
National N=9946, communities=1487				
Mean age at first marriage	19.7	2.23	13.3	30.8
Mean children ever born	1.8	0.64	0.50	7.00
Proportion approval of FP by husband/partner	0.9	0.10	0.00	1.00
Proportion approval of FP by respondent	0.9	0.05	0.40	1.00
Urban N=7162, communities=1085				
Mean age at first marriage	19.9	2.20	13.8	30.8
Mean children ever born	1.7	0.51	0.50	3.90
Proportion approval of FP by husband/partner	0.9	0.10	0.25	1.00
Proportion approval of FP by respondent	0.9	0.04	0.50	1.00
Rural N=2784, communities=402				
Mean age at first marriage	19.1	2.07	13.3	27.5
Mean children ever born	2.3	0.73	0.71	7.00
Proportion approval of FP by husband/partner	0.9	0.12	0.00	1.00
Proportion approval of FP by respondent	0.9	0.06	0.40	1.00
2010				
National N=17400, communities=2498				
Mean age at first marriage	19.6	2.52	12.0	31.4
Mean children ever born	2.62	0.91	0.25	9.25
Proportion approval of FP by respondent	0.98	0.06	0.40	1.00
Urban N=11509, communities=1679				
Mean age at first marriage	20.1	2.48	13.5	31.4
Mean children ever born	2.36	0.75	0.25	7.00
Proportion approval of FP by respondent	0.98	0.06	0.40	1.00
Rural N=5891, communities=819				
Mean age at first marriage	18.6	2.29	12.0	31.0
Mean children ever born	3.13	0.98	0.80	9.25
Proportion approval of FP by respondent	0.97	0.08	0.40	1.00

[1]FP=Family planning

Women's exposure to intimate partner violence (IPV)

Table 7.8shows the proportion of reported IPV at the community level in 2005 and 2010. Reported prevalence of any form of IPV was almost 40% across communities at the national level and by urban and rural place of residence. Reported mean proportion of exposure to sexual abuse was 10% in rural communities and slightly less in urban areas and at the national level. Levels decreased for the 2010 sample but the standard deviations remained very similar.

Table 7.8Women's exposure to IPV[1] at the community level DHS 2005 and 2010

2005	Mean	Std. Dev.	Min	Max
National N=9946, communities=1487				
Proportion any form of IPV	0.36	0.22	0.00	1.00
Proportion reported sexual abuse	0.09	0.13	0.00	1.00
Urban N=7162, communities=1085				
Proportion any form of IPV	0.36	0.22	0.00	1.00
Proportion reported sexual abuse	0.08	0.12	0.00	0.75
Rural N=2784, communities=402				
Proportion any form of IPV	0.37	0.22	0.00	1.00
Proportion reported sexual abuse	0.10	0.14	0.00	1.00
2010				
National N=17400, communities=2498				
Proportion any form of IPV	0.33	0.21	0.00	1.00
Proportion reported sexual abuse	0.07	0.11	0.00	0.75
Urban N=11509, communities=1679				
Proportion any form of IPV	0.33	0.21	0.00	1.00
Proportion reported sexual abuse	0.06	0.10	0.00	0.67
Rural N=5891, communities=819				
Proportion any form of IPV	0.33	0.21	0.00	1.00
Proportion reported sexual abuse	0.07	0.11	0.00	0.75

[1]IPV=Intimate partner violence

7.3. Contextual municipality level characteristics

This section describes selected municipality-level characteristics extracted from the Colombian 2005 National Census partly updated in 2008. These characteristics provide information on socioeconomic and cultural circumstances at the smallest administrative level in the country. Colombia had1,098 municipalities in 2005 and 1,103 in2010.This section presents both municipality-level variables of interest: NBI a government indicator of the proportion of people with unsatisfied basic needs at the municipality level and 'ethnic diversity' measured as the proportion of ethnic minorities in each municipality including indigenous, Afro-Colombian and gypsy communities (see methods section page 68).

Results are presented in maps to illustrate the distribution of these characteristics of interest across the Colombian territory. Maps were created using ARCGIS software and display information for the whole country according to the 2005 Census and for the municipalities in the analytical samples of interest of 2005 and 2010.

NBI – unsatisfied basic needs by municipalities

Figure 14 shows the distribution of municipalities in Colombia by the proportion of people living with unsatisfied basic needs according to the 2005 Census. Municipalities with the lowest proportion of people living with unsatisfied basic needs were clustered in the central area of the country where the capital of the country and other major cities are located. Municipalities in the south and south eastern territories have the highest level of NBI; these areas coincide with areas that are geographically distant from the main cities and where the internal civil conflict has taken place over the past decades. The northern coast had high levels of NBI and the highest coincide with areas with a large proportion of indigenous population and African-Colombian groups.

Figures 15 and 16 show the municipalities with women in marital union (married/cohabiting) selected in the analytical sample of interest for 2005 and 2010 respectively.

Figure 14 NBI (%) by all municipalities in Colombia Census 2005
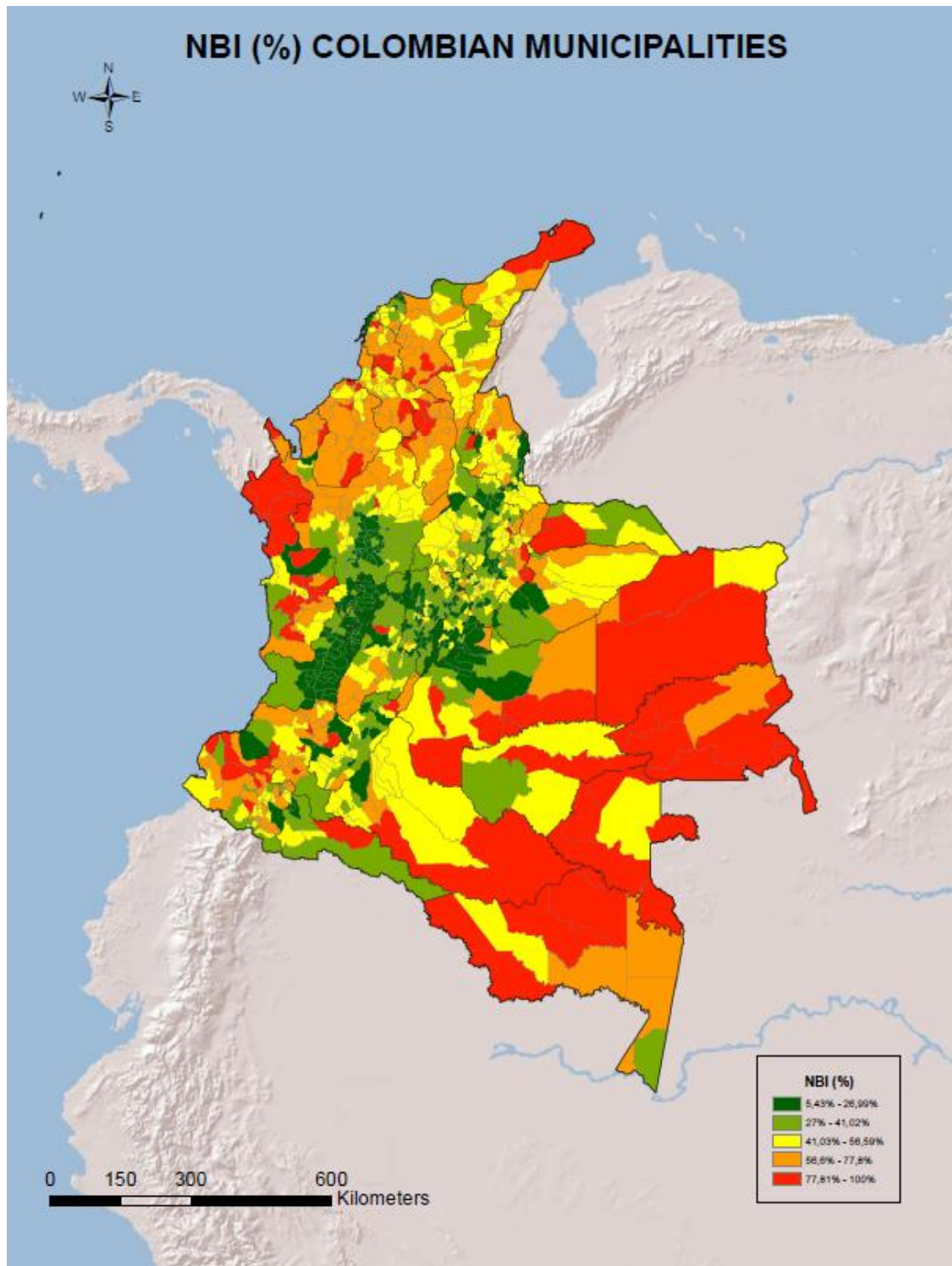
Note: Municipalities by NBI (unsatisfied basic needs) characteristics ranged from 5.43-26.9% in dark green to the highest level of NBI 77.8-100% in red.

Figure 15 NBI (%) by municipalities in the analytical sample DHS 2005
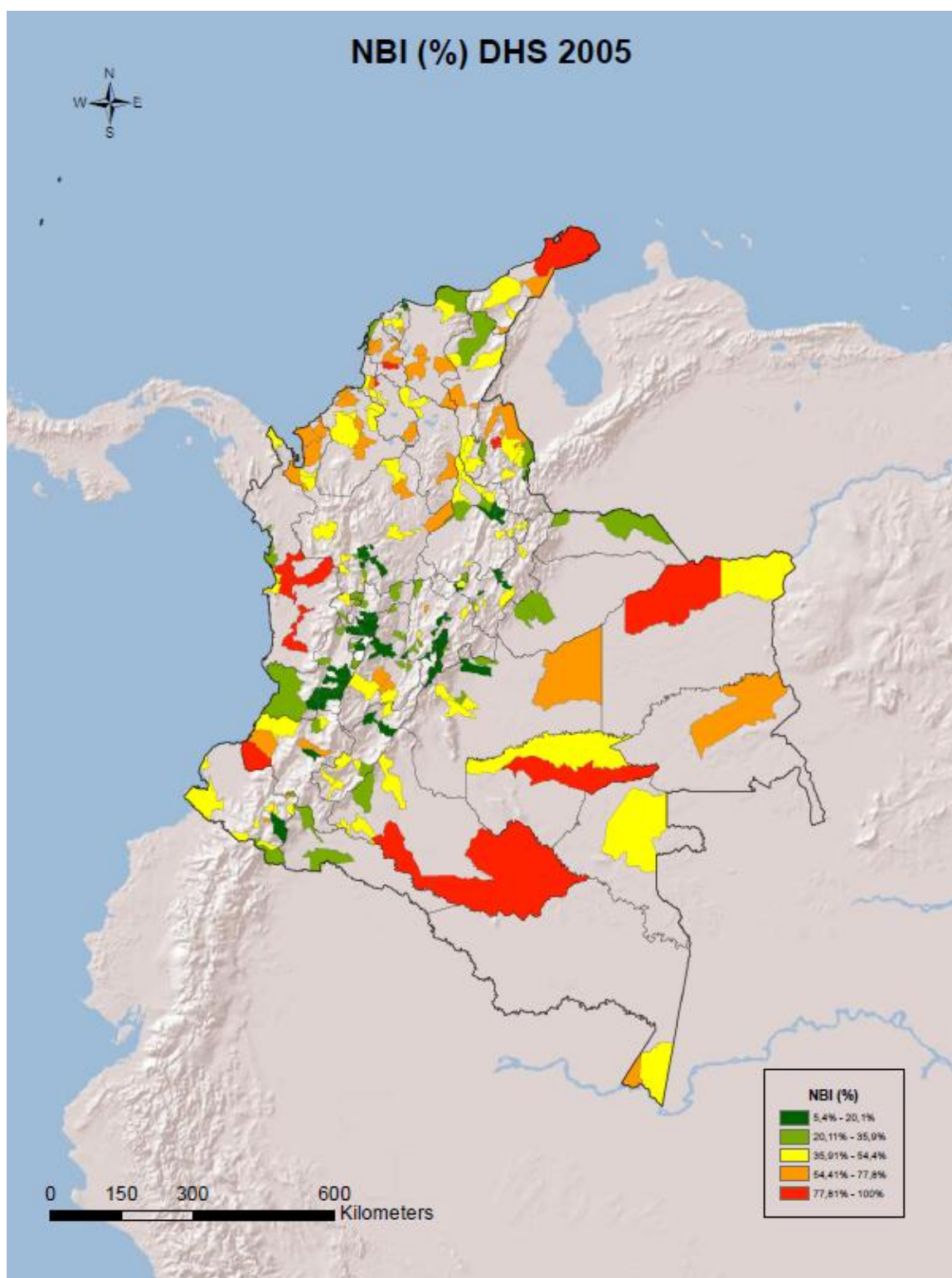
Note: Municipalities by NBI (unsatisfied basic needs) characteristics ranged from 5.4-20.1% in dark green to the highest level of NBI 77.8-100% in red.

Figure 16 NBI (%) by municipalities in the analytical sample DHS 2010
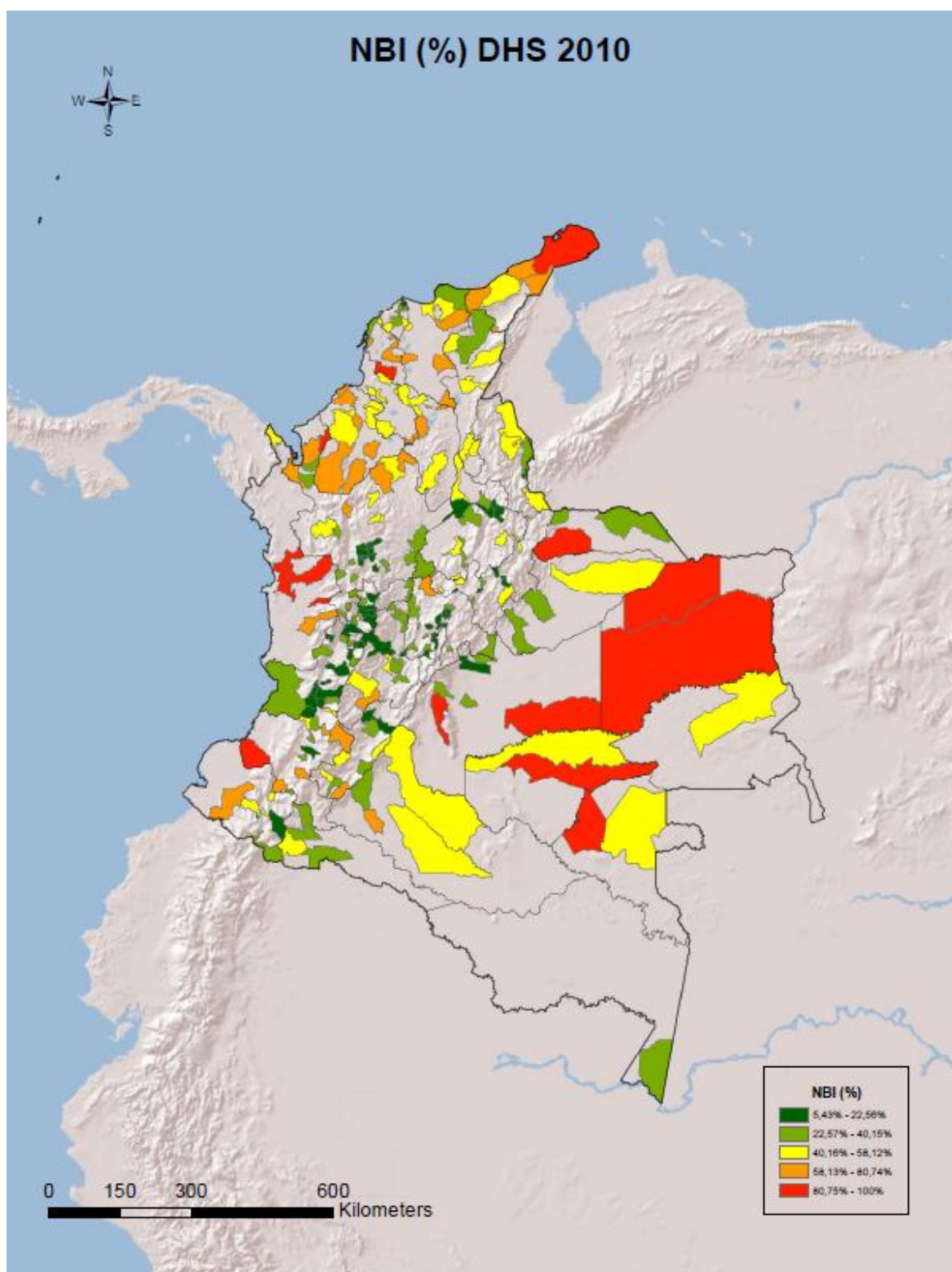
Note: Municipalities by NBI (unsatisfied basic needs) characteristics ranged from 5.4-22.6% in dark green to the highest level of NBI 80.7-100% in red.

Proportion of ethnic minorities by municipalities

Figure 17 shows the distribution of ethnic minorities by municipalities across Colombia according to the 2005 Census. Municipalities with a larger proportion of ethnic minorities (80-100%) are clustered in the Pacific coast, Northern coast and in the south eastern territory. This geographical distribution indicates that the ethnic minority populations, including indigenous, African-Colombian and gypsy, inhabit the rural areas while the major cities located in the central areas of the country are mainly populated by white and mestizos. These areas with larger proportions of ethnic minorities, as mentioned earlier, coincide with areas where there are larger proportions of the population living in precarious socioeconomic circumstances as measured by the NBI government indicator of unsatisfied basic needs. Figure 18 and 19 show the municipalities selected in the analytical sample of interest for 2005 and 2010 respectively.

Figure 17 Ethnic minorities (%) by all municipalities in Colombia Census 2005
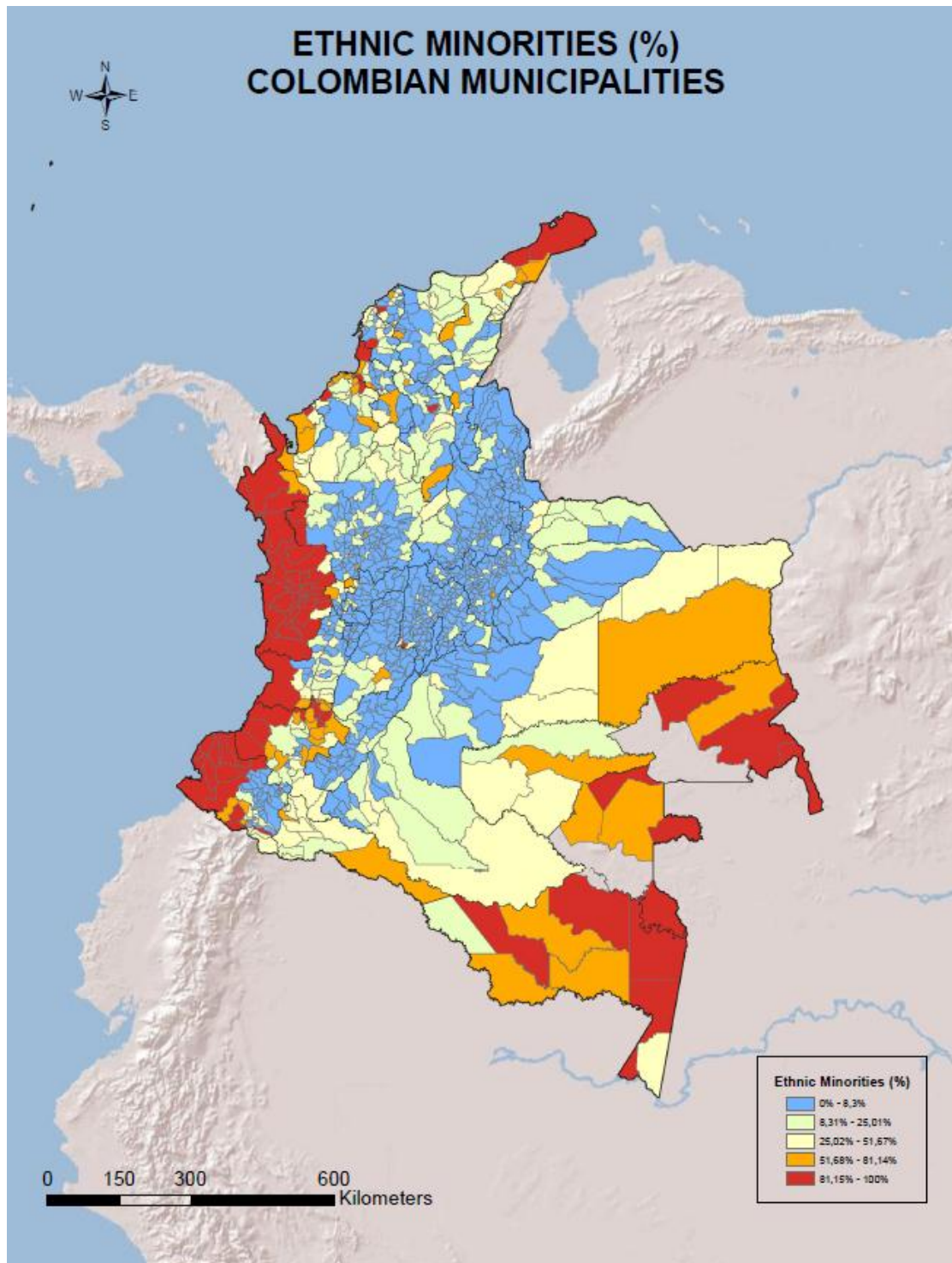
Note: Municipalities by 'ethnic minorities' composition ranged from 0-8.3% in light blue to the highest level of 81.2-100% in red.

Figure 18 Ethnic minorities (%) by municipalities in the analytical sample DHS 2005
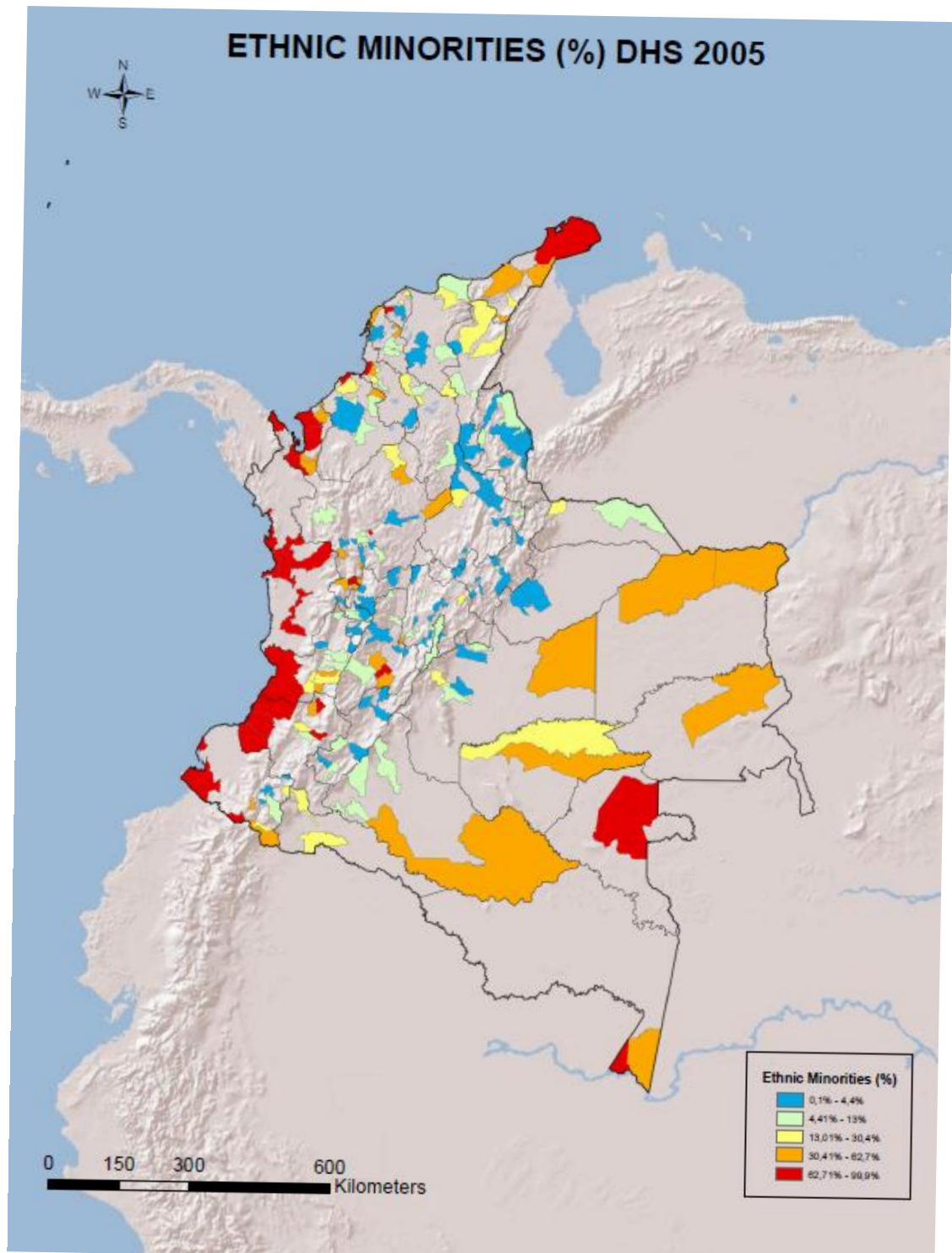
Note: Municipalities by 'ethnic minorities' composition ranged from 0.1-4.4% in light blue to the highest level of 62.7-99.9% in red.

Figure 19 Ethnic minorities (%) by municipalities in the analytical sample DHS 2010
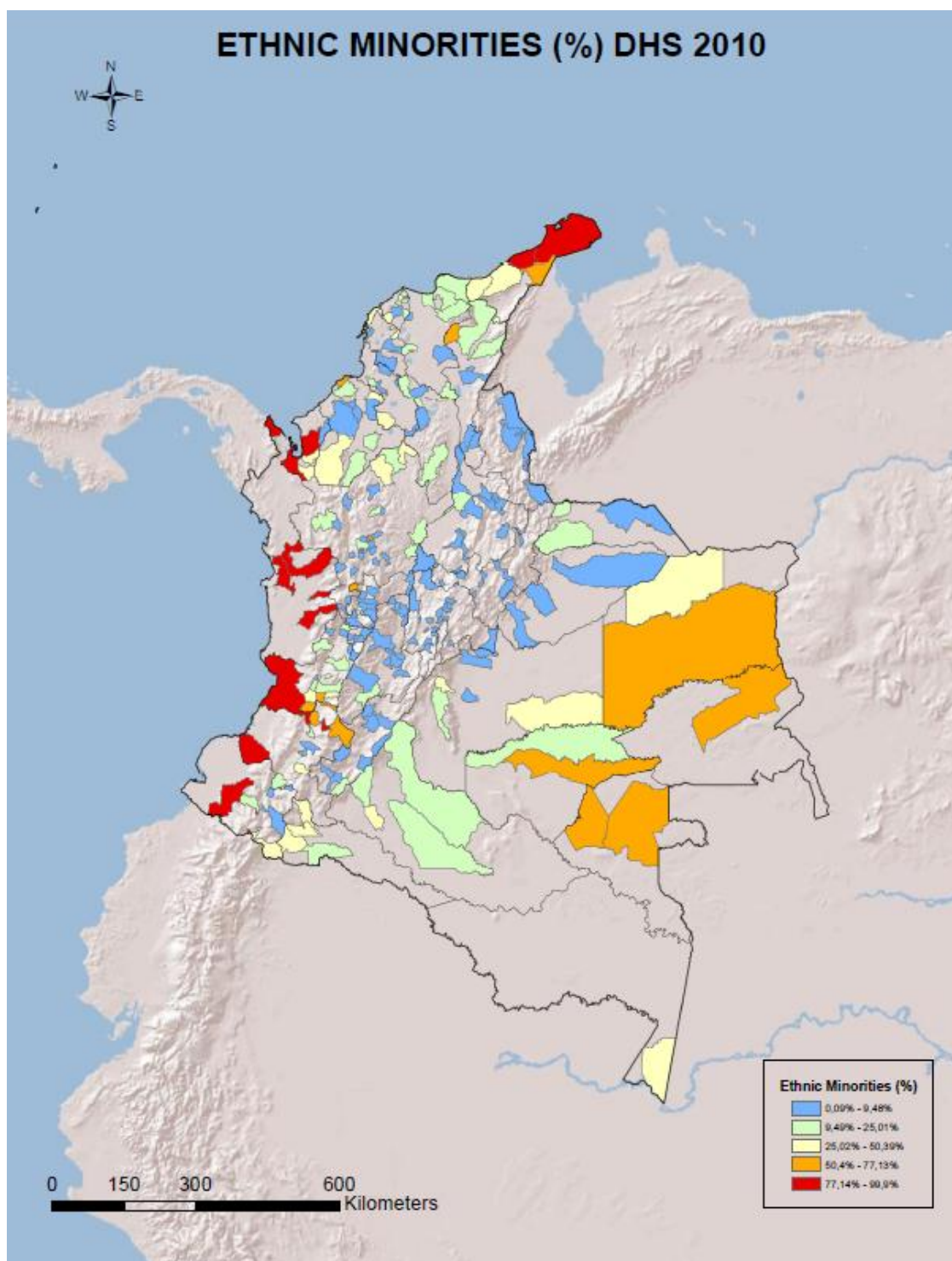
Note: Municipalities by 'ethnic minorities' composition ranged from 0.0-9.5% in light blue to the highest level of 77.1-99.9% in red.

7.4.   *Summary of main findings and discussion*

Main findings

- At the national level, most fecund women in marital union (married or cohabiting) in Colombia in years 2005 and 2010 were aged 30 and 39, had secondary or higher achieved levels of formal education and lived in households with higher HWI, Physical and Public capital. Differences were observed between urban and rural place of residence whereby women in urban areas resembled the national level distribution while women in rural areas had lower achieved levels of education and lived in poorer socioeconomic households.

- With respect to fertility related characteristics, most women had one to two children and poor knowledge of their fertile period. In general, approval and exposure to family planning information was high although differences were observed between urban and rural areas.

- Current use of contraception increased from 78.7% in 2005 to 81% in 2010, 6% above the contraceptive target of the 2015 MDG. Urban and rural differences in family planning related characteristics widened in 2010 compared to 2005.

- The reported prevalence of any form of IPV was relatively smaller in 2010 (33%) than in 2005 (36%). The most prevalent form of IPV was 'less severe' violence, whereas the least reported was sexual abuse. Urban and rural differences in reported exposure to IPV narrowed in 2010 compared to 2005.

- Communities in urban areas were richer with respect to Physical and Public capital and in general the distribution of these SEP characteristics was more homogenous than in rural areas.

- Reported approval of family planning by women and women's perception of husband/partner's approval was almost universal and homogeneous at the national level and across urban and rural areas.

- Clustering of ethnic minorities coincides with clustering of relatively poorer socioeconomic circumstances as measured by the NBI government indicator of unsatisfied basic needs.

Discussion

In Colombia, between 2005 and 2010 women of reproductive age in marital union (married or cohabiting) shared a similar distribution of demographic and socioeconomic characteristics. There were improvements in socioeconomic circumstances and fertility and family planning related characteristics in recent decades, but substantial inequalities are evident between urban and rural areas of residence consistent with patterns observed across the Latin American region[7,17].

These findings should be interpreted with caution, bearing in mind that single women were excluded from this analytical sample. Household socioeconomic circumstances among women in marital union (married/cohabiting) reflect the contribution of other bread winners in the household i.e. partners, extended family; whereas among single women it may reflect solely their own contribution and/or that of extended family members. Census information in Colombia indicates that single women and mothers carry a heavy burden of poverty and violence that suggests they may be more likely to live in relatively poorer SEP circumstances than women in marital union (married/cohabiting), particularly for women in urban areas who may lack access to extended family networks or social support. However, women in urban areas who are more likely to have higher levels of education may be less economically dependent from their extended families due to increase employment opportunities in urban areas.

Despite increased use of contraception, reported unmet need for contraception persisted and increased among women in both urban and rural areas. Unmet need for contraception is one possible cause for unintended pregnancies. Reducing unintended pregnancies provides direct health benefits for women, their families and could improve educational and employment opportunities particularly among younger women. Notable gains in contraceptive use measured through the CPR misses out information on discontinuation and contraceptive failure which may be partly captured through the measurement of unmet need for contraception. Hence improvements in CPR should be interpreted with caution as it presumably overestimates gains of contraceptive use if women's needs for modern family planning with respect to counselling and follow-up, asides from provision are not met.

A 'community' was captured through the primary sampling unit which covers an area of approximately two blocks. This definition is the standard approach in the literature using DHS data. A possible weakness is that women may not define their community networks in relation to physical proximity. In urban areas for example access to

transport alternatives may provide mechanisms to develop a sense of 'community' with people geographically distant. In contrast, among people in rural areas, geographical proximity may play a relatively more crucial role for developing a sense of 'community' due to lower density population, and poor transport alternatives [144]. Municipalities in Colombia follow political subdivisions which may overlap with social definitions of regional boundaries. However, the strength of using municipality level data is that this political subdivision is important with respect to all aspects related to infrastructure and provision of health services in Colombia since the Health Sector reform (1993) when through decentralisation health authority levels and areas of competency were transferred from the central government to the departmental, district, and municipality levels[38].Both municipality variables correspond to Census information collected every 10 years and last conducted in 2005 which imposes a time constraint for both measures regarding the 2010 sample. In the context of Colombia, the last few years have seen an improvement in poverty levels but detriment in relative inequalities along with forced displacement which could reshape the NBI and ethnic composition within municipalities. However, the geographical distribution of NBI and ethnic minorities shown in figures 14 to 19 is consistent with historically socioeconomically marginalised areas and zones exposed to higher levels of conflict over the past two decades within the country.

Chapter 8:

Women's contraceptive non-use: area differences and the effect of compositional and contextual characteristics DHS 2005 and 2010

8. Women's contraceptive non-use: area differences and the effect of compositional and contextual characteristics

Introduction

The objective of this chapter is to describe the relationship between women's current non-use of contraception and compositional and contextual (community and municipality) level characteristics of interest. The first section presents crude prevalence levels of current non-use of contraception by compositional characteristics. Sections two to five present the results of multivariate multilevel models to assess area differences and the effects of compositional and contextual (community and municipality) level factors on women's current non-use of contraception.

8.1. Women's current non-use of contraception by individual characteristics

Prevalence of current non-use of contraception by IPV

Prevalence of women's current non-use of contraception by exposure to IPV is presented in Table 8.1 at the national level and by urban and rural place of residence. Prevalence of current non-use of contraception at the national level was higher among women who reported no exposure to 'less severe', 'severe', sexual and any form of violence inflicted by partner or husband. Prevalence levels were lower in urban areas than rural areas for all forms of reported IPV and were smaller in 2010 compared to 2005, except for women in rural areas who reported exposure to sexual abuse for whom reported current non-use of contraception rose from 15.6 % in 2005 to 19.5% in 2010. The correlations (Spearman correlation coefficients ρ) between 'any form of IPV', 'less severe', 'severe' and sexual violence in 2005 were between ρ=0.34-0.41 at the national level=0.32-0.40 in urban areas and ρ=0.39-0.45in rural areas, except for the correlation between 'any form of IPV' and 'less severe' which was around ρ=0.97 at the national level and by urban and rural place of residence. In 2010, the correlations were between ρ=0.33-0.51 at the national level, ρ=0.33-0.50 in urban areas and ρ=0.34-0.53 in rural areas with the exception between 'any form of IPV' and 'less severe' which was around ρ=0.98 at the national level and by urban and rural place of residence.

Table 8.1 Prevalence % (n) of current non-use of contraception by exposure to IPV among married/cohabiting fecund women DHS 2005 and 2010

	2005			2010		
	National	**Urban**	**Rural**	**National**	**Urban**	**Rural**
Any form of violence						
No	22.6 (1468)	22.5 (1039)	22.6 (429)	19.6 (2499)	19.2 (1565)	20.6 (934)
Yes	19.2 (745)	18.4 (523)	20.8 (222)	17.8 (1094)	17.4 (684)	19.0 (410)
Less severe violence						
No	22.6 (1507)	22.6 (1072)	22.5 (435)	19.7 (2534)	19.2 (1582)	20.8 (952)
Yes	19.0 (706)	18.1 (490)	21.0 (216)	17.7 (1059)	17.5 (667)	18.5 (392)
Severe violence						
No	21.5 (2051)	21.4 (1459)	21.9 (592)	19.3 (3222)	19.0 (2039)	20.1 (1183)
Yes	19.0 (162)	16.7 (103)	22.9 (59)	17.0 (371)	15.7 (210)	20.3 (161)
Sexual violence						
No	21.9 (2041)	21.5 (1445)	22.7 (596)	19.3 (3408)	19.0 (2146)	20.1 (1262)
Yes	16.2 (172)	16.5 (117)	15.6 (55.0)	15.0 (185)	12.9 (103)	19.5 (82)

Prevalence of current non-use of contraception by age group and SEP

Prevalence of women's contraceptive behaviour by age groups and SEP indicators is presented in Table 8.2. Prevalence of current non-use of contraception is higher among younger women (15-19 years old) and women living in households with low Physical capital. There were mixed findings with respect to level of education as non-use of contraception was higher among women with no achieved level of education and decreased with higher levels of education at the national level and in rural areas, whereas it was higher among women with higher/secondary level of education in urban areas and decreased for lower levels of education.

Between 2005 and 2010, prevalence levels of current non-use of contraception were similar for women in the older reproductive age group (40-49) and were lower for women aged 30 to 39 and 20 to 29, women with higher/secondary and primary levels of education and for women living in households with high and low Physical capital. In contrast, prevalence levels increased around 4 % points among women with no achieved level of education at the national level and in urban and rural areas. Among women in the youngest reproductive age groups, prevalence levels decreased in 2010 at the national level and in rural areas, but remained the same in urban areas.

Table 8.2 Prevalence of current non-use of contraception % (n) by demographic and SEP indicators among married/cohabiting fecund women DHS 2005 and 2010

	2005			2010		
	National	**Urban**	**Rural**	**National**	**Urban**	**Rural**
Age group						
40-49	17.0 (456)	16.0 (308)	19.4 (148)	18.1 (1007)	17.4 (619)	19.9 (388)
30-39	19.2 (707)	19.4 (508)	18.6 (199)	16.5 (1145)	16.8 (762)	15.6 (383)
20-29	25.4 (859)	26.0 (633)	24.1 (226)	21.6 (1172)	20.7 (727)	23.9 (445)
15-19	38.6 (191)	32.3 (113)	49.9 (78.0)	32.4 (269)	32.3 (141)	32.5 (128)
Level of education						
Higher/ Secondary	21.3 (1319)	21.6 (1116)	19.8 (203)	19.4 (2236)	19.3 (1705)	19.5 (531)
Primary	21.2 (799)	19.9 (416)	22.5 (383)	17.6 (1189)	15.8 (492)	19.4 (697)
None	23.4 (95)	18.4 (30)	26.4 (65)	27.9 (168)	22.5 (52)	31.6 (116)
Physical capital						
High	18.5 (706)	18.8 (641)	15.8 (65)	16.8 (1057)	17.1 (971)	14.6 (86)
Low	23.4 (1507)	23.7 (921)	23.0 (586)	20.8 (2536)	20.8 (1278)	20.9 (1258)

Prevalence of current non-use of contraception by family planning related characteristics

Prevalence of current non-use of contraception by family planning related characteristics is presented in Table8.3 for 2005. There was lower prevalence levels of current non-use of contraception for women who had heard about family planning at a health centre in the past 12 months, whose partner approved of family planning and for those who discussed family planning with a friend. Women who discussed family planning with husband or partner reported higher non-use of contraception of about 28% at the national level and in urban and rural areas. In general, prevalence of non-use was higher in rural than urban areas with the exception of women who were not affiliated to health insurance and women who reported discussing family planning with husband or partner. The correlations between the selected family planning related characteristics were very low (ρ=0.03-0.10) which suggests independence between these variables.

Table 8.3 Prevalence % (n) of current non-use of contraception by family planning related characteristics among married/cohabiting fecund women DHS 2005

	National	Urban	Rural
Heard of FP[1] at health centre (past 12 months)			
No	21.9 (1009)	21.9 (732)	21.8 (277)
Yes	18.0 (682)	17.1 (485)	20.1 (197)
Not affiliated	26.5 (522)	27.3 (345)	25.1 (177)
Discussed FP with partner			
No	20.8 (2003)	20.4 (1397)	21.6 (606)
Yes	28.2 (210)	28.4 (165)	27.7 (45)
Discussed FP with friend			
No	22.1 (1378)	21.9 (938)	22.5 (440)
Yes	20.1 (835)	19.8 (624)	20.9 (211)
Husband/partner approves of FP			
Yes	20.5 (1989)	20.3 (1419)	20.9 (570)
No	33.9 (130)	33.4 (86)	34.8 (44)
Does not know	36.1 (94)	33.3 (57)	41.3 (37)

[1] FP=Family planning

In 2010, prevalence of current non-use of contraception by family planning characteristics is reported for exposure to messages at health centre and on the media (Table 8.4). Information on discussion and approval of family planning with husband, partner or friends was not available Current non-use of contraception was higher among women who did not visit a health centre in the past 12 months followed by women who visited a health centre and heard of family planning which is opposite to findings for 2005. With respect to exposure to messages of family planning on the radio, TV or news, the prevalence of current non-use was at least 6% points lower for those who reported exposure to family planning information on the media. The correlations between the selected family planning related characteristics at the national level and in urban and rural place of residence were very low (ρ=0.02-0.07) which suggests independence between these two variables.

Table 8.4 Prevalence % (n) of current non-use of contraception by family planning related characteristics among married/cohabiting fecund women (married/cohabiting) DHS 2010

	National	Urban	Rural
Heard of FP[1] at health centre (past 12 months)			
No	17.6 (1634)	17.8 (1126)	16.9 (508)
Yes	18.7 (872)	18.3 (533)	19.5 (339)
Not visited	22.6 (1087)	20.8 (590)	26.5 (497)
FP messages radio, TV, news			
Yes	18.1 (2757)	17.9 (1827)	18.6 (930)
No	24.8 (836)	23.3 (422)	27.7 (414)

[1] FP=Family planning

8.2. The effect of individual characteristics on women's current non-use of contraception

This section presents the results of multivariate multilevel models of the effects of individual level factors on women's current non-use of contraception analysed separately for years 2005 and 2010. The data followed a two-level hierarchy with women (level-1) nested within communities (level-2). Multilevel models were considered to account for between-community differences in women's non-use of contraception. This section presents: (1) the results of the null two-level model (Model 1) that provides a baseline estimate of the community variance and (2) fixed effects of individual explanatory variables(level-1) (Models 2-5) at the national level and separately by urban and rural place of residence.

Women's current non-use of contraception in 2005

The 2005 data had 9,946 women nested in 1,487 communities and was used to explore four compositional dimensions: the effects of women's exposure to sexual violence, couples' discussion and approval of contraception, exposure to family planning messages at health centres and socioeconomic circumstances. There were four main hypotheses: 1. Community effects in contraceptive use will remain after accounting for selected individual (level-1) characteristics; 2. Exposure to sexual violence will be associated with higher current non-use of contraception; 3. Discussion, approval and exposure to family planning information will be associated with lower current non-use of contraception and 4. Lower levels of education and low Physical capital will be associated with higher current non-use of contraception.

Null two-level model

The null two-level model (Model 1) is an empty model (without covariates) that provides a baseline estimate of the extent of between-community (level-2) variation in women's current non-use of contraception (varianceσ^2_u).Based on the null or empty two-level model, the estimated log-odds of current non-use of contraception in an 'average' community were-1.29 with a corresponding probability of 0.22. The between-community variance (random-effect) in the log-odds of current non-use of contraception was0.15 with a standard error of 0.04which is strong evidence (p-value <0.001) that the between-community variance was non-zero.

Individual explanatory variables

The compositional individual explanatory variables included in the analyses were categorised into two groups (see methods page 80). The first group included psychosocial and family planning related characteristics: 'sexual abuse by partner' as an indicator of women's exposure to IPV, 'discussion of family planning with husband/partner and friends' (no/yes), 'women's perception of husband/partner's approval of family planning' (no/yes/does not know),and 'exposure to family planning messages at health centre' (no/yes/no affiliated). The second group included socioeconomic circumstances: individual (women's level of education) and household (Physical capital) characteristics. Except for the null model all models were adjusted for women's age in years (15-49) divided into 4 categories (15-19, 20-29, 30-39, and 40-49).

Effect of woman's age on current non-use of contraception

Table 8.5 shows the fixed effects of individual characteristics on women's current non-use of contraception in 2005. Model 2 presents the effect of women's age on current non-use of contraception. The associations by age groups took the expected direction whereby younger women (15-19 year old) had almost four times the odds of current non-use of contraception than relatively older women. Adjustment for women's age explained some of the community differences in current non-use of contraception; the community variance in Model 2 was 0.14 vs. 0.15 in the null model (p-value<0.001, respectively).

Effect of sexual abuse and family planning-related characteristics

Compared to Model 1 (null model), Model 3(Table 8.5) shows that adjustment for women's age, exposure to sexual abuse and family planning decision-making characteristics reduced the random intercept variance from 0.15 to 0.12 (p-value <0.001 respectively). This reduction indicates that taking account of these characteristics explained some of the community differences in current non-use of contraception.

Opposite to the hypothesised associations, exposure to sexual abuse inflicted by husband or partner was associated with lower current non-use of contraception OR 0.90 (95% CI 0.75-1.09), and women who discussed with their partners about use of contraception had higher odds of non-use than those who did not OR 1.65 (95% CI 1.36-1.99).With respect to family planning decision-making characteristics, the

associations took the hypothesised direction. Women who did not know and those who thought their partner did not approve of family planning had higher odds of current non-use of contraception than women who knew/perceived their partner approved of family planning. Women without health insurance were more likely to not use contraception than those who were insured but did not receive information about family planning at a health centre. Discussing family planning with a friend and hearing about family planning at a health centre were associated with lower odds of current non-use of contraception.

Effect of socioeconomic circumstances

Model 4(Table 8.5) was adjusted for women's age and socioeconomic circumstances. Compared to Model 1 (null model) the random intercept variance explained some of the community variance, from 0.15 to 0.13 (p-value< 0.001, respectively). The association between women's current non-use of contraception and socioeconomic circumstances took the expected direction. Women with no achieved level of formal education had about double the odds of non-use than those with higher, secondary, or primary level of education. Living in a household with lower Physical capital than higher Physical capital was associated with higher odds of current non-use of contraception.

Combined effect of age, sexual abuse, family planning related characteristics and socioeconomic circumstances

Adjustment for all individual-level variables (Model 5 in Table 8.5) decreased the random intercept variance from 0.15 to 0.11 (p-value <0.001, respectively). Residual between community variance could be due to unobserved or unmeasured individual compositional factors and to contextual community factors not adjusted for in the model.

Compared to Models 1 to 4, results in Model 5 indicate that there were no changes in the direction and minor changes in the size of the association between current non-use of contraception and exposure to sexual abuse, discussion of family planning with friends and health care affiliation remained very similar. The size of the association decreased slightly after adjustment for all individual level variables of interest with respect to the odds of non-use of contraception among younger, women without health affiliation and among women who did not know and those who thought their partner did not approve of family planning.

The size of the association became stronger for women who desired to be pregnant within the next two years, women in households with low Physical capital and women with no achieved formal level of formal education. There was a change in the direction of the association for women with primary level of education, but it remained non-significant.

Urban and rural place of residence

The multilevel analytical approach was applied separately to urban and rural place of residence to explore how the effects of individual explanatory variables on current non-use of contraception varied in comparison to national level estimates (Table 8.5)

Table 8.6 shows the effects of the selected individual explanatory characteristics among women in urban areas. The strength and direction of the fixed effects in urban areas estimates resemble the size and direction of national level estimates with respect to women's age, IPV, Physical capital and family planning related characteristics, with the exception of a slightly smaller association among women who did not know if their partner approved family planning (Model 5 in Table 8.5 and Table 8.6). Regarding socioeconomic circumstances, there was a change in the direction of the association with respect to women's level of education, whereby in urban areas primary and no achieved level of education were associated with lower odds of current non-use of contraception, but these associations were not statistically significant. Importantly, the community variance was explained after adjustment for all individual explanatory variables.

Table 8.7 presents the results among women in rural areas. Compared to Model 5 at the national level (Table 8.5) the direction and/or strength of the associations in rural areas was different for the effect of age, family planning related characteristics and women's level of education. In contrast to national level estimates, among women in rural areas the effect of age was only significant and stronger for the youngest women (15 to 19 years old), the association with level of education and Physical capital was stronger and the direction changed among women exposed to family planning messages at health centre. The community variance remained significant after adjustment for all individual explanatory variables; 6% remaining variance was due to between-community variation.

Table 8.5 Effect of individual level characteristics on women's current non-use of contraception OR (95% CI) National level DHS 2005 N=9,946, communities=1,487

Fixed effects	Model 2	Model 3	Model 4	Model 5
Sexually abused by partner				
No	n/a	1	n/a	1
Yes	n/a	0.90 (0.75-1.09)	n/a	0.88 (0.73-1.07)
Age				
40-49	1	1	1	1
30-39	1.15 (1.01-1.32)	0.97 (0.84-1.11)	1.15 (1.01-1.32)	0.96 (0.84-1.11)
20-29	1.78 (1.56-2.03)	1.32 (1.15-1.52)	1.75 (1.53-2.00)	1.30 (1.13-1.50)
15-19	3.37 (2.71-4.18)	2.51 (1.99-3.16)	3.21 (2.58-4.01)	2.40 (1.90-3.05)
Wants to have a child in 12 months				
No	n/a	1	n/a	1
Yes	n/a	7.04 (6.08-8.16)	n/a	7.27 (6.27-8.44)
Discussed FP[1] with partner (past 12 months)				
No	n/a	1	n/a	1
Yes	n/a	1.61 (1.33-1.94)	n/a	1.65 (1.36-1.99)
Discussed FP[1] with friends (past 12 months)				
No	n/a	1	n/a	1
Yes	n/a	0.84 (0.76-0.94)	n/a	0.86 (0.77-0.96)
Husband/partner approves FP				
Yes	n/a	1	n/a	1
No	n/a	2.19 (1.72-2.80)	n/a	2.09 (1.64-2.68)
Woman does not know	n/a	2.47 (1.83-3.33)	n/a	2.37 (1.75-3.20)
Heard of FP[1] (last 12 months) at health centre				
No	n/a	1	n/a	1
Yes	n/a	0.85 (0.75-0.96)	n/a	0.85 (0.75-0.96)
Not affiliated	n/a	1.34 (1.17-1.53)	n/a	1.27 (1.11-1.46)
Level of education				
Secondary/Higher	n/a	n/a	1	1
Primary	n/a	n/a	0.98 (0.88-1.09)	1.04 (0.93-1.17)
None	n/a	n/a	1.34 (1.03-1.74)	1.37 (1.05-1.80)
Physical capital				
High	n/a	n/a	1	1
Low	n/a	n/a	1.29 (1.15-1.44)	1.33 (1.18-1.49)
Random-effects parameters				
Community variance (s.e.)^2	**0.14 (0.04)****	**0.12 (0.04)****	**0.13 (0.04)****	**0.11 (0.04)****

[1]FP=Family planning.[2] Standard error,* p-value<0.05 **p-value <0.001 Model 1 corresponds to the null model (without covariates) with a community variance (s.e.) = 0.15(0.04) **.

Table 8.6Effect of individual level characteristics on women's current non-use of contraception OR (95% CI) DHS 2005 urban areas N=7,162, communities=1,085

Fixed effects	Model 2	Model 3	Model 4	Model 5
Sexually abused by partner				
No	n/a	1	n/a	1
Yes	n/a	0.93 (0.74-1.16)	n/a	0.92 (0.73-1.16)
Age				
40-49	1	1	1	1
30-39	1.26 (1.08-1.48)	1.02 (0.86-1.20)	1.23 (1.05-1.44)	0.99 (0.84-1.17)
20-29	1.92 (1.64-2.24)	1.42 (1.20-1.67)	1.80 (1.54-2.12)	1.33 (1.13-1.58)
15-19	2.81 (2.15-3.66)	2.15 (1.62-2.85)	2.53 (1.94-3.32)	1.94 (1.45-2.59)
Wants to have a child (next two years)				
No	n/a	1	n/a	1
Yes	n/a	7.27 (6.14-8.62)	n/a	7.41 (6.25-8.78)
Discussed FP[1] with partner (past 12 months)				
No	n/a	1	n/a	1
Yes	n/a	1.72 (1.39-2.13)	n/a	1.75 (1.41-2.17)
Discussed FP with friends (past 12 months)				
No	n/a	1	n/a	1
Yes	n/a	0.85 (0.75-0.96)	n/a	0.86 (0.76-0.98)
Husband/partner approves FP				
Yes	n/a	1	n/a	1
No	n/a	2.20 (1.64-2.96)	n/a	2.13 (1.58-2.86)
Woman does not know	n/a	2.11 (1.46-3.05)	n/a	2.05 (1.42-2.98)
Heard of FP(last 12 months) at health centre				
No	n/a	1	n/a	1
Yes	n/a	0.80 (0.69-0.92	n/a	0.79 (0.69-0.91)
Not affiliated	n/a	1.38 (1.17-1.62)	n/a	1.33 (1.13-1.57)
Education				
Secondary/Higher	n/a	n/a	1	1
Primary	n/a	n/a	0.93 (0.81-1.06)	0.98 (0.85-1.13)
None	n/a	n/a	0.86 (0.57-1.31)	0.91 (0.59-1.39)
Physical capital				
High	n/a	n/a	1	1
Low	n/a	n/a	1.29 (1.14-1.46)	1.33 (1.17-1.52)
Random-effects parameters				
Community variance (s.e.)[1]	**0.10 (0.05)**	**0.07 (0.05)**	**0.06 (0.05)**	**0.06 (0.05)**

[1]FP=Family planning.[1] Standard error, * p-value<0.05 **p-value <0.001Model 1 corresponds to the null model (without covariates) with a community variance (s.e.) = 0.11(0.05)*.

Table 8.7Effect of individual level characteristics on women's current non-use of contraception OR (95% CI) DHS 2005 rural areas N=2,784, communities=402

Fixed effects	Model 2	Model 3	Model 4	Model 5
Sexually abused by partner				
No	n/a	1	n/a	1
Yes	n/a	0.87 (0.62-1.21)	n/a	0.83 (0.60-1.16)
Age				
40-49	1	1	1	1
30-39	0.94 (0.73-1.20)	0.86 (0.67-1.11)	0.98 (0.76-1.25)	0.90 (0.69-1.16)
20-29	1.47 (1.15-1.88)	1.11 (0.86-1.44)	1.60 (1.24-2.07)	1.22 (0.93-1.60)
15-19	4.97 (3.36-7.38)	3.59 (2.36-5.46)	5.44 (3.64-8.14)	4.03 (2.63-6.19)
Wants to have a child (next two years)				
No	n/a	1	n/a	1
Yes	n/a	6.46 (4.78-8.73)	n/a	6.78 (5.01-9.20)
Discussed FP[1] with partner (past 12 months)				
No	n/a	1	n/a	1
Yes	n/a	1.30 (0.87-1.95)	n/a	1.32 (0.88-1.98)
Discussed FP[1] with friends (past 12 months)				
No	n/a	1	n/a	1
Yes	n/a	0.83 (0.67-1.03)	n/a	0.85 (0.69-1.05)
Husband/partner approves FP				
Yes	n/a	1	n/a	1
No	n/a	2.10 (1.35-3.26)	n/a	2.03 (1.31-3.16)
Woman does not know	n/a	3.30 (1.95-5.58)	n/a	3.13 (1.84-5.30)
Heard of FP[1] (last 12 months) at health centre				
No	n/a	1	n/a	1
Yes	n/a	1.04 (0.82-1.31)	n/a	1.05 (0.84-1.33)
Not affiliated	n/a	1.27 (0.99-1.62)	n/a	1.22 (0.95-1.56)
Education				
Secondary/Higher	n/a	n/a	1	1
Primary	n/a	n/a	1.15 (0.93-1.43)	1.28 (1.02-1.61)
None	n/a	n/a	2.01 (1.39-2.92)	2.14 (1.45-3.17)
Physical capital				
High	n/a	n/a	1	1
Low	n/a	n/a	1.37 (1.01-1.86)	1.42 (1.03-1.96)
Random-effects parameters				
Community variance (s.e.)	**0.24 (0.09)****	**0.23 (0.09)***	**0.20 (0.08)***	**0.20 (0.09)***

[1]FP=Family planning.[2] Standard error,* p-value<0.05 **p-value <0.001Model 1 corresponds to the null model (without covariates) with a community variance (s.e.) = 0.24(0.08) **.

Women's current non-use of contraception in 2010

The 2010 analytical strategy focused on the compositional individual level effects of women's exposure to sexual violence, women's exposure to family planning messages on the media and at health centres and women's socioeconomic circumstances. The information available varied slightly compared to the 2005 analytical sample due to differences in the DHS questionnaire (see methods page 80), but the same hypotheses were evaluated (page 211). The 2010 data had 17.400 women nested in 2,498 communities at the national level.

Null two-level model

Based on the null or empty two-level model the estimated log-odds of current non-use of contraception in an 'average' community were -1.40 with a corresponding probability of 0.20. The between-community variance (random-effect) in the log-odds of current non-use of contraception was 0.22 which is strong evidence that the between-community variance was non-zero (p-value <0.001).

Level-1 explanatory variables

Similar to the analytical strategy for the 2005 sample in the previous section, the individual level variables included in the analyses were categorised into two groups (page 212). The first group included sexual abuse by partner as an indicator of women's exposure to IPV and family planning information including exposure to family planning messages at health centre in the past 12 months (no/yes/did not visit health centre) and in the media (news, TV, radio) (yes/no). The second group included individual (women's level of education) and household SEP circumstances (Physical capital). Except for the null two-level model, all models were adjusted for women's age in years (15-49) divided into 4 categories (15-19, 20-29, 30-39, and 40-49). There was no information available about discussion and approval of family planning in the 2010 DHS survey.

Effect of woman's age on current non-use of contraception

Table 8.8 shows the fixed effects of compositional individual level characteristics on women's current non-use of contraception in 2010.Model 2 (Table 8.8) was adjusted for women's age only. The associations by age groups took the expected direction for younger women (15-19) whereby they had more than twice the odds of current non-use

of contraception compared to women in older age groups. In contrast to younger women and to findings for the 2005 sample, the direction of the association among women aged 30 to 39 years old was in the opposite direction.

Adjustment for women's age in Model 2 explained some of the community differences in current non-use of contraception found in the null-model, the community variance was 0.22 vs. 0.21 respectively (p-value<0.001, in both models).

Effect of sexual abuse and family planning information

Compared to Model 1(null two-level model), Model 3 shows that adjustment for women's age, exposure to sexual abuse and family planning information increased slightly the random intercept variance from 0.22 to 0.23 (p-value <0.001, respectively). This slight increase in the community variance indicates that adjustment for exposure to sexual abuse and family planning information did not explain differences between communities.

Opposite to the hypothesised association and consistent with findings in 2005, reported exposure to sexual abuse inflicted by husband or partner was associated with lower odds of current non-use of contraception OR 0.83 (95% CI 0.69-0.99) and had borderline significant effect. With respect to family planning information, the associations took the hypothesised direction. Women who did not visit a health centre were more likely to not use contraception than those who received no information about family planning at a health centre in the past 12 months. Opposite to findings in 2005, women who received information about family planning at health centre were more likely to not use contraception OR 1.19 (95% CI 1.07-1.32).

Effect of socioeconomic circumstances

Model 4 (Table 8.8) was adjusted for women's age and socioeconomic circumstances. Compared to Model 1 (null two-level model) the random intercept variance explained some of the community variance from 0.22 to 0.19 (p-value <0.001, respectively).

Compared to the null-model, the strength and direction of the associations with women's age remained relatively the same. As hypothesised and consistent with findings in 2005, women with no achieved level of formal education had higher odds of non-use of contraception OR 1.70 (95% CI 1.39-2.08) than those with higher or secondary level, whereas primary level of education took the opposite direction. Consistent with findings in 2005, living in a household with lower Physical capital than

higher Physical capital was associated with higher odds of current non-use of contraception.

Combined effect of age, sexual abuse, family planning related characteristics and socioeconomic circumstances

Adjustment for all individual-level variables (Model 5 Table 8.8) decreased the random intercept variance to 0.20 which was less than the null model (0.22) but slightly larger than Model 4 (0.19).Compared to Models 1 to 4, there were three changes observed in Model 5. First, for the effect of age the direction of the association for women aged 20 to 29 changed and the strength of the association among women in the youngest age group decreased. Second, the association among women with primary level of education changed to the hypothesised direction, but remained non-significant similar to findings in 2005 and the strength of the association among women with no level of education became stronger. Third the strength of the association increased among women in household with low Physical capital, but decreased among women who reported receiving information on family planning through the media, at a health centre and for those without health insurance. Consistent with findings in 2005 women who reported wishing to become pregnant in the following two years had higher odds of current non-use of contraception.

Urban and rural place of residence

Table 8.9 shows the effects of the selected compositional individual explanatory characteristics among women in urban areas. The direction of the fixed effects in urban areas estimates resemble the national level estimates, except for the effect of primary level of education which took the opposite direction by which it was associated with lower odds if current non-use of contraception, but the association was not significant in Model 5 (Table 8.9) after adjustment for all selected individual characteristics. The strength of the associations were relatively smaller than at the national level among women who reported not receiving information on family planning through the media, during a visit to the health centre, among women without health insurance, women with no level of education and women in households with low Physical capital. Similar to findings in 2005, adjustment for all individual level characteristics explained the remaining between-community variation in urban areas.

Table 8.10 presents the fixed effects among women in rural areas. The direction of the effects for all explanatory variables was the same to estimates at the national level, but the strength of the associations was in general stronger in rural areas. In contrast to national estimates, the strength of the effect of reported sexual abuse was not significant whereas the effect of primary level of education was significant (Model 5 Table 8.10). In contrast to national and urban estimates, the community variance in rural areas remained significant after adjustment for all compositional explanatory variables.

Table 8.8Effect of individual level characteristics on women's current non-use of contraception OR (95% CI) National level DHS 2010 N=17,400

	Model 2	Model 3	Model 4	Model 5
Fixed effects				
Sexually abused by partner				
No	n/a	1	n/a	1
Yes	n/a	0.83 (0.69-0.99)	n/a	0.81 (0.68-0.97)
Age				
40-49	1	1	1	1
30-39	0.90 (0.82-0.99)	0.65 (0.59-0.72)	0.90 (0.82-0.99)	0.66 (0.59-0.73)
20-29	1.23 (1.12-1.36)	0.81 (0.73-0.91)	1.22 (1.10-1.35)	0.83 (0.74-0.92)
15-19	2.21 (1.87-2.62)	1.58 (1.31-1.91)	2.15 (1.80-2.55)	1.59 (1.31-1.92)
Wants to have a child (next two years)				
No	n/a	1	n/a	1
Yes	n/a	11.3 (10.0-12.6)	n/a	11.6 (10.4-13.0)
Family planning messages radio, TV or news				
Yes	n/a	1	n/a	1
No	n/a	1.61 (1.45-1.78)	n/a	1.51 (1.36-1.68)
Heard of FP[1] (last 12 months) at health centre				
No	n/a	1	n/a	1
Yes	n/a	1.19 (1.07-1.32)	n/a	1.17 (1.05-1.30)
Not affiliated	n/a	1.58 (1.43-1.74)	n/a	1.51 (1.37-1.67)
Level of education				
Secondary/Higher	n/a	n/a	1	1
Primary	n/a	n/a	0.97 (0.89-1.06)	1.10 (0.99-1.21)
None	n/a	n/a	1.70 (1.39-2.08)	1.89 (1.53-2.35)
Physical capital				
High	n/a	n/a	1	1
Low	n/a	n/a	1.24 (1.14-1.36)	1.30 (1.18-1.43)
Random-effects parameters				
Community variance (s.e.)[2]	**0.21 (0.03)****	**0.23 (0.04)****	**0.19 (0.03)****	**0.20 (0.04)****

[1]FP=Family planning. [2] Standard error,* p-value <0.05 **p-value <0.001 Model 1 corresponds to the null model (without covariates) with a community variance (s.e.) = 0.22 (0.03) **.

Table 8.9Effect of individual level characteristics on women's current non-use of contraception OR (95% CI) DHS 2010 urban areas N=11,509

	Model 2	Model 3	Model 4	Model 5
Fixed effects				
Sexually abused by partner				
No	n/a	1	n/a	1
Yes	n/a	0.80 (0.64-1.01)	n/a	0.79 (0.63-0.99)
Age				
40-49	1	1	1	1
30-39	1.04 (0.92-1.17)	0.75 (0.66-0.85)	1.01 (0.90-1.14)	0.73 (0.65-0.84)
20-29	1.30 (1.15-1.46)	0.85 (0.74-0.97)	1.23 (1.08-1.39)	0.82 (0.71-0.94)
15-19	2.20 (1.76-2.74)	1.68 (1.32-2.14)	2.04 (1.63-2.55)	1.58 (1.24-2.02)
Wants to have a child (next two years)				
No	n/a	1	n/a	1
Yes	n/a	10.3 (9.01-11.8)	n/a	10.4 (9.13-11.9)
Family planning messages radio, TV or news				
Yes	n/a	1	n/a	1
No	n/a	1.43 (1.25-1.64)	n/a	1.40 (1.22-1.61)
Heard of FP[1] (last 12 months) at health centre				
No	n/a	1	n/a	1
Yes	n/a	1.04 (0.92-1.19)	n/a	1.04 (0.91-1.18)
Not affiliated	n/a	1.35 (1.19-1.53)	n/a	1.32 (1.16-1.49)
Level of education				
Secondary/Higher	n/a	n/a	1	1
Primary	n/a	n/a	0.86 (0.77-0.97)	0.99 (0.87-1.12)
None	n/a	n/a	1.26 (0.91-1.75)	1.48 (1.05-2.08)
Physical capital				
High	n/a	n/a	1	1
Low	n/a	n/a	1.19 (1.08-1.32)	1.26 (1.13-1.40)
Random-effects parameters				
Community variance (s.e.)[2]	**0.08 (0.04)***	**0.07 (0.04)***	**0.06 (0.04)***	**0.06 (0.04)**

[1]FP=Family planning.[2] Standard error, * p-value <0.05, **p-value <0.001Model 1 corresponds to the null model (without covariates) with a community variance (s.e.) = 0.08 (0.04) **.

Table 8.10Effect of individual level characteristics on women's current non-use of contraception OR (95% CI) DHS 2010 rural areas N=5,891

	Model 2	Model 3	Model 4	Model 5
Fixed effects				
Sexually abused by partner				
No	n/a	1	n/a	1
Yes	n/a	0.86 (0.65-1.14)	n/a	0.83 (0.63-1.11)
Age				
40-49	1	1	1	1
30-39	0.68 (0.58-0.81)	0.50 (0.42-0.60)	0.71 (0.60-0.85)	0.53 (0.44-0.64)
20-29	1.10 (0.93-1.30)	0.76 (0.63-0.91)	1.19 (1.00-1.42)	0.85 (0.70-1.03)
15-19	2.08 (1.59-2.72)	1.42 (1.06-1.91)	2.27 (1.72-2.99)	1.64 (1.21-2.22)
Wants to have a child (next two years)				
No	n/a	1	n/a	1
Yes	n/a	13.7 (11.0-17.0)	n/a	14.3 (11.5-17.9)
Family planning messages radio, TV or news				
Yes	n/a	1	n/a	1
No	n/a	1.76 (1.49-2.07)	n/a	1.63 (1.38-1.92)
Heard of FP[1] (last 12 months) at health centre				
No	n/a	1	n/a	1
Yes	n/a	1.46 (1.22-1.76)	n/a	1.44 (1.20-1.73)
Not affiliated	n/a	2.01 (1.70-2.38)	n/a	1.93 (1.63-2.29)
Level of education				
Secondary/Higher	n/a	n/a	1	1
Primary	n/a	n/a	1.12 (0.97-1.30)	1.25 (1.06-1.47)
None	n/a	n/a	2.09 (1.58-2.76)	2.27 (1.67-3.07)
Physical capital				
High	n/a	n/a	1	1
Low	n/a	n/a	1.43 (1.10-1.86)	1.42 (1.06-1.89)
Random-effects parameters				
Community variance (s.e.)[2]	**0.42 (0.07)****	**0.45 (0.08)****	**0.38 (0.07)****	**0.42(0.08)****

[1]FP=Family planning. [2] Standard error,* p-value <0.05 **p-value <0.001 Model 1 corresponds to the null model (without covariates) with a community variance (s.e.) = 0.42 (0.07) **.

8.3. Summary of main findings and discussion

Main findings

- Between-community variation in women's current non-use of contraception was found at the national level in 2005 and 2010. Adjustment for women's exposure to sexual abuse, family planning decision making, exposure to family planning information and socioeconomic circumstances at the individual level explained some of this variation. In stratified analysis by urban and rural place of residence, variation between urban communities was fully explained, but significant variation remained between communities in rural areas.

- Experience of sexual abuse inflicted by husband or partner was associated with lower odds of current non-use of contraception in 2005 and 2010, OR 0.88 and 0.81 respectively at the national level. This effect was opposite to the hypothesised direction, but was not statistically significant in 2005 and was borderline significant at the national level and urban areas in 2010.

- In terms of family planning related characteristics, discussion of family planning with a friend and exposure to family planning messages at a health centre were associated with lower odds of current non-use of contraception. Contrariwise, discussion with husband or partner, lack of health insurance and not visiting a health centre in the past 12 months were associated with higher odds of non-use for contraception.

- Women's socioeconomic position was associated with current non-use of contraception in 2005 and 2010. Women who lived in households with low Physical capital had higher odds of non-use of contraception than women with higher Physical capital. There were mixed findings for the effect of education at the national level vs. urban and rural areas. Except for urban areas in 2005, women with no-achieved level of education had higher odds of non-use than women with higher or secondary level of education.

Discussion

As hypothesised, there were between-community variations in women's current non-use of contraception which were partly explained by compositional individual explanatory characteristics at the national level and in rural areas. Residual between-community variance could be due to unobserved or unmeasured compositional or contextual factors

not yet adjusted for in the model. It also indicates that between-community disparities persist after adjustment for the individual composition of the community in terms of IPV, family planning decision making and information and women's socioeconomic circumstances. Interestingly, between-community variation in urban areas was not significant in 2005 and 2010 after inclusion of the selected compositional explanatory characteristics. This lack of statistical evidence does not indicate absence of a contextual phenomenon for women's current non-use of contraception in urban areas in Colombia. An explanation for low and non-significant between-community variation in urban areas could be that the definition of 'community' and its geographical boundary as used in this study based on the standard approach in the literature do not correspond to relevant contextual areas with respect to women's contraceptive use dynamics in urban areas in Colombia.

With respect to the main psychosocial variable of interest, the results do not support the hypothesis that exposure to sexual violence inflicted by husband or partner increases non-use of contraception among fecund women in marital union (married or cohabiting). Methodological considerations should be noted with regards to measurement and interpretation of women's reported exposure to IPV. DHS questionnaires in Colombia capture comparable information about emotional, physical and sexual violence inflicted by current partner only. Questions regarding exposure to violence inflicted by previous partners or others have not been collected systematically. As mentioned in the methods section (page 57), despite strict protocols, underreporting of violence victimisation should be considered especially in the context of the country were women have endured violence in many forms inside and outside of their households. Women in rural areas are more likely to be exposed to rape as a war strategy used by guerrilla, paramilitary and army groups [145]. Information on exposure to physical and/or sexual assaults inflicted by others than current partner is missing and could be useful to explore its effect on contraceptive use among women in areas relatively more vulnerable to the undergoing civil conflict. See general discussion chapter 10 page 274.

8.4. The effect of community characteristics on women's current non-use of contraception

The objective of this section is to present the results of adding community (level-2) explanatory variables to examine the community contextual effects of family planning norms and socioeconomic circumstances on women's current non-use of contraception. All models were fitted separately for years 2005 and 2010. There are two main hypotheses specific to this section: first, community characteristics will have an effect on women's use of contraception over and above women's individual characteristics; second, disparities in contraceptive use between communities will remain after accounting for selected individual and community characteristics.

For the Colombian DHS a community corresponds to the smallest unit into which the respondents could be aggregated equivalent to one or two blocks of households in urban areas or a small village in rural areas with an average mean size of 10 women per community. This approach assumes that based on geographical proximity a community of people are likely to share a common normative and socioeconomic environment (see methods page 66).

Community contextual effects on current non-use of contraception in 2005

The 2005 data was used to explore community contextual level effects of: (1) IPV and family planning norms measuredas the proportion of women who reported sexual abuse inflicted by partner and proportion of women who reported any form of IPV, women's mean age at marriage, mean number of children born per woman, proportion of husbands/partners and respondents who approved family planning;(2) socioeconomiccircumstances measured as mean years of education and mean Public capital and (3) urban/rural place of residence.

The crude effects of the selected community-level indicators were examined separately for each variable (Model 6, Table 12.21 in Appendix 8 page 330). Based on results from Model 6, community-level variables that were significantly associated with women's current non-use of contraception were included in Models 7 and 8. Results in Table 8.11show the effect of these selected community-level indicators by dimensions of interest including IPV and family planning cultural norms of interest (Model 7), socioeconomic circumstances (Model 8) and both models combined (Model 9).

Urban and rural place of residence was initially conceptualised as a community-level dimension in the multilevel analytical approach, but due to high correlation between

place of residence (urban/rural) and community mean Public capital (Spearman correlation coefficient ρ=0.63 in 2005), it was not included as a contextual variable. Instead the analytical strategy for the national level was applied separately to urban and rural places of residence consistent with previous sections.

Contextual effects

IPV and family planning contextual characteristics

The effect of IPV measured at the community-level as the 'proportion of women who reported sexual abuse' and the 'proportion of women who reported any form of IPV (low to high)' were associated with lower odds of current non-use of contraception. This direction is opposite to the hypothesised relationship of higher current non-use of contraception for women in communities with higher proportion of women exposed to IPV, yet this finding is consistent with findings for the effect of IPV at the individual level found in the previous section (see pages 212 and 219). The strength of these associations were not statistically significant at the national level for either variable (Model 6, Table 12.21 in Appendix 8 page 330), hence both IPV characteristics were not included in Model 7.

Family planning related characteristics measured as 'mean age at first marriage', 'partners' approval of family planning' and 'women's approval of family planning'were associated with lower odds of current non-use of contraception. The direction of these associations was consistent to a hypothesised community effect that favours family planning decision making in contexts where a larger proportion of women reported first marital unions at relatively older ages, and higher approval of family planning decision making. Women who lived in communities with larger families ('mean number of children ever born per woman') had higher odds of current non-use of contraception than those who lived in communities with smaller families (Model 6, Table 12.21 in Appendix 8 page 330). 'Mean number of children ever born per woman' and 'women's approval of family planning' were found to be significantly associated with current non-use of contraception in Model 6. Both variables were included in Model 7 for mutual adjustment which reduced slightly the size of the associations, but these remained in the same direction and statistically significant (Table 8.11).

Contextual socioeconomic circumstances

The crude effects of community-level socioeconomic circumstances on women's current non-use of contraception were explored separately for each variable (Model 6, Table 12.21 in appendix 8 page 330). Women in communities with lower levels of community Public capital had higher odds of current non-use of contraception than women in communities with higher levels of community Public capital. Conversely, women in communities with higher women's mean years of education had lower odds of current non-use of contraception. The effect of both variables was statistically significant. Mutual adjustment for both variables in Model 8 (Table 8.11), changed the direction of the association for the effect of 'mean years of education', but the strength was not statistically significant. The size of the effect of 'mean Public capital' on women's current non-use of contraception increased slightly.

Combined effects of family planning and socioeconomic contextual characteristics

The proportion of 'women who approved family planning', 'mean number of children born per woman' and 'mean Public capital' were the only community-level factors that were significantly related to women's use of contraception. After mutual adjustment (Model 9 in Table 8.11) there were no changes in the direction of the associations of these variables with current non-use of contraception. The size for the effect of 'mean Public capital' and 'mean number of children ever born per woman' decreased and became non-significant for the latter.

Table 8.11 Contextual effects: family planning norms and socioeconomic circumstances DHS 2005 N=9,946; communities=1,487

Community characteristics	Model 7	Model 8	Model 9
Mean number of children born per woman	1.12 (1.06-1.18)	n/a	1.06 (0.99-1.13)
Approval of FP by women (%)	0.91 (0.86-0.97)	n/a	0.92 (0.86-0.98)
Mean years of education	n/a	1.02 (0.95-1.09)	n/a
Mean Public capital (high to low)	n/a	1.15 (1.08-1.23)	1.10 (1.04-1.17)
Random-effects parameters			
Community variance (s.e.) [1]	**0.14 (0.04)****	**0.13 (0.04)****	**0.12 (0.04)****

[1]FP=Family planning.[2] Standard error,* p-value<0.05 **p-value <0.001. Model 6: see Appendix8.

Combined compositional and contextual effects at the national level 2005

Between-community differences persisted after combined adjustment for compositional (level-1) and contextual (level-2) variables in Model 10, Table 8.12. Community contextual factors explained some of the between-community disparities in current non-use of contraception, but did not account for all the individual clustering of contraceptive use within communities.

Compositional effects

Fixed compositional effects in Model 10 (Table 8.12) were in the same direction and of relatively similar size than results in Model 4 before adjustment for contextual-level characteristics (see Table 8.5, page 214). Two differences were observed after combined adjustment for compositional and contextual characteristics. First, the effect of no-level of education on women's non-use of contraception became smaller and non-significant. On the other hand, the effect of living in a household with low Physical capital on women's non-use of contraception decreased from OR 1.33 (95% CI 1.18-1.49) to 1.27 (95% CI 1.13-1.44).

Contextual effects

In Model 10 (Table 8.12), both community- level variables were found to have a significant effect over and above individual age, exposure to sexual abuse, approval, discussion and information about family planning, level of education and Physical capital. Women living in communities with lower levels of mean Public capital i.e. electricity, sewage, piped water, had higher odds of current non-use of modern contraception. Conversely, women living in communities where a larger proportion of women approved contraception were more likely to be using contraception.

Table 8.12 Effect of compositional and community contextual characteristics on women's current non-use of contraception OR (95% CI) DHS 2005 N=9,946; communities=1,487

Fixed effects	Model 10
Sexually abused by husband/partner	
No	1
Yes	0.88 (0.73-1.07)
Age	
40-49	1
30-39	0.96 (0.83-1.10)
20-29	1.29 (1.12-1.49)
15-19	2.38 (1.88-3.02)
Wants to have a child (next two years)	
No	1
Yes	7.23 (6.24-8.39)
Discussed FP[1] with partner (past 12 months)	
No	1
Yes	1.65 (1.36-1.99)
Discussed FP[1] with friends (past 12 months)	
No	1
Yes	0.86 (0.78-0.96)
Husband/partner approves FP[1]	
Yes	1
No	2.06 (1.61-2.63)
Woman does not know	2.30 (1.70-3.02)
Heard of FP[1] (last 12 months) at health centre	
No	1
Yes	0.85 (0.76-0.96)
Not affiliated	1.27 (1.11-1.45)
Level of education	
Secondary/Higher	1
Primary	1.01 (0.90-1.14)
None	1.28 (0.97-1.68)
Physical capital	
High	1
Low	1.27 (1.13-1.44)
Community characteristics	
Approval of FP[1] by women (Low to high)	0.93 (0.87-0.99)
Mean Public capital(High to low)	1.07 (1.01-1.13)
Random-effects parameters	
Community variance (s.e.)[2]	**0.09 (0.04)***

[1] FP= Family planning, [2]Standard error. * P-value<0.05, **p-value <0.001.

Community contextual effects by urban and rural place of residence DHS 2005

Contextual effects

Table 8.13shows the associations of the selected community-level indicators in urban and rural areas (Model 9). Consistent with the analytical strategy at the national level, the variables of interest in Model 9 were selected based on results from models 6, 7 and 8 by urban and rural place of residence (Tables 11.22, 11.23, 11.27 and 11.28 in appendix 8 page 331).Between community-variance remained unexplained in both urban and rural areas.

Among women in urban and rural communities, women living in communities with lower mean levels of Public capital had higher odds of current non-use of modern contraception, whereas women living in communities where a larger proportion of women approved contraception had lower odds of current non-use ofcontraception. The directions of these associations were consistent with results for the national level (see Model 9, Table 8.11, page 229). The strength of these associations was significant among women in rural areas, but not among women in urban areas (Table 8.13).

Table 8.13 Contextual effects: family planning norms and socioeconomic circumstances DHS 2005 by urban/rural place of residence

Community characteristics	**Model 9**	
	Urban	*Rural*
Approval of FP[1] by women (low to high)	0.95 (0.87-1.03)	0.89 (0.82-0.98)
Mean Public capital(high to low)	1.10 (0.99-1.22)	1.24 (1.14-1.35)
Random-effects parameters		
Community variance (s.e.) [1]	**0.10 (0.05)***	**0.12 (0.07)***

[1]FP=Family planning.[2] Standard error,* p-value<0.05 **p-value <0.001. Urban N=7,162, communities=1,085. Rural N=2,784, communities=402.

Combined compositional and contextual effects by place of residence

Model 10 in (Table 8.14) presents the combined effects of compositional and contextual characteristics of interest on women's current non-use of contraception by urban and rural place of residence. The between-community variance in urban areas was explained after adjustment for all compositional (level-1) and community (level-2) explanatory selected characteristics. This was an expected result based on the results from Model 5 in Table 8.6 (see page 216) where the between-community variance in non-use of contraception was fully explained after adjustment for compositional characteristics. In contrast, the between community variance in rural areas was reduced from 0.20 (standard error 0.09, p-value <0.05) in Model 5 (Table 8.7 adjusted for compositional characteristics only see page 217) to 0.14 (standard error 0.08, p-value <0.05 in Table 8.14) after adding community (level-2) contextual factors.

Compositional effects by place of residence

Compared to national estimates, compositional effects among women in urban areas had the same direction, size and level of significance. The strength of the associations between low Physical capital and no level of education and current non-use of contraception were slightly stronger in urban areas than at the national level (Model 10, Table 8.14).

Among women in rural areas the direction was similar to national estimates, but there was no significant effect for information on family planning or affiliation to a health centre and low Physical capital. No differences in direction or level of significance were found with respect to exposure to sexual abuse inflicted by partner on women's current non-use of contraception. In contrast to national and urban estimates, women in rural areas with no achieved level of education had almost twice the odds of current non-use of contraception.

Community contextual effects by place of residence

Community-level variables included in Model10 were found to have the same direction in urban and rural areas, but there was a significant effect over and above compositional factors in rural areas only for the effect of lower levels of Public capital associated with higher odds of current non-use of modern contraception (Table 8.14).

Table 8.14 Effect of compositional and community contextual characteristics on women's current non-use of contraception OR (95% CI) DHS 2005 by urban/rural place of residence

		Model 10	
Fixed effects			
Sexually abused by husband/partner		*Urban*	*Rural*
	No	1	1
	Yes	0.92 (0.73-1.16)	0.83 (0.59-1.15)
Age			
	40-49	1	1
	30-39	0.99 (0.84-1.17)	0.88 (0.69-1.14)
	20-29	1.33 (1.13-1.58)	1.19 (0.91-1.55)
	15-19	1.94 (1.46-2.59)	3.80 (2.48-5.82)
Wants to have a child (next two years)			
	No	1	1
	Yes	7.40 (6.24-8.77)	6.68 (4.94-9.04)
Discussed FP[1] with partner (past 12 months)			
	No	1	1
	Yes	1.75 (1.41-2.17)	1.31 (0.88-1.96)
Discussed FP[1] with friends (past 12 months)			
	No	1	1
	Yes	0.86 (0.75-0.97)	0.87 (0.71-1.08)
Husband/partner approves FP[1]			
	Yes	1	1
	No	2.13 (1.58-2.86)	1.86 (1.20-2.90)
	Woman does not know	2.04 (1.40-2.95)	2.85 (1.68-4.85)
Heard of FP[1] (last 12 months) at health centre			
	No	1	1
	Yes	0.79 (0.69-0.91)	1.07 (0.85-1.35)
	Not affiliated	1.33 (1.13-1.57)	1.20 (0.94-1.53)
Level of education			
	Secondary/Higher	1	1
	Primary	0.98 (0.85-1.13)	1.20 (0.96-1.51)
	None	0.90 (0.59-1.38)	1.89 (1.27-2.81)
Physical capital			
	High	1	1
	Low	1.32 (1.15-1.51)	1.30 (0.94-1.80)
Community characteristics			
Approval of FP[1] by women (Low to high)		0.96 (0.88-1.05)	0.90 (0.82-1.00)
Mean Public capital (High to low)		1.04 (0.92-1.17)	1.14 (1.04-1.26)
Random-effects parameters			
Community variance (s.e.)[2]		**0.06 (0.05)**	**0.14 (0.08)***

[1]FP= Family planning, [2]Standard error. * P-value<0.05, **p-value <0.001. Urban N=7,162, communities=1,085. Rural N=2,784, communities=402.

Community contextual effects on current non-use of contraception in 2010

The 2010 data was used to explore the same contextual community-level dimensions of interest like withthe2005 analytical sample (page 227): (1) IPV and exposure to family planning norms and information, (2) socioeconomic circumstances and (3) urban/rural place of residence. Information on the proportion of community partner's approval of family planning was not available for models in 2010.

Contextual effects

Crude effects of each community-level variable were fitted to explore the size and direction of the associations with women's current non-use of contraception (Model 6 in Table 12.24 appendix 8 page 333). In contrast to findings for 2005, the direction of the association between women's current non-use of contraception and community-level exposure to sexual abuse was in the opposite direction for 2010, whereby IPV variables were associated with higher odds of current non-use of contraception, but the strength of these associations was not statistically significant for the analytical sample of interest. No other differences in direction of the association were observed with respect to findings in 2010 vs. 2005.

Community-level variables with a statistically significant effect in Model 6 (Table 12.24 page 333) were included in Models 7-9 and were fitted at the national level and separately for urban and rural place of residence. Urban and rural place of residence was not included as a community-level variable due to strong correlation with community 'mean Public capital' a key community-level variable of interest for this section (Spearman correlation $\rho=0.73$).This analytical strategy followed the same analytical approach as for 2005.

Family planning contextual characteristics

Results in Table 8.15 show the effect of community-level indicators of family planning cultural norms on women's current non-use of contraception (Model 7). Consistent with results in2005, 'mean number of children ever born per woman' and 'women's approval of family planning' were found to be significantly associated with current non-use of contraception after mutual adjustment for variables in this dimension. Women who lived in communities with larger mean number of children per woman had higher odds of current non-use of contraception than those who lived in communities with smaller families (number of children). Higher proportion of community approval of family

planning by women was associated with lower odds of current non-use of contraception than among women in communities with a lower proportion of women who approved family planning.

Both variables were included in Model 9 (Table 8.15) for mutual adjustment with community socioeconomic characteristics. The direction remained the same for both variables, but the size of the association decreased slightly for 'mean number of children per woman'.

Contextual socioeconomic circumstances

Model 8 (Table 8.15) shows the unadjusted associations of community-level socioeconomic circumstances. Alike findings for 2005, lower 'mean Public capital' and 'mean years of education' were found to be associated with higher odds of current non-use of contraception. The size of the effect for community mean years of education was non-significant; hence it was not included in Model 9. Mean Public capital was included in Model 9 (Table 8.15) for mutual adjustment with family planning related characteristics; there were no changes in direction but the size of the effect became smaller.

Table 8.15Contextual effects: family planning norms and socioeconomic circumstances DHS 2010 N=17400, communities=2498

Community characteristics	Model 7	Model 8	Model 9
Mean age at first marriage(younger to older)	0.99 (0.95-1.04)	n/a	n/a
Mean number of children born per woman(lower to higher)	1.24 (1.19-1.30)	n/a	1.19 (1.13-1.25)
Approval of FP by women (lower to higher)	0.94 (0.90-0.97)	n/a	0.94 (0.91-0.98)
Mean years of education(lower to higher)	n/a	1.04 (0.99-1.09)	n/a
Mean Public capital(higher to lower)	n/a	1.23 (1.17-1.29)	1.09 (1.04-1.14)
Random-effects parameters			
Community variance (s.e.) [1]	**0.19 (0.03)****	**0.17 (0.03)****	**0.17 (0.03)****

[1]FP= Family planning, [2]Standard error. * P-value<0.05, **p-value <0.001.

Combined compositional and contextual effects at the national level 2010

Consistent with findings in 2005, between-community differences persisted after combined adjustment for compositional (level-1) and contextual (level-2) variables in Model 10, Table 8.16. Community contextual factors of interest explained some of the community disparities in current non-use of contraception, but did not account for all the individual clustering of contraceptive use within communities.

Compositional effects

Fixed compositional effects in Model 10 (Table 8.16) remained in the same direction and relatively the same size compared to Model 5 (see Table 8.8, page 222) before adjustment for contextual characteristics. Three main differences were observed compared to Model 5. First, the contextual effect of higher exposure to sexual abuse inflicted by husband or partner on women's current non-use of contraception remained in the same direction, but became statistically significant OR 0.81 (95% CI0.68-0.97).Second, there was a slight decrease in the odds of non-use of contraception for women not exposed to family planning messages in the radio, TV or news. Third, there was a decrease in the effect of both socioeconomic variables of interest.

Contextual effects

Both community (level-2) variables of interest were found to have a significant effect over and above compositional variables of interest. The direction was consistent with Model 5 (see Table 8.8) and results for 2005, whereby women living in communities with lower levels of mean Public capital had higher odds of current non-use of modern contraception and women living in communities where a larger proportion of women approved contraception had lower odds of current non-use of contraception.

Table 8.16Effect of compositional and community contextual characteristics on women's current non-use of contraception OR (95% CI) at national levelDHS 2010 N=17,400; communities=2,498

Fixed effects	Model 10
Sexually abused by husband/partner	
No	1
Yes	0.81 (0.68-0.97)
Age	
40-49	1
30-39	0.65 (0.56-0.72)
20-29	0.81 (0.73-0.91)
15-19	1.54 (1.27-1.86)
Wants to have a child (next two years)	
No	1
Yes	11.6 (10.3-13.0)
FP messages radio, TV, news	
Yes	1
No	1.46 (1.31-1.62)
Heard of FP (last 12 months) at health centre	
No	1
Yes	1.16 (1.04-1.29)
Not affiliated	1.49 (1.35-1.64)
Education	
Secondary/Higher	1
Primary	1.03 (0.93-1.13)
None	1.68 (1.35-2.09)
Physical capital	
High	1
Low	1.16 (1.05-1.29)
Community characteristics	
Women's approval of FP (lower to higher)	0.93 (0.89-0.97)
Mean Public capital (higher to lower)	1.15 (1.10-1.21)
Random-effects parameters	
Community variance (s.e.)[1]	**0.16 (.04)****

[1]FP= Family planning. [2]Standard error, * p-value<0.05 **p-value <0.001

Community contextual effects by urban and rural place of residence DHS 2010

Contextual effects by place of residence

Table 8.17 shows the results of mutual adjustment for the selected community-level indicators in urban areas and rural areas (Model9). A different set of community-level variables were included in Models 9 for urban and rural areas than at the national level (Table 8.15 page 236), based on results from models 6 to 8 by urban and rural place of residence (Tables 11.25-26 and 11.29-30). This analytical strategy is consistent with the strategy in 2005 and 2010 at the national level.

Among women in urban areas, the contextual effect of 'mean number of children born per woman' and 'mean Public capital' were associated with higher odds of current non-use of contraception (Model 9); the same direction than at the national level. The effect of 'family planning community approval by women' was not significant after mutual adjustment in Model 7 and was not included in Model 9. Between-community variance remained unexplained in urban areas.

Among women in rural areas, three community-level variables were included in Model 9 (Table 8.17). 'Mean number of children born per woman', 'family planning community approval by women' and 'mean Public capital' contextual effects were in the same direction than at the national level estimate. Between community-variance remained significant.

Table 8.17Contextual effects: IPV, family planning norms and socioeconomic circumstances DHS 2010by urban and rural place of residence

Community characteristics	Model 9	
	Urban	*Rural*
Mean number of children born per woman(lower to higher)	1.12 (1.06-1.20)	1.26 (1.17-1.36)
Approval of FP[1] by women (lower to higher)	n/a	0.94 (0.88-0.99)
Mean Public capital(higher to lower)	1.23 (1.11-1.36)	1.14 (1.05-1.24)
Random-effects parameters		
Community variance (s.e.) [1]	**0.08 (0.04)***	**0.32 (0.07)****

[1]FP= Family planning. [2]Standard error, * p-value<0.05 **p-value <0.001

Compositional and contextual effects by place of residence

Model 10 in Table 8.18presents the combined effect of compositional and community-level variables of interest. Consistent with findings in 2005, the between-community variance in urban areas was explained after adjustment for all compositional (level-1) and community (level-2) explanatory selected characteristics. In contrast, the between community variance in rural areas was reduced from 0.42 (standard error 0.08, p-value <0.001) in Model 4 (Table 8.10) adjusted for compositional characteristics to 0.35 (standard error 0.07, p-value <0.001) after adding community contextual factors.

Compositional effects

Compositional effects (Model 10 in Table 8.18) among women in urban areas and rural areas differed against national estimates (Model 10 in Table 8.16, page 238) with respect to sexual abuse, level of education and Physical capital. Exposure to sexual abuse had the same direction at the national, urban and rural areas, but the size of the effect was not significant among women in urbanareasor rural areas. No achieved level of education on women's current non-use of contraception had a significant effect among women in the national sample and among women in rural areas. In contrast, among women in urban areas the effect of primary level of education was associated with lower odds of current non-use of contraception, but among women in rural areas, primary and no achieved level of education was associated with higher odds of current non-use of contraception. The effect of low Physical capital was not significant among women in rural areas in contrast to urban and national estimates.

Contextual effects

Community-level variables entered in Model 10 (Table 8.18) were found to have the same direction in urban and rural areas, except for the effect of primary level of education which was associated with higher current non-use of contraception in rural areas whereas it took the opposite direction in urban areas.

Table 8.18 Effect of compositional and community contextual characteristics on women's current non-use of contraception OR (95% CI) by urban and rural place of residence DHS 2010

Fixed effects	Model 10	
	Urban	*Rural*
Sexually abused by husband/partner		
No	1	1
Yes	0.80 (0.63-1.00)	0.84 (0.63-1.11)
Age		
40-49	1	1
30-39	0.73 (0.65-0.84)	0.53 (0.44-0.63)
20-29	0.82 (0.71-0.94)	0.83 (0.68-1.00)
15-19	1.57 (1.22-2.00)	1.57 (1.16-2.12)
Wants to have a child (next two years)		
No	1	1
Yes	10.4 (9.11-11.9)	14.2 (11.4-17.7)
FP[1] messages radio, TV, news		
Yes	1	1
No	1.36 (1.19-1.56)	1.56 (1.32-1.84)
Heard of FP[1] (last 12 months) at health centre		
No	1	1
Yes	1.04 (0.91-1.18)	1.43 (1.20-1.72)
Not affiliated	1.31 (1.16-1.48)	1.88 (1.59-2.22)
Education		
Secondary/Higher	1	1
Primary	0.98 (0.86-1.11)	1.21 (1.03-1.42)
None	1.40 (0.99-1.67)	2.05 (1.51-2.78)
Physical capital		
High	1	1
Low	1.18 (1.06-1.32)	1.26 (0.94-1.69)
Community characteristics		
Women's approval of FP[1]	0.95 (0.90-1.00)	0.93 (0.87-0.98)
Mean Public capital	1.24 (1.12-1.38)	1.20 (1.10-1.30)
Random-effects parameters		
Community variance (s.e.)[1]	**0.04 (0.04)**	**0.35 (0.07)****

[1]FP=Family planning.[2]Standard error, * p-value<0.05 **p-value <0.001. Urban areas N=11,509; communities=1,679. Rural areas N=5,891; communities=819.

8.5. *Summary of main findings and discussion*

Main findings

- There was no evidence of a contextual effect for women's exposure to IPV, measured as the proportion of women in a community who reported 'any form' of IPV including sexual, severe and less severe physical abuse.

- Community-level female approval of family planning was found to have a contextual effect on women's current non-use of contraception. This family planning related local cultural norm finding was associated with lower odds of current non-use of contraception and was true for 2005 and 2010 at the national level.

- Community mean level of Public capital was found to have a contextual effect on current non-use of contraception. Women who lived in communities with lower levels of Public capital i.e. electricity, sewage and piped water had increased odds of current non-use of contraception.

- Between-community differences on current non-use of contraception remained after adjustment for compositional and contextual factors at the national level and in rural areas in 2005 and 2010. In contrast, community differences within urban areas were fully explained.

Discussion

There was evidence to support both proposed hypotheses in this section (see page 227). First, community-level characteristics in the form of women's approval of family planning and mean Public capital had an effect over and above women's individual level characteristics, specifically exposure to IPV, information, discussion and approval of family planning and socioeconomic circumstances. As expected, communities with high female approval of family planning were associated with lower odds of current non-use of contraception. One possible mechanism for this positive effect is the role that women's social networks play as tools for knowledge transfer, empowerment and empathy to women's needs[146]. The latter could indicate social mechanisms that promote uptake of contraception irrespective of women's knowledge about the female biology which has remained low in the period of study. On the other hand, these social networks could also enforce social conformity or peer pressure regarding culturally

acceptable sexual behaviours and expectations among women of similar social background.

Second, disparities in contraceptive use between communities remained after accounting for both compositional and contextual characteristics as hypothesised. This is the case for the rural areas, but not the urban areas. As discussed before (page 225) the absence of statistical evidence for a contextual effect in urban areas could indicate an inadequate definition of 'community' in urban areas with respect to women's contraceptive behaviour dynamics. In this study a 'community' was captured through the primary sampling unit which covers an area of approximately two blocks. In Colombia, this definition may pose limitations as people in urban areas may not define their community networks in relation to physical proximity.

See general discussion chapter 10 page 275.

8.6. The effect of municipality characteristics on women's current non-use of contraception

Introduction

The objective of this section is to present the results of adding a third contextual level to the multilevel analysis using municipality (level-3) information, whichcorresponds to decentralised political subdivisions of Colombia. The country has 1,122 municipalities as of 2010 each led by a Mayor elected by popular vote. Information was extracted from the 2005 Colombian census which provides the latest official information and was partly updated in 2008. Two main municipality characteristics were included for analysis: first, the NBI known as the 'unsatisfied basic needs' government indicator of household socioeconomic circumstances widely used in Colombia and other Latin American countries (see methods page 69); second, an indicator of the proportion of ethnic minorities in each municipality as a proxy for cultural diversity within each municipality (see methods page 69).

There are two main hypotheses specific to this section: first, municipality characteristics (level-3) will have an effect on women's use of contraception over and above women's compositional and community level characteristics; second, disparities in contraceptive use between municipalities will remain after accounting for selected compositional individual (level-1) and community (level-2) characteristics.

Women's current non-use of contraception in 2005: exploring municipality characteristics

The data followed a three-level hierarchy with 9,946women nested in 1,487 communities, nested in 219 municipalities. The first model in this section explored the effect of the municipality characteristics on women's current non-use of contraception based on a three-level model adjusted for NBI and cultural diversity (Model 11 Table 8.19, page 247).Results indicate that both municipality variables of interest were associated with women's current non-use of contraception. Women who lived in communities within municipalities with higher proportion of people living with 'unsatisfied basic needs' had higher odds of current non-use of contraception than those within communities with relatively better socioeconomicconditions OR 1.11 (95% CI 1.03-1.19). Women who lived in communities within municipalities with higher proportion of ethnic minorities (indigenous, Afro-Colombians andgypsy) had higher

odds of current non-use of contraception than those in municipalities with less proportion of ethnic minoritiesOR1.11 (95% CI 1.03-1.18).

Adding a third contextual level of interest explained between-community variance and provided evidence of residual between-municipality variation in women's current non-use of contraception 0.06 (standard error 0.02, p-value=<0.001 see Table 8.19, page 247).The correlation between both municipality variables of interest was relatively low (Spearman correlation ρ=0.35).

Compositional and contextual community and municipality effects on women's current non-use of contraception

To test the second hypothesis a three-level hierarchical model was fitted to explore the effect of all compositional and contextual community and municipality characteristics of interest on women's current non-use of contraception (Model 12 in Table 8.19, page 247).

Due to high correlation between mean community Public capital and municipality NBI (Spearman correlation ρ=0.58), the community variable was excluded from the model as the main interest of this section focused on the municipality characteristics. Urban and rural place of residence was introduced as a community-level variable of interest. The correlation between municipality NBI and urban/rural place of residence was relatively low (Spearman correlation ρ=0.28)

Compositional characteristics

The compositional (level-1) effects of IPV, family planning related characteristics and socioeconomic circumstances were in general consistent with the two-level hierarchical models (Model 10 in Table 8.12, page 231). Exposure to sexual abuse, discussion of family planning with a friend and receiving information about family planning at a health centre were associated with lower odds of women's current non-use of contraception. Conversely, discussion and disapproval of family planning from husband or partner, no achieved formal level of education and low Physical capital were associated with higher odds of current non-use of contraception. The size of the association for exposure to sexual abuse and primary level of education were not statistically significant.

Contextual community characteristics

Between-community variance was fully explained in the three-level hierarchical model (Model 12). Rural place of residence was associated with higher odds of current non-use of contraception whereas higher 'women's community approval of family planning' was associated with lower odds of current non-use of contraception. The size of the effect of both community-level variables was not significant over and above compositional characteristics. A Sensitivity analysis using simple means derived community information was consistent with the size and direction of the effect of 'women's community approval of family planning.

A sensitivity analysis including community mean Public capital instead of urban/rural place of residence did not found a statistically significant effect of this community characteristic. As mentioned above, mean Public capital was not included in Model 12(Table 8.19) due to high correlation with the municipality NBI variable (Spearman correlation $\rho=0.58$).

Contextual municipality characteristics

Contextual municipality-effects (level-3) of higher NBI measured as proportion of households with 'unsatisfied basic needs' and higher cultural diversity measured as the municipality 'proportion of ethnic minorities'were associated with higher odds of current non-use of contraception (Model 12 in Table 8.19).

Adjustment for compositional and community variables of interest decreased the size of the effect, whereby NBI became not significant while the proportion of ethnic minorities in a municipality remained significant over and above compositional and community level characteristics. There were no changes in the direction of the effects of both variables. Between-municipality variation remained 0.07 (standard error 0.02, p-value=<0.001) whereas between-community variation was fully explained (Model 12 in Table 8.19).

Table 8.19Compositional and contextual community and municipality effects of current non-use of contraception DHS 2005 N=9946, communities=1487, municipalities=219

Fixed effects	Model 11	Model 12
Sexually abused by husband/partner		
No	n/a	1
Yes	n/a	0.88 (0.73-1.06)
Age40-49	n/a	1
30-39	n/a	0.96 (0.83-1.10)
20-29	n/a	1.30 (1.13-1.50)
15-19	n/a	2.41 (1.91-3.05)
Wants to have a child (next two years)		
No	n/a	1
Yes	n/a	7.23 (6.24-8.38)
Discussed FP[1] with partner (past 12 months)		
No	n/a	1
Yes	n/a	1.61 (1.34-1.95)
Discussed FP with friends (past 12 months)		
No	n/a	1
Yes	n/a	0.87 (0.78-0.97)
Husband/partner approves FP		
Yes	n/a	1
No	n/a	2.06 (1.61-2.63)
Woman does not know	n/a	2.22 (1.65-3.00)
Heard of FP (last 12 months) at health centre		
No	n/a	1
Yes	n/a	0.86 (0.77-0.97)
Not affiliated	n/a	1.26 (1.09-1.44)
Education		
Secondary/Higher	n/a	1
Primary	n/a	1.08 (0.95-1.21)
None	n/a	1.33 (1.02-1.75)
Physical capital		
High	n/a	1
Low	n/a	1.26 (1.11-1.42)
Community characteristics		
Place of residence Urban	n/a	1
Rural	n/a	1.02 (0.86-1.16)
Women's approval of FP(low to high)	n/a	0.94 (0.88-0.99)[3]
Municipality characteristics		
Proportion people with NBI (low to high)	1.11 (1.03-1.19)	1.02 (0.95-1.11)
Proportion ethnic minorities (low to high)	1.11 (1.03-1.18)	1.10 (1.03-1.18)
Random-effects parameters		
Municipality variance (s.e.)[2]	**0.06 (0.02)****	**0.07 (0.02)****
Community variance (s.e.)	**0.04 (0.04)**	**0.01 (0.04)**

[1]FP=Family planning. [2] Standard error, * p-value<0.05 **p-value <0.001.[3]Sensitivity analysis with simple means generated variable OR 0.91 (0.86-0.96).

Women's current non-use of contraception in 2010: exploring municipality characteristics

The DHS 2010 data followed a three-level hierarchy with 17,400 women nested in 2,498 communities, nested in 257 municipalities. The same analytical approach than in 2005 was applied to the 2010 data. The first model in this section explored the effect of the municipality characteristics in women's current non-use of contraception based on a three-level model adjusted for NBI 'unsatisfied basic needs' and cultural diversity measured as the 'proportion of ethnic minorities' within a municipality (Model 11in Table 8.20, page 250).

Results for the effect of both municipality variables of interest on women's current non-use of contraception were consistent with findings in 2005 with respect to the direction of the association, but the size was slightly larger. Women who lived in communities within municipalities with higher proportion of people living with NBI 'unsatisfied basic needs' had higher odds of current non-use of contraception than those within communities with relatively better socioeconomic conditions OR 1.14 (95% CI 1.06-1.22). Women who lived in communities within municipalities with higher proportion of ethnic minorities had higher odds of current non-use of contraception than those in municipalities with less proportion of ethnic minorities OR 1.17 (95% CI 1.10-1.25). Adding a third contextual level of interest explained between-community variance and provided evidence of residual between-municipality variation in women's current non-use of contraception 0.09 (standard error 0.02, p-value=<0.001) (see Model 11 in Table 8.20, page 250).

Compositional and contextual community and municipality effects on women's contraceptive behaviour

Model 12inTable 8.20 presents the combined effects of compositional, community and municipality characteristics. A relatively stronger correlation between mean community Public capital and municipality NBI (Spearman correlation ρ=0.63) was found in 2010 than in 2005 (Spearman correlation ρ=0.58). Consistent with the analytical strategy for 2005, the community variable was excluded from the model as the main interest of this section focused on the municipality characteristics. Alternatively, information on urban and rural place of residence was introduced as a community-level variable of interest instead of 'mean Public capital'. The correlation between urban/rural place of residence

and municipality NBI in 2010 (Spearman correlation ρ=0.39) was relativelystronger than in 2005 (Spearman correlation ρ=0.28).

Compositional characteristics

The compositional (level-1) effects of IPV, family planning related characteristics and socioeconomic circumstances presented in Model 12 (Table 8.20) were in general consistent with findings for the two-level hierarchical model presented in section 8.4 (Model 10 in Table 8.16 page 238).

Women exposed to sexual abuse and women aged 20 to 39 had lower odds of current non-use of contraception. In contrast, not receiving information on family planning through the media or at a health centre, low Physical capital, lack of health insurance, no achieved level of education andbeing 15 to 19 years old was associated with higher odds of current non-use of contraception. The size of the association for exposure to low Physical capital and primary level of education with current non-use of contraception were not statistically significant.

Contextual community characteristics

Consistent with findings in 2005, there was no evidence of between-community variation after adjustment for compositional and contextual characteristics of interest. The effect of rural place of residence was associated with higher odds of current non-use of contraception, but the size of the effect was not statistically significant. Higher community approval of family planning by women was associated with lower odds of current non-use of contraception. A sensitivity analysis using simple means derived information on 'women's community approval of family planning' produced a slightly larger effect but was consistent with respect to direction.

Contextual municipality characteristics

Consistent with findings in 2005, the contextual municipality-effects of higher NBI 'unsatisfied basic need' and higher 'proportion of ethnic minorities' were associated with higher odds of current non-use of contraception. Adjustment for compositional and community variables of interest (Model 12in Table 8.20) decreased the size of these effects, whereby NBI became not significant while the proportion of ethnic minorities in a municipality remained significant over and above compositional and community level characteristics. Between-municipality variation remained significant 0.09 (standard error 0.02, p-value=<0.001) whereas between-community variation was fully explained.

Table 8.20 Compositional and contextual community and municipality effects of current non-use of contraception DHS 2010 N=17400, communities=2498, municipalities=257

		Model 11	Model 12
Fixed effects			
Sexually abused by husband/partner			
	No	n/a	1
	Yes	n/a	0.81 (0.68-0.97)
Age			
	40-49	n/a	1
	30-39	n/a	0.65 (0.59-0.73)
	20-29	n/a	0.83 (0.74-0.93)
	15-19	n/a	1.57 (1.30-1.90)
Wants to have a child (next two years)			
	No	n/a	1
	Yes	n/a	11.3 (10.7-12.6)
FP[1] messages radio, TV, news			
	Yes	n/a	1
	No	n/a	1.43 (1.29-1.58)
Heard of FP (last 12 months) at health centre			
	No	n/a	1
	Yes	n/a	1.16 (1.04-1.29)
	Not affiliated	n/a	1.48 (1.34-1.63)
Level of education			
	Secondary/Higher	n/a	1
	Primary	n/a	1.10 (0.99-1.21)
	None	n/a	1.78 (1.43-2.21)
Physical capital			
	High	n/a	1
	Low	n/a	1.10 (0.98-1.23)
Community characteristics			
Place of residence			
	Urban	n/a	1
	Rural	n/a	1.02 (0.92-1.13)
Women's approval of FP (low to high)		n/a	0.95 (0.92-0.99)[3]
Municipality characteristics			
Proportion people with NBI (low to high)		1.14 (1.06-1.22)	1.06 (0.98-1.15)
Proportion ethnic minorities (low to high)		1.17 (1.10-1.25)	1.20 (1.12-1.28)
Random-effects parameters			
Municipality variance (s.e.)[1]		**0.09 (0.02)****	**0.09 (0.02)****
Community variance (s.e.)		**0.04 (0.03)**	**0.03 (0.03)**

[1] FP=Family planning. [2] Standard error, * p-value<0.05 **p-value <0.001. [3]Sensitivity analysis with simple means derived community information OR 0.90 (0.86-0.93).

8.7. *Summary of main findings and discussion*

Main findings

- The addition of municipalities as a third contextual level of analysis explained the between-community variation in women's current non-use of contraception in years 2005 and 2010.

- Municipality level characteristics of interest, NBI and proportion of ethnic minorities, were associated with higher odds of current non-use of contraception in 2005 and 2010. The size of the effect for NBI was fully explained in models adjusted for compositional and community contextual factors of interest, but the effect of the proportion of ethnic minorities as a proxy for cultural diversity within municipalities remained significant.

- Between-municipality variation in women's current non-use of contraception remained significant after adjustment for all compositional, community and municipality characteristics of interest.

Discussion

Municipality characteristics were hypothesised to have an effect on women's current non-use of contraception over and above individual and community factors. The hypothesis was true for the municipality-level effect of ethnic minorities only. This finding suggests that cultural factors have an important effect on women's contraceptive non-use that is not accounted for by compositional and community family planning related characteristics or compositional, community and municipality socioeconomic circumstances. This is an expected finding due to Colombia's ethnic diversity that warrants further exploration of the possible mechanisms with respect to women's contraceptive behaviour. Ethnic minorities include indigenous populations, Afro-Colombians and gypsy communities who are clustered in geographical areas of the country with poor living conditions and highly exposed to the internal civil conflict and violent displacement. The clustering of these characteristics could be one possible mechanism which may have been partly captured through the NBI variable, yet contextual influences of exposure to the internal conflict were not measured and hence not accounted for in the models.

Differences could also be due to factors such as religious beliefs and practices as well as strong cultural norms associated with family values. In the case of Afro-Colombians,

Colombia has the second largest African descendant population in Latin America. These groups are concentrated in the Chocó region and have historically followed mixed African and Catholic traditions with large polygamous family structures where cultural acceptability and negotiation of family planning may be limited. Regarding indigenous populations, in the more traditional communities attaining large families is highly desirable and most of them follow their own medicinal practices which could represent barriers for the use of modern methods of contraception produced by 'western medicine'. Significant between-municipality differences in fully adjusted models for compositional, community and municipality factors support the second hypothesis of residual disparities in current non-use of contraception. Unmeasured characteristics, not captured through the NBI and ethnic minorities' indicators, could explain residual variation.

See general discussion chapter 10 page 246.

Chapter 9:

Compositional effect of women's level of education on current non-use of contraception by community level of Public capital

9. Compositional effect of women's level of education on current non-use of contraception by community level of Public capital

Introduction

This last chapter of results presents further analysis on the effect of level of education on women's current non-use of contraception. Chapter6 (page 162) analyzed the effect of women's level of education regardless of household level of Public capital, this chapter explores if the compositional effect of level of education on current non-use of contraception will vary depending on the community level of Public capital. The hypothesis is that high community level of Public capital would compensate for low levels of education such that the effect of education in contraceptive non-use is smaller among women in households within communities with high Public capital than low Public capital. To test this hypothesis a cross-level interaction was fitted between women's level of education (level-1) and mean Public capital (level-2) adjusted for all compositional and contextual variables of interest and was evaluated before and after adjustment for Physical capital. Results are presented separately for 2005 and 2010 at the national level and by urban and rural place of residence.

9.1. Compositional effect of level of education on women's current non-use of contraception by community level of Public capital

National level DHS 2005

The first model in this section (Model 13 in Table 9.1) presents the results of fitting an interaction term between women's level of education and community mean Public capital while adjusting for compositional and community contextual factors of interest includingsexual abuse by partner, discussion of family planning with husband/partner and friends, women's perception of husband/partner's approval of family planning, exposure to family planning messages at health centre, fertility desires, women's age and level of education.

Model 13 in Table 9.1shows the results for the effect of women's level of education on current non-use of contraception, separately for communities with low Public capital (low vs. high mean Public capital) and high Public capital (high vs. low mean Public capital) only. The fixed effects of all other covariates remained relatively the same

before and after fitting the cross-level interaction between level of education and community Public capital (not shown in Table 9.1, seeAppendix8 in Table 12.31 page 340).

The direction of the effect of level of education differed between communities with high and low Public capital. As hypothesised, the effect of education was associated with lower odds of current non-use of contraception among women in communities with high Public capital, whereas the opposite was observed for women in communities with low Public capital. There was evidence of a cross-level interaction between women's level of education and mean community Public capital, such that the effect of level of education on current non-use of contraception was statistically significantly different between communities with low and high Public capital (p-value for interaction=0.007).

Adjustment for household wealth differences

Model 14 in Table 9.1takes account of household wealth differences in the form of Physical capital e.g. ownership of durable assets and household construction materials.Adjustment for compositional Physical capital did not change the direction of the associations, but the size of the effect increased slightly for women in communities with low and high Public capital. After adjustment for Physical capital the effect of all levels of education on current non-use of contraception was significant and the interaction remained.

Table 9.1 Compositional effect OR (95% CI) of level of education on women's current non-use of contraception by community level of Public capital DHS 2005 N=9,946, communities=1,487

	Model 13	Model 14
Cross-level interaction		
Effect of education in communities with low Public capital		
Primary level	1.12 (1.00-1.25)	1.15 (1.02-1.29)
No achieved level	1.36 (1.11-1.67)	1.41 (1.15-1.73)
Effect of education in communities with high Public capital		
Primary level	0.89 (0.80-1.00)	0.87 (0.78-0.98)
No achieved level	0.74 (0.60-0.90)	0.71 (0.58-0.87)
p-value cross-level interaction	*0.007*	*0.002*

Urban and rural place of residence 2005

Table 9.2 presents the results of Models 13 and 14 separately for urban and rural areas. Among women in communities in urban and rural areas, the direction of the effect of level of education resembled findings at the national level. The size of the effect of no achieved level of education and primary level of education on women's current non-use of contraception was not significant in both urban and rural areas with wide confidence intervals due to relatively smaller sample size. Except among women in communities with high Public capital in urban areas for whom the size of the effect was significant.

In contrast to national level results, there was no evidence of a cross-level interaction between level of education and community level of Public capital, hence pooled estimates for the effect of education were reported for both urban and rural areas. In general, pooled estimates for the effect of level of education took the expected direction of higher current non-use of contraception for lower levels of education, but the size of the effect was not significant with wide confidence intervals.

Adjustment for household wealth differences

After adjustment for Physical capital, the size of the pooled estimates of the effect of level of education among women in urban and rural areas decreased and remained in the same direction, except for the effect of no achieved level of education in urban areas which took the opposite direction but remained non-significant with wide confidence intervals.

Table 9.2 Compositional effect of level of education on women's current non-use of contraception by community level of Public capital DHS 2005 urban and rural areas

	Urban N=7,162, communities=1,085		*Rural* N=2,784, communities=402	
Cross-level interaction	**Model 13**	**Model 14**	**Model 13**	**Model 14**
Effect of education in communities with low Public capital				
Primary level	1.27 (1.01-1.61)	1.30 (1.03-1.64)	1.00 (0.82-1.22)	1.01 (0.83-1.23)
No achieved level	1.37 (0.83-2.25)	1.42 (0.86-2.34)	1.17 (0.85-1.60)	1.19 (0.87-1.62)
Effect of education in communities with high Public capital				
Primary level	0.79 (0.62-0.99)	0.77 (0.61-0.98)	1.00 (0.82-1.22)	0.99 (0.81-1.21)
No achieved level	0.73 (0.44-1.20)	0.76 (0.43-1.16)	0.86 (0.63-1.17)	0.84 (0.62-1.15)
p-value cross-level interaction	_0.09_	_0.06_	_0.54_	_0.51_
Pooled effect of level of education[1]				
Primary level	1.14 (0.96-1.35)	1.08 (0.91-1.27)	1.25 (0.93-1.68)	1.20 (0.89-1.63)
No achieved level	1.05 (0.68-1.61)	0.95 (0.62-1.47)	1.53 (0.83-2.84)	1.45 (0.78-2.69)

[1]There was no evidence of a cross-level interaction between level of education and community level of Public capital, hence pooled estimates for the effect of education are reported for both urban and rural areas.

National level DHS 2010

Consistent with the analytical strategy for 2005, a cross-level interaction was modeled by fitting an interaction term between women's level of education and community mean Public capital while adjusting for sexual abuse by partner, exposure to family planning messages at health centre, fertility desire, women's age, and level of education in Model 13 (Table 9.3).Fixed effects for all covariates are presented in Table 12.31 (appendix 8 page 340).

Results for the effect of level of education in Table 9.3 show that the direction of the association in both models was consistent with findings in 2005, whereby the effect of level of education was associated with higher odds of current non-use of contraception among women in communities with low Public capital while lower current non-use of contraception was observed among women in communities with high Public capital. The strength of the effect was relatively smaller than in 2005 with large confidence intervals.

In contrast to findings for 2005, there was no evidence of a significantly different effect of level of education between communities with low and high Public capital (p-value cross-level interaction=0.22). Pooled estimates of the effect of level of education indicate that no-achieved level of education was associated with higher current non-use of contraception.

Adjustment for household wealth differences

Further adjustment for Physical capital was modelled to account for differences in the distribution of compositional Physical capital in Model 14 (Table 9.3).Adjustment for Physical capital attenuated the size of the pooled effect of primary and no achieved level of education and there were no changes in the direction of the association. The size of the effect was not significant for primary level of education before and after adjustment for Physical capital, but remained significant for no achieved level of education.

Table 9.3Compositional effect OR (95% CI) of level of education on women's current non-use of contraception by community level of Public capital DHS 2010 N=17,400, communities=2,498

	Model 13	Model 14
Cross-level interaction		
Effect of education in communities with low Public capital		
Primary level	1.07 (0.98-1.16)	1.08 (1.00-1.19)
No achieved level	1.11 (0.94-1.32)	1.14 (0.96-1.35)
Effect of education in communities with high Public capital		
Primary level	0.94 (0.86-1.02)	0.92 (0.84-1.00)
No achieved level	0.90 (0.76-1.06)	0.87 (0.74-1.04)
p-value cross-level interaction	*0.22*	*0.10*
Pooled effect of level of education[1]		
Primary level	1.09 (0.99-1.20)	1.05 (0.95-1.16)
No achieved level	1.76 (1.35-2.28)	1.67 (1.28-2.17)

[1]There was no evidence of a cross-level interaction between level of education and community level of Public capital; hence pooled estimates for the effect of education were reported.

Urban and rural place of residence 2010

Table 9.4shows the results for the effect of level of education on women's current non-use of contraception in urban and rural areas in 2010. Consistent with findings at the national level in 2010 and similar to findings for 2005 there was no evidence of a cross-level interaction between women's level of education and mean community Public capital. Pooled estimates of the effect of level of education were in the hypothesised direction of higher current non-use of contraception for lower levels of education; the size of the effect was significant for no achieved level of education only.

Adjustment for household wealth differences

Adjustment for Physical capital in Model 14 (Table 9.4) decreased the size of the pooled effects of primary and no achieved level of education in both urban and rural areas. There were no changes in the direction of the association except for the effect of primary level of education in urban areas. The size of the effect of no-level of education was relatively larger among women in rural than urban areas.

Table 9.4 Compositional effect of level of education on women's current non-use of contraception by community level of Public capital DHS 2010 urban and rural areas

Cross-level interaction	Urban N=11,509, communities=1,679		Rural N=5,891, communities=819	
	Model 13	**Model 14**	**Model 13**	**Model 14**
Effect of education in communities with low Public capital				
Primary level	0.90 (0.72-1.12)	0.91 (0.73-1.14)	1.11 (0.94-1.29)	1.12 (0.95-1.31)
No achieved level	1.28 (0.79-2.06)	1.32 (0.82-2.12)	0.96 (0.73-1.27)	0.98 (0.74-1.29)
Effect of education in communities with high Public capital				
Primary level	1.12 (0.89-1.39)	1.10 (0.88-1.38)	0.90 (0.77-1.06)	0.90 (0.76-1.05)
No achieved level	0.78 (0.49-1.26)	0.76 (0.47-1.22)	1.04 (0.79-1.37)	1.02 (0.77-1.35)
p-value cross-level interaction	*0.32*	*0.31*	*0.34*	*0.31*
Pooled effect of level of education[1]				
Primary level	1.00 (0.85-1.17)	0.97 (0.82-1.14)	1.15 (0.91-1.45)	1.12 (0.89-1.41)
No achieved level	1.58 (1.11-2.24)	1.50 (1.06-2.13)	2.57 (1.55-4.25)	2.44 (1.47-4.06)

[1]There was no evidence of a cross-level interaction between level of education and community level of Public capital, hence pooled estimates for the effect of education were reported for both urban and rural areas.

9.2. Summary of main findings and discussion

Main findings

- At the national level, the effect of primary and no achieved level of education were associated with lower odds of current non-use of contraception among women who lived in communities with higher levels of Public capital, whereas higher odds of current non-use of contraception were observed among women in communities with lower levels of Public capital. This cross-level interaction was significant in 2005.

- The direction of the association between level of education and community Public capital in urban and rural place areas in 2005 was consistent with findings at the national level. There were mixed findings in 2010, whereby the direction of the effect of education was consistent to findings at the national level for the effect of no achieved level of education but not for primary level of education. There was no evidence of a cross-level interaction between level of education and mean Public capital by urban and rural place of residence in 2005 and 2010.

- Pooled estimates of the level of education took the expected direction by urban and rural place of residence in 2010 and among women in rural areas in 2005, whereby lower levels of education were associated with higher current non-use of contraception.

Discussion

There was evidence to support the main hypothesis that high community levels of Public capital compensate for the compositional effects of women's low achieved levels of formal education with respect to current non-use of contraception. This was the case for the 2005 national sample, with borderline evidence among the urban sample and results were not consistent in the 2010 sample.

One limitation in the analysis relates to the sample size for each level of education e.g. the number of women with low levels of education in communities with high Public capital. Women with low levels of education tended to live in areas with poorer socioeconomic conditions including access and availability of public services provided by or on behalf of the local of central government in Colombia. This clustering of educational attainment and level of public infrastructure limits the model in its ability to separate the two effects.

Restrictions in terms of data availability should be considered as a limitation when assessing the indicators included in the construction of community Public capital. In this study, Public capital was defined as a proxy for community availability of electricity, sewage and potable water based on data availability and comparability at the household level. Household characteristics were aggregated to the community level and although this is a widely used method for constructing contextual proxies' one possible limitation is the lack of available information captured directly at the community level. In addition, the distribution of women by Public capital was skewed which points out a challenge in using asset-based indicators to measure relative socioeconomic position. In this context, the original purpose of the DHS for Colombia should be recognised. The survey was not designed for collecting information for the construction of Public capital, and although the indicators included cover a wide range of assets, information on other types of asset relevant for assessing this indicator are absent. Additional forms of public services could refine the measurement of Public capital and provide a smoother distribution with the inclusion of other amenities such as garbage collection and provision of piped gas which would allow for better household differentiation into socioeconomic groups. See general discussion chapter 10, page 271.

Chapter 10: Discussion and conclusions

10. Discussion and conclusions

Introduction

This chapter summarises the main findings in relation to the aim, objectives and hypothesesof this thesis anddiscusses them in the light of previous studies, methodological considerations and future research and policy implications.

10.1.   Main findings

Multidimensional approach to SEP

The aim of this project was to develop a framework to investigate socioeconomic inequalities in women's 'current non-use of contraception' against the backdrop of the MDGs and the third recommendation of the CSDH which states the need to measure and understand the problem of socioeconomic inequalities in health. This aim was carried out by applying a multidimensional asset-based approach to SEP, in which socioeconomic inequalities in women's current non-use of contraception were investigated along four dimensions of SEP: level of education, HWI, Physical and Public capital using the Colombian DHS.

Based on the literature review conducted for this thesis, no other studies have used a multidimensional asset-based approach to explore socioeconomic inequalities in contraceptive use for Colombia or other Latin American country. This thesis has found that the application of a multidimensional approach to the measurement of SEP using DHS data provides a comprehensive framework to describe and understandsocioeconomic inequalities in contraceptive non-use along different dimensions of women's SEP.This approach is relevant for research on health inequalities from a social determinants perspective in low and middle income countries for which information on income or consumption is often unavailable or unreliable, but more importantly, this approach sets out an alternative way of measuring socioeconomic circumstances that overcomes monetary driven measures of SEP which miss non-material dimensions of SEP measurement.

A multidimensional approach echoes AmartyaSen's[147,148] work on human development and capabilities which takes into account not only the lack of 'material resources', but also incorporates measurement of deprivation in non-material areas of human life such as deprivation of capabilities defined as the freedom to achieve

valuable beings and doings and deprivation of fundamental rights such as knowledge e.g. level of education and living standards e.g. access to water and services.

To construct the measures of SEP used in this thesis, the composite Household Wealth Index(HWI),widely used in the literature [56,58,77,149],was divided into two dimensions: material (Physical capital) and publicly provided services (Public capital), and a third dimension was added based on the level of educational attainment (Human capital).The items considered here correspond to the most commonly used assets in the literature[56,78,79,84,150].By separating the composite index into theoretically sound dimensions of SEP, each measure captured latent socioeconomic circumstances which were relatively independent of each other at the national level and in urban and rural areas (see chapter 4 page 116).

From this standpoint, this thesis has the theoretical advantage of using a framework for disentangling socioeconomic inequalities in contraceptive non-use in a way that is not possible with a composite index such as the HWI. This advantage is evident in two ways. First, this thesis goes beyond a one-dimensional individual-level measurement of women's SEP by separating and comparing different individual and contextual dimensions of SEP e.g. material pathways (Physical capital, Public capital) and psychosocial pathways (Human capital) which are important to distinguish with respect to public health interventions. Second, besides asking which socioeconomic dimensions are relatively more important for women with respect to their contraceptive behaviour, this thesis investigated how these dimensions may interact among different social groups. To fulfil this aim, three general objectives were set out with their corresponding hypotheses; these are summarised below along with the main findings.

1. First objective: Levels and trends in absolute and relative socioeconomic inequalities in contraceptive non-use

The first objective of this thesis was to develop a multidimensional approach to SEP to describe and understand levels and trends in absolute and relative socioeconomic inequalities in women's current non-use of contraception along four dimensions of women's SEP: level of education, HWI, Physical and Public capital. Three hypotheses were tested.

National averages vs. within country inequalities

The first hypothesis proposed that absolute and relative socioeconomic inequalities in contraceptive non-use in Colombia were larger in rural than urban areas. Studies in Latin American countries have consistently found that national averages provide misleading information of within country levels of health and health-related outcomes [45,151]. Findings in this thesis confirm this hypothesis for Colombia with respect to women's contraceptive non-use whereby national averages masked within country larger absolute and relative inequalities in current non-use of contraception among women in rural than urban areas.

Possible explanations for the observed differences in the magnitude of inequalities between urban and rural areas include differences in women's reported,realized and wanted fertility rates, which are inextricably linked to women's urbanization trends, higher educational opportunities, empowerment and social mobility associated with higher use of contraception and lower fertility levels [51]. Different stages of fertility transition were observed among women in urban vs. rural areas. In 2010 the fertility rate was2.0 births per woman inurbanareas which is below population replacement level (2.1 births per woman),while in rural areas itwas 2.8 births per woman, slightly higher than the figure observed back in 1986 for women in urban areas (2.6 births per woman). The wanted fertility rate in urban areas in 1986 was 1.9 which was the wanted fertility rate among women in rural areas in 2010.These findings for Colombia are consistent with national fertility levels vs. within country fertility profiles in other countries in the Latin American region [51].

Based on the results in this thesis a shift to within-country monitoring does not compete but complement national level information by providing an informed platform for local ownership and pro-equity approaches in the country. Tackling socioeconomic inequalities in health requires not only improvement on the national contraceptive prevalence rate (CPR) average as observed in the findings of this thesis, where contraceptive non-use in Colombia decreased between 1986 and 2010 from32.6% to 22.9%. These results are important in the context of monitoring socioeconomic health inequalities and suggest the need to introduce national agendas like the MDGs to within-country goals by key social determinants like urban and rural place of residence which could improve regional monitoring of socioeconomic inequalities in health and health-related outcomes. Theexclusive use of national threshold-based targets to monitor the CPR target of the MDG5 misleads findings on the progress within the

country and could increase inequalities provided that vulnerable and hard to reach populations continue to be left behind [120,152,153].

Inequalities in use of contraception within the country could be reduced if the disadvantaged i.e. women with no achieved level of education in urban and rural areas who are lagging behind and who were the only two groups that did not experience any improvement in contraceptive use from 1986 until 2010, could decrease non-use of contraception at the same or faster rates as the better off groups. This finding highlights that low levels of human capital measured as achieved level of education is a key social determinant of inequalities in women's current non-use of contraception and suggests that the well-known effects of women's education on contraceptive behaviour were confirmed in this study [65]. In the absence of fulfilled educational opportunities women with no achieved level of education have taken the heaviest burden over the past 24 years in Colombia with respect to current non-use of contraception and ought to be targeted through public health policies to reduce the educational gap in contraceptive use despite high uptake of contraception at the national level surpassing ahead of time the CPR MDG5 target for 2015.

SEP dimensions of inequality in contraceptive non-use

The second hypothesis tested if socioeconomic inequalities in contraceptive non-use were larger by Physical capital than inequalities by level of education. Results suggest that the absolute and relative gradient by level of education was relatively smaller than by Physical capital. Overall, household asset-based measures of SEP i.e. HWI, Physical and Public capital were associated with larger inequalities in contraceptive non-use than level of education. These findings do not undermine the importance of level of education as a key factor associated with women's contraceptive behaviour [64,104]; instead they stress how inequalities in household material living conditions measured through physical and public assets have an important effect in women's current non-use of contraception by creating larger inequalities through material conditions which have been previously interpreted as proxies of women's economic and geographical barriers [146,154].

These results make sense in the context of Colombia where financial barriers are a possible mechanism for lower use of contraception among relatively poorer women, who are also likely to be the least educated. Though legislation has been in place to guarantee public provision of modern contraceptive methods since 2003, access to

health services in the country is not universal. Studies have found that women in Colombia incur additional costs e.g. user fees at point of service, transport costs or taking time off work to travel to health facilities [111,155,156]. Another mechanism for accessing contraceptives is through commercial providers like pharmacies which may lower the costs for women who can afford and are willing to pay private providers and who may want to avoid administrative barriers of the health sector i.e. prescriptions, yet it has implications with respect to contraceptive failure due to misinformation and lack of follow-up [20]. Other possible mechanism is cultural lifestyle through mass media i.e. radio and TV soap operas, female role models, information on contraceptives and sexual choices. Physical capital could also be an indicator of social standing and may influence women's reproductive desires, ability and willingness to pay for health services i.e. contraceptive services. On the other hand, women in isolated areas or regions in conflict, particularly Afro-Colombian, indigenous or peasant women face geographical barriers and are more likely to be left out of public and commercial provision of health services and are less likely to access mass media information including access to modern contraceptive methods [111].

Findings of larger inequalities through material household conditions than by level of education with respect to contraceptive non-use are important because they provide evidence of the need for intersectoral actions as suggested during the World Conference on Social Determinants of Health(SDOH) in 2011 [157]. To tackle socioeconomic inequalities in contraceptive use in Colombia public and social policies need to be put in place through the collaboration and mutual benefit of different sectors. For example, the education sector must continue strengthening women's education as a priority through public policies, the government should strengthen social policies that guarantee better housing, material living conditions and public infrastructure, and the health sector should guarantee contraceptive security [158] by which individuals are able to choose, obtain and use contraceptives when needed across the country. In this way each sector articulates into its own agenda actions on social determinants associated with women's contraceptive non-use in Colombia.

Trends in socioeconomic inequalities

The third hypothesis tested if a decrease or no change in non-use of contraception at the national level masked differences in socioeconomic trends within the country, whereby inequalities between 1986 and 2010 stayed the same in urban areas but increased in

rural areas. The rationale for this hypothesis was based on the experience, during the 1990s, of family planning graduation programmes parallel to the health sector reform in Colombia, two factors that have been associated with an increase in national CPR levels, but important within country variations [130-133].Findings on national trends indicate that absolute socioeconomic inequalities by HWI and Physical capital have narrowed, but relative inequalities remained stable from 1986 until 2010. Studies using DHS data from Ghana and Kenya have found no significant overall changes in use of modern contraceptive methods at the national level, which masked trends in opposite direction in urban and rural areas [137,159,160].

Findings for urban areas indicate that absolute and relative inequalities remained broadly constant except for absolute inequalities by Physical capital which decreased over time. The decline of inequalities by Physical capital may be explained provided that poorer women increased use of contraception through the public sector[130].Decentralisation among richer urban municipalities is less likely to have a negative effect on resource allocation for family planning, provided there is less competition with other primary health-care priorities and less political sensitivities about family planning procurement and distribution [36]. In urban areas in Colombia Public provision of contraceptive methods rose from 14% in 1990 to 56% in 2010 [120].

Among women in rural areas absolute and relative inequalities persisted over time. Contrary to the proposed hypothesis there was no evidence of increasing inequalities in contraceptive non-use in rural areas in Colombia despite a decrease in contraceptive use among women in vulnerable groups i.e. women with no achieved level of education. Public provision of modern contraceptive methods increased from 30% to 65%, studies in Latin America and Africa suggest that the expansion of the public sector is unsustainable and could perpetuate and/or increase inequalities if access to family planning for the poor and 'hard to reach populations' is unreliable particularly in rural areas where decentralisation of preventive services is less politically rewarding and receives less attention than curative services [130,133].Studies on the effect of decentralisation of health to the municipality level in Africa and Latin America provide mixed results, but there is evidence of increasing inequalities in health service provision such as immunization and family planning particularly among populations in rural areas [36,160,161].

These results provide evidence that family planning efforts through private and increasing public provision of modern contraceptive methods in the country along with changes in women's fertility preferences and behaviours have been successful in reducing non-use of contraception down to 23% achieving the national CPR target for the 2015 MDG5. User rates of modern contraception have gone up substantially, but socioeconomic disadvantages have not been addressed successfully by public health policies. Inequalities between urban and rural levels have not been targeted and women with no achieved level of education have taken the heaviest burden over the past two and a half decades with respect to current non-use of contraception. Possible reasons for these findings could be that the withdrawal of USAID support for family planning from the national government and NGOs led to improved central level administration i.e. import laws, legal regulations, use of mass media, but had a negative impact in field outreach activities such as community-based services and social marketing provided in rural areas which led to increasing inequalities within countries, as has been observed in similar contexts [133,160].

These findings are important because they provide evidence that the country lacks a comprehensive approach to socioeconomic inequalities which is necessary for equitable progress towards the MDG5 in Colombia. Government monitoring of trends in socioeconomic inequalities requires within-country targets and policy guidelines. Public providers and NGOs are not reaching vulnerable populations and overreliance in the public sector ignores long-term sustainability [133,137]. The health sector in Colombia has become financially overextended and it remains a critical question if it will be able to afford for universal access to primary health care including family planning without structural changes. Every year each municipality is required to allocate funding for family planning according to their needs, but political interests and competition with other health priorities endanger family planning security across municipalities[38,161]. Family planning provision in the public sector has not reached its full potential in Colombia presumably due to poor logistics which result in stock outs and misdistribution[38,156].Public health efforts should focus on poorer women with no achieved level of education and on trends in the social gradient in contraceptive non-use by material household living conditions particularly in rural areas.

2. Second objective: interplay between SEP dimensions on women's contraceptive non-use

The second objective of this thesis was to explore the interplay between different kinds of social inequality on women's current non-use of contraception through the identification of interactions between socioeconomic dimensions. Provision of Public capital was hypothesised to compensate for low levels of education with respect to current non-use of contraception. The first analytical strategy conceptualized provision of Public capital as a measure of women's SEP (Chapter 6), and the second as a measure at the community-level defined as community mean Public capital (Chapter 9).The interaction took the expected direction for both analytical strategies whereby the effect of level of education was associated with lower odds of current non-use of contraception among women in households with higher than lower Public capital and among women in household within communities with higher than lower mean community Public capital. A study in Peru found a similar interaction between Public service availability at household level and maternal years of education with respect to their children's nutritional status [80]. Nutritional status was higher among children in households with access to public services compared to those without them when mothers had less years of education, but this contrast was not evident among more educated mothers. These important observations emphasize that provision of public infrastructure at the household and community level can complement the effect of level of education among women with lower achieved levels of education.

There may be four explanations for our findings. First, women in households with high Public capital may have better access to family planning through health insurance, yet the inclusion of health insurance cover had no effect in the interaction model. Second, better living conditions may influence contraceptive use through higher physical wealth and resources in the household. Households with high Public capital do differ from low Public capital households particularly in terms of physical wealth (ownership of durable goods and housing quality) in urban and rural areas. However, the interaction remains after adjusting for household wealth (Physical capital) consistent with an independent effect of public services provision.

Third, Public capital could be a proxy for local economic development, with better public infrastructure and social organisation such as health programmes or services in those areas that have mains water, sewage and electricity. Households with higher Public capital may be more exposed to family planning campaigns, closer to pharmacies

and hospitals and other factors associated to family planning uptake. Fourth, higher levels of Public capital could benefit women in their household chores (e.g. household access to water, garbage collection) and indirectly provide women with autonomy that may translate into spare time to participate in activities that enhance women's health and status e.g. social activities and use of health services.

On the other hand, the combined effects of low levels of education (Human capital) and low Public capital may operate as a bottleneck for family planning interventions in deprived urban and rural areas in Colombia. The evidence that higher provision of Public capital compensates for low levels of Human capital suggests that government investment in public services is even more necessary in areas where women with lower levels of education are clustered. The socioeconomic gap in contraceptive use documented in Colombia in the past decade is likely to decrease with improvement of household living conditions and community infrastructure.

The evidence that these two socioeconomic dimensions interact with positive effects on women's contraceptive use suggests the equal importance of acting on social determinants that have an effect on educational and public assets inequalities. In Colombia provision of public infrastructure and formal education has increased in the past decade and particularly with the MDGs agenda[162].Improving Public capital should be prioritised in rural areas, which remain relatively underserved compared to urban areas where provision is almost universal. Investment in women's education, although important, is not enough to tackle inequalities in contraceptive non-use. Strengthening educational opportunities for women is a social policy in Colombia under the MDGs agenda, which benefits mainly younger women of reproductive age. Intersectoral actions on other dimensions of women's SEP like Public capital at the household and community level could compensate for the lack of educational opportunities among women of reproductive age in relatively older age groups who lacked educational opportunity at a younger age and for whom formal education is less likely an alternative because of their age group.

These findings are important for policy planners as they indicate that the combined effects of low levels of Human capital measured through achieved level of education and low Public capital operate as a bottleneck for family planning interventions in deprived urban and rural areas in Colombia. The evidence that higher provision of Public capital compensates for low levels of Human capital suggests that government investment in public services is even more necessary in areas where women with lower

levels of education are clustered for structural reasons i.e. civil conflict in rural areas or due to cultural norms that exclude women of educational opportunities. In regions where Public capital is far from being universal, sole investment in Human capital is not sufficient to reduce inequalities in women's contraceptive use. The importance of public asset provision at the household and community level is more important in regions with larger inequalities in access to public assets than among better-off areas. Coordinated action on social determinants such as living conditions with respect to physical and public assets and women's empowerment through education could trigger a 'virtuous circle' of improvements in which health and its determinants would provide mutual benefits across sectors [157].

3. Third objective: area differences and the effect of contextual characteristics on contraceptive non-use

The third objective examined area differences and the effect of individual and contextual community and municipality characteristics of interest using a multilevel analytical approach. A set of hypotheses were tested to examine area differences in contraceptive non-use and the effects of individual and contextual variables of: SEP, IPV and family planning related characteristics.

Area differences

Area differences in women's current non-use of contraception were found at the national level in 2005 and 2010, both of the surveys used in this analysis. Adjustment for women's exposure to sexual abuse, family planning decision making, exposure to family planning information and socioeconomic circumstances at the individual level explained some of this variation, but as hypothesised these did not account for area differences in contraceptive non-use at the national level and in rural areas. Significant variation between communities and between municipalities after adjustment for individual and contextual factors indicates the influence of unmeasured characteristics in a woman's environment e.g. social, physical, political, etc. with respect to contraceptive non-use [163].

Among women in communities in urban areas the lack of statistical evidence of differences between-communities does not indicate absence of a contextual phenomenon for women's current non-use of contraception. Studies with DHS data in African countries suggest that an explanation for low and non-significant between-

community variation in urban areas in Colombia could be that the definition of 'community' and its geographical boundary as used in this study do not correspond to relevant contextual areas [164] with respect to women's contraceptive use dynamics.

In this thesis, a 'community' was captured through the primary sampling unit which covers an area of approximately two blocks. This definition is the standard approach in the literature, but may pose limitations as people may not define their community networks in relation to physical proximity. In urban areas for example access to transport alternatives may provide mechanisms to develop a sense of 'community' with people geographically distant but socially proximate e.g. work and recreational activities. In contrast, among people in rural areas, geographical proximity may play a relatively more crucial role for developing a sense of 'community' due to lower density population, and poor transport alternatives [144].

Individual characteristics

Women's exposure to intimate partner violence at the individual and community-level was not associated with higher odds of contraceptive non-use contrary to the hypothesised effect. This finding may reflect measurement limitations and although the DHS in Colombia follows strict ethical guidelines for data collection on sensitive issues like IPV, this survey was not specifically designed to measure sexual violence and hence is not sensitive to different forms of sexual coercion and may be prone to report bias e.g. social desirability bias in face-to-face interviews, gender roles. Studies on the effect of IPV on women's contraceptive behaviour provide mixed results [97,110,165-167], but there is evidence from African countries to support the hypothesis that sexually abused women in marital union (married or cohabiting) take up female contraceptive methods as a strategy to avoid having a child in a violent context which may precipitate further violence and future violence towards the child [101]. These women remain at risk of sexually transmitted diseases if negotiation of barrier methods is not possible. Further research is warranted to understand these findings in the Colombian context.

Results on discussion of family planning with husband or partner and friends provide important information for policy planners. As expected, discussion of family planning with a female friend plays a plausible protective role which can be explained by access to information and social acceptability of family planning through a woman's peers and social network [168]. In contrast, increased non-use of contraception for women who

reported discussing family planning with husband or partner could indicate measurement limitations as the question does not provide information on the frequency and nature of these discussions, but it could also indicate male oriented cultural norms of 'machismo' common in Latin American countries which stress domination of women and may dictate men to refuse negotiation of family planning[146]. Lack of male participation or inclusion also indicates limitations in the delivery of sexual and reproductive health policies that traditionally focused the burden of reproductive health on women of reproductive age and excluded men from participating.

The latter is related to findings regarding exposure to family planning information at health centres. Although from the questionnaire it is not possible to determine the form and content of this information, it serves as a proxy for women's physical access to health facilities and information as a hypothesised protective role with respect to contraceptive behaviour. Further research is warranted as the direction of the association was different in 2010 whereby exposure to information on family planning at a health centre was associated with higher odds of current non-use of contraception. In Colombia, there are cultural, economic and geographical barriers for accessing sexual health services which may prevent women from acquiring medical information and support [38].

Contextual factors

Contextual factors played an important role in women's contraceptive non-use overand above individual characteristics. There was evidence to support both proposed hypotheses in this section. First, community-level characteristics in the form of women's approval of family planning and mean Public capital had an effect on contraceptive non-use over and above women's individual level characteristics, specifically exposure to IPV, information, discussion and approval of family planning and socioeconomic circumstances. As expected, communities with higher female approval of family planning were associated with lower odds of current non-use of contraception. One possible mechanism for this positive effect is the role that women's social networks play as tools for knowledge transfer, empowerment and empathy to women's needs[146]. Individual knowledge of women's reproductive system has remained low, yet uptake of contraception has increased remarkably. The latter could indicate social mechanisms that promote uptake of contraception irrespective of women's knowledge of the female biology. On the other hand, these social networks

could also enforce social conformity or peer pressure regarding culturally acceptable sexual behaviours and expectations among women of similar social background [101,113,167].

Second, disparities between communities remained after accounting for the individual and community characteristics of interest. These findings are important because they provide evidence that women's contraceptive behaviour goes beyond merely individual decision-making processes; hence contraceptive use is strongly influenced by community factors such as women's perception of cultural acceptance in the social networks around her and community socioeconomic circumstances in the form of public assetsand unmeasured characteristics in a woman's environment e.g. social capital, physical and political barriers. These results are consistent with previous studies in African and Asian communities where there is a wealth of information using DHS and similar nationally representative surveys [101,113,114,169-171]. Findings in this thesis are novel for the Colombian context. Based on the literature review conducted for this thesis this is the first time community characteristics and their effect on current non-use of contraception are explored using a multilevel framework. These findings can be used by policy planners in Colombia to tailor local strategies at the community level to move beyond individual-level women oriented strategies.

Municipality effects

There was evidence to support the first hypothesis of interest in part. Municipality characteristics were hypothesised to have an effect on women's current non-use of contraception over and above individual and community factors. The hypothesis was consistent with respect to municipality ethnic composition but not for unsatisfied basic needs (NBI). Higher proportion of ethnic minorities at the municipality-level was associated with higher current non-use of contraception. Ethnic minorities include indigenous populations, Afro-Colombians and gypsy communities. This finding suggests that cultural factors have an important impact on women's contraceptive non-use that is not accounted for by compositional and community family planning related characteristics or compositional, community and municipality socioeconomic circumstances.

This is an expected finding due to Colombia's ethnic diversity that warrants further exploration of the possible mechanisms with respect to women's contraceptive behaviour. First, strong cultural norms among traditional ethnic minorities may

represent a social barrier for the use of modern contraceptives e.g. social resistance to barrier methods like condoms and social expectations of large families among indigenous communities[172].Second, ethnic minorities are clustered in geographical areas of the country with poor living conditions and highly exposed to the internal civil conflict and violent displacement. The clustering of these characteristics could be one possible mechanism which may have been partly captured through the NBI variable, yet municipality contextual influences of exposure to the internal conflict were not measured and hence not accounted for in the models.

Municipality characteristics measured using census data influenced women's reported non-use of contraception and explained between community-variation. Consistent with the second hypothesis there was residual municipality variation in women's current non-use of contraception. Between municipality differences should be interpreted bearing in mind that municipalities in Colombia follow political subdivisions which may overlap with social definitions of regional boundaries. However, the strength of using municipality level data is that this political subdivision is important with respect to all aspects related to infrastructure and provision of health services in Colombia since the Health Sector reform (1993) when through decentralisation health authority levels and areas of competency were transferred from the central government to the departmental, district, and municipality levels. Law #715 in 2001 established that municipality-level governments are responsible for health monitoring and maintenance of the public health surveillance system in their respective jurisdictions as well as implementation of local promotion of public health including sexual and reproductive information and services[38].Findings of the effect of municipality ethnic composition on current non-use of contraception are novel in Colombia; further exploration of this effect is warranted to tailor local agendas with respect to contraceptive use and maternal health among municipalities with higher proportion of ethnic minorities historically neglected in the political context of the country.

10.2. Methodological considerations

Strengths and weaknesses

This section discusses issues about the representativeness of the data, information bias, and concerns regarding the construction of asset based indices for the study of socioeconomic inequalities in health.

Representativeness

The DHS series is an incomparable source of information on demographic and health indicators for the population of Colombia and surveys have been used systematically as official national statistics on demographic and reproductive health indicators in the absence of other sources of information. This thesis has the strength of using the best available information on contraceptive use for Colombia designed to be nationally representative and covering a period of more than two decades. In addition, findings are comparable to the wealth of literature with DHS data in other low and middle income countries.

The CONPES 91 Colombia is an official document which added the MDGs in national social policies and currently uses the Colombian DHS as the main source of information for evaluating demographic and reproductive health outcomes[173]. Although other surveys have been carried out in the country, none has focused on sexual and reproductive health at a national level or examined socioeconomic inequalities in contraceptive behaviour and related outcomes.

Thehistoryof forced internal displacement in the country should be considered an important factor when assessing the representativeness of the data. Although the DHS are large surveys with sophisticated sampling procedures and selection processes[174], it is not always possible to guarantee an up to date sample in urban and rural areas where hundreds of people are moving around in absence of a permanent and safe place to reside, as is the case of the internally displaced population expelled from the departments of Antioquia, Bolívar, Magdalena, Cesár, Chocó, Caquetá, Putumayo and Tolima. This limitation is addressed by the DHS technical team which updates all sampling maps in the field before conducting the surveys. With this in mind, displaced groups are likely to be underrepresented in the sample if they lack a permanent household. These groups of women are particularly at risk of sexual and reproductive ill health [25,32,175-177].

Information bias

This thesis is based on self-reported information about women's reproductive health and culturally sensitive topics like exposure to intimate partner violence. The valuable wealth of information provided by the Colombian DHS series is unique. The 1990 Colombian DHS was the first DHS survey to implement a questionnaire on family violence and since then the content and ethical guidelines have been reviewed and refined. High response rates (86-95%) and relatively low levels of missing data in the Colombian DHS are comparable to levels in other Latin American countries for a wide spectrum of the population with exceptions among the wealthiest households in urban areas (see methods section page 56 and 85).

Possible misreporting of contraceptive behaviour and exposure to intimate partner violence must be taken into account when interpreting the results of this study. Women may use contraceptive methods for purposes other than family planning i.e. skin conditions, menstrual disorders, or may refrain from admitting use of birth control in front of family members due to social pressure[178]. Cultural differences may influence individual and social perceptions on family violence which is especially relevant in more traditional contexts i.e. indigenous and peasant populations with dominant male patriarchal control, or in contexts of civil conflict where violence against women is generalised[50]. To investigate this potential weakness a series of sensitivity tests were carried out using different analytical samples. Sensitivity tests showed some sample size limitations; however the main findings and conclusions of this thesis were robust in general irrespective of the analytical sample. Based on these findings the application of sensitivity analyses is recommended as a standard approach for monitoring health inequalities to provide comprehensive information applicable to the larger population.

Another possible limitation is the lack of information on factors such as ethnicity and religion for the Colombian DHS. This was considered a drawback of this study as it is not possible to explore the effect of these factors on women's contraceptive use. This is particularly relevant as Colombia is a country with a diverse population. This weakness was partly overcome by using Census data information on the proportion of ethnic minorities at the municipality level measured using national official categories e.g. whites and mestizos (mixed white and indigenous ancestries), Afro-Colombian (blacks, mulattoes -mixed black and white ancestry- and zambos –mixed indigenous and black ancestry-), indigenous and gypsy. This indicator was interpreted as a proxy for 'ethnic diversity'.

Construction of asset-based measures of SEP

One important challenge in using asset-based indicators to measure socioeconomic inequality is to use a broad and sufficient set of indicators to allow for differentiation of wealth groups across all households. TheDHS surveys were not designed for this purpose, and although the indicators included cover a wide range of assets, information on additional assets relevant for assessing SEP are absent from the data e.g. livestock and machinery for households in rural areas. Therefore, restrictions in terms of data availability should be considered a possible weakness when assessing the indicators included in the construction of the asset-based indicesparticularly for rural contexts[56,78,83,179,180] Similarly, for the case of Public capital index, there is some clumping and truncation in the distribution of the wealth score, explained by an insufficient number of asset indicators (see methods section page 61) available to use which constraints the classification of households into wealth groups (quintiles)[83,150,179].

This weakness in the data was investigated through a series of sensitivity analysis applying different forms of factor analysis to derive the weights used in the asset-based measures of SEP and toassess the best approach for household classification into socioeconomic groups. Based on a review of the literature, principal component (PCA) and multiple correspondence analyses (MCA) were applied to the household data. Weights and household classification were compared. MCA was the method of choice for the construction of asset-based measures of SEP in this thesis because it is more suited for categorical data [122]and it provided a smoother distribution of households into socioeconomic groups. Nevertheless it should be noted that comparability with asset-based measures derived using PCA, widely used in the literature was not compromised by the application of MCA. There were high correlations (Spearman rank correlation coefficients >0.88) between PCA and MCA derived SEP measures (see appendix 9).

Linearity assumption

Linearity assumption is related to measurement characteristics of the SII and the RII, which summarise the absolute and relative association respectively between the SEP measure and the outcome of interest with one single value that comprises all SEP categories at once. This approach is based on a linearity assumption. To explore the degree of non-linearity present in the Colombian DHS all models using the SII and RII

were tested for departure from linear trend. Some examples of departure from linearity were found at the national level and by urban and rural place of residence for all measures of SEP used (see appendix 6). Although departure from linearity is not usually reported with the use of the SII and RII in the literature, care is needed as the magnitude and direction of the bias depend on the degree of nonlinearity present [134,141]. Nonlinearity could partly explain inconsistent results with respect to direction, relatively small magnitudes and differences between analytical sample and the sensitivity sample due to the distribution of the outcome across SEP groups.

Despite this possible weakness for the interpretation of some of the models, the advantagesof applying weighted measures like the SII and RII to allow for comparisons across time and place balances out this limitation. The latter is relevant as this thesis uses data from six time points across 24 years during which the country experienced major demographic and socioeconomic changes i.e. distribution of achieved levels of education increased at the national level yet there were differences between urban and rural areas. Previous studies on methodological issues in measuring inequalities recommend the use of summary weighted measures specially when there is an interest in understanding time trends like in this thesis [123,181,182].

10.3.   *Implications for research*

Several research opportunities have emerged from this thesis. First, the possibility of applying a multidimensional approach to individual and contextual socioeconomic circumstances could enhance our understanding of health inequalities in low and middle income countries. This framework can prove valuable for monitoring progress on the MDGs and help build public understanding of socioeconomic health inequalities from a social determinants perspective.

Second, this approach could be applied to capture other individual and contextual dimensions such as social participation, social protection, and democratic activity to advance research on social determinants of health missed out in current research for Latin America [78,183]. The residual variation in women's contraceptive behaviour found in this thesis indicates the need to improve collection of contextual data for SEP, IPV and family planning related characteristics as well as information on unexplored potential factor such as health services and family planning programmes that can be linked to readily available data like the DHS [119]. Another way of improving measurement of contextual characteristics is through the application of more

sophisticated ways of deriving aggregated-level measures using individual-level data with DHS data e.g. Empirical Bayes to improve estimates where there is small within sample size or poor agreement among individuals within the contextual unit of analysis i.e. community, neighbourhood [184].

Third, studies using longitudinal data are needed to determine the temporal order of contraceptive non-use and the independent characteristics of interest at the individual and community level and separately for urban and rural areas of residence, which could provide opportunities for local interventions particularly for groups of women lagging behind the CPR MDG target in the country i.e. women with lower achieved levels of education.

10.4.   Policy implications

Several policy implications arise from this study. More than a decade has passed since Colombia underwent a major nationwide health sector reform that restructured and decentralised all health programs on sexual and reproductive health[35,38].Combined with this reform, the country faced the phase-out of USAID funding for modern contraceptive methods, introduced mandatory education on sexual and reproductive health in all primary and secondary schools in the country and eliminated tax and import duties on contraceptive methods. Additionally, the country has consistently adhered to international agreements like the Cairo consensus, where for the first time, the reproductive and sexual health and reproductive rights of women are central to an international agreement on population and declared the MDGs agenda central to the state public and social policies [185].

However, in the past 24 years Colombia has experienced major population dynamics that pose new challenges for policy-makers. Women's urbanisation trends accompanied by higher achieved levels of education and lower fertility levels can be explained by changes in cultural norms regarding gender relations, women's and couples' autonomy and family size expectations as well as access and availability to contraceptive methods. These changes have taken place despite persistent relatively low knowledge levels on sexual and reproductive health and no national legislation on reproductive health until 2003.

Findings from this thesis reveal that while programs on contraceptive use should focus on Human capital inequalities i.e. level of education they must not overlook the complex interrelationship with other determinants as Physical and Public capital. In

other words, to tackle inequalities in family planning governments need to recognize the interconnections among reproductive health and material and psychosocial factors as well as contextual characteristics relevant to the social groups of interest. This perspective goes hand in hand with intersectoral approaches for achieving the MDGs. In Colombia the CPR target of the MDG5 linked to the MDG7 water and sewage target for ensuring environmental sustainability. A potential synergy arising from the interconnectedness of both goals provides a line of action where intersectoral efforts could be the key for achieving these targets [152].

The region as a whole is moving into a phase of demographic transition that could be used to overcome poverty if appropriate investments and policies are in place. By the year 2025, the region will have the possibility of a demographic 'bonus' as the number of people in their most productive years (between 15 and 65) will outnumber older and younger dependents. It is a time in which the population structure favours savings and investments. The realization of reproductive rights will enable these people to control their fertility, which could enhance educational opportunities and favour upward social mobility provided that other political, social and economic variables will come into play as well, including governance and employment, among others. Nevertheless, ensuring reproductive rights like equitable access to safe and reliable family planning is a prerequisite for taking advantage of this potential demographic bonus.

10.5.   *Conclusions*

From a social determinants perspective, a multidimensional approach to individual and contextual socioeconomic circumstances provides an informative framework for monitoring inequalities in women's use of modern contraceptives in the context of the MDGs. Colombia has reached ahead of time the 2015 national CPR target of the MDG5. However, the socioeconomic gradient in modern contraceptive use by household wealth and education indicates the need to go beyond country averages and individual level determinants to unmask within-country socioeconomic inequalities by urban and rural place of residence and contextual municipality effects on women's contraceptive behaviour. Within-country targets need to be introduced, measured and monitored to build public understanding and implement strategies for women with no achieved level of education who lag behind the CPR target particularly in rural areas and to tackle the persistent gradient by household wealth in contraceptive non-use.

Researchers and policy makers should be aware that individual and contextual human, physical and public capital dimensions of women's SEP and contextual cultural factors are associated and interact with women's current non-use of contraception. The present findings suggest that continued progress in reducing current non-use and inequalities in non-use of contraception may depend on recognizing intersectoral influences of women's education, household living conditions and contextual cultural factors with respect to reported contraceptive non-use. The DHS findings show that social inequalities in women's contraceptive non-use are persistent in Colombia and a SDOH perspective is relevant because this aspect of health inequality has not been a policy target to date.

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11.   List of appendices

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11.1.   Appendix 1

Figure 20 presents the Gini coefficient in Colombia for the past 25 years according to the World Income inequality database. The Gini coefficient is the most commonly used measure of inequality. The coefficient varies between 0, which reflects complete equality and 1, which indicates complete inequality. The Gini coefficient increased in the 1990s and has remained above 0.50 ever since. The Latin American region is considered one of the most unequal regions with respect to income distribution in the world. Levels in Colombia remained high during the period of interest for this thesis.

Figure 20Gini coefficients in Colombia1985-2010
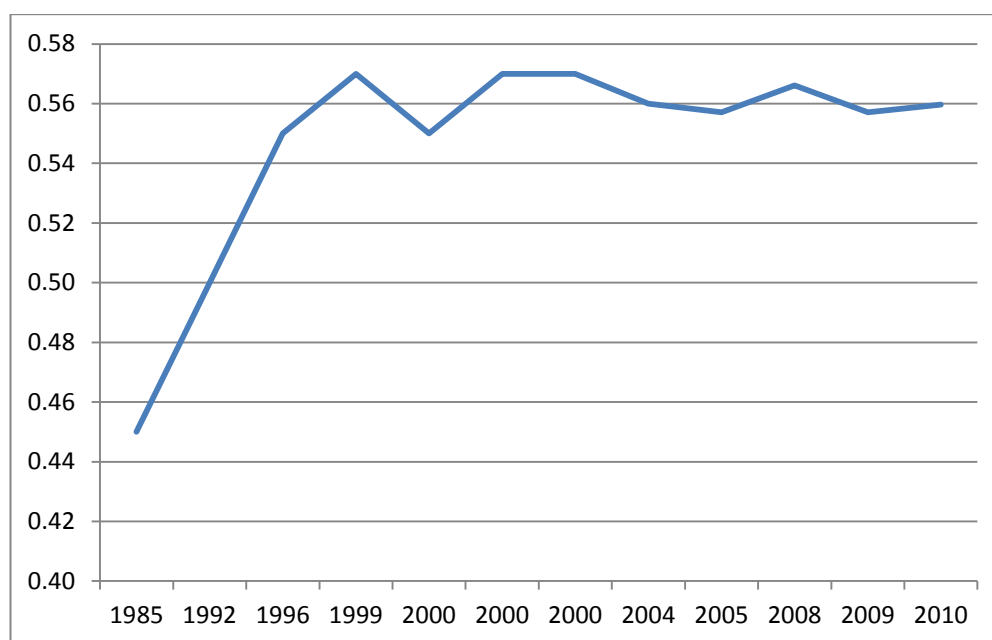
Source: World Income Inequality Database V2.0c May 2008

11.2. Appendix 2

This appendix presents a summary of studies on the association between socioeconomic position and contraceptive behaviour and related outcomes. A review of the literature was carried out to identify a relevant body of information from low and middle income countries. The table identifies key aspects like the source of data, proxies used for measuring women's SEP and women's empowerment, social status and/or exposure to IPV both at the individual and if available at the community level.

Online databases Pub Med, Web of Science, Science Direct and Scielo were queried for English, Spanish and Portuguese language articles. Additionally, other sources were sought through personal communication with authors and institutions in Colombia. For each search key words were combined to identify the studies on fertility regulation ("contraceptive", "contraception", "ever use of contraception", "unmet need") and women's empowerment ("status", "empowerment", "decision making", "violence"). Two terms were added to refine all searches when relevant ("developing countr*" and "epidemiolo*").

Table 11.1Review of selected studies on the association between socioeconomic position and fertility regulation.

Authors	Study Design/ Data set	Health/ Health related outcome	Proxies of women's SEP	Proxies women's Empowerment	Contextual variables	Main Findings
Kiragu&Zabin, 1995[99]	Cross-sectional (1989) Kenya N=2059	Contraceptive use at first and last intercourse	Education, literacy, occupation of parents and household materials, electricity.	--	--	High SES (OR 4.1) and high academic achievement (OR 2.9) predicted increased odds of method use at first intercourse and for last intercourse.
Gage, 1995[186]	DHS (1988) Togo N=3360	Current and ever use of contraception (Modern and traditional)	Level of education Cash earner	Free choice of partner Age at first marriage Polygyny Spousal communication about family planning.	--	The effect of women's SEP is statistically significant even after controlling for all independent variables. The odds of using contraception increase for women with greater control over their choice of partner.
Schuler, 1997[107]	Cross-sectional (1992) Bangladesh N=1300	Contraceptive use	Analyses exposure to credit programmes	Eight dimensions of empowerment.	--	Three dimensions had statistical significant effects on contraceptive use: freedom of mobility (OR 1.21 95% CI 1.08-1.36), freedom from domination by family (OR 1.40 95% CI 1.03-1.91) and economic security and contribution (OR 1.53 95% CI 1.11-2.10).
Dharmalingham et al. 1996[100]	Cross-sectional (1993) South India N=522	Contraceptive use	Level of education Work status	Perceived economic independence Freedom of movement	--	Level of education (OR 1.68), work status (1.75) and autonomy (2.23) were strong predictors of contraceptive use.
Nazar-Beutelspache et al., 1999 [96]	Cross-sectional (1994) Mexico N=883	Never use of contraception	Area of residence Level of education Paid employment	--	--	Illiterate women were 2.15 times more likely to have never used any contraception compared to women with secondary education (95 % CI 1.24-3.76). Increased availability of family planning services had weakened the effect of schooling on contraceptive use.

Authors	Study Design/ Data set	Health/ Health related outcome	Proxies of women's SEP	Proxies women's Empowerment	Contextual variables	Main Findings
			Type of flooring			
Hogan et al, 1999[187]	Cross-sectional (1990 and 1997), Ethiopia N (1990)=1176 N (1997)=1657	Contraceptive use	Agro ecological location of household Household economic status	Literacy Paid employment Age difference with spouse Decision making	--	Rural married women who were literate (OR 3.66) and worked for cash (OR 4.52) were more likely to use contraception, compared to literate urban women (OR 1.51) and for those that worked for cash (OR 0.80).
Saleem&Bobak, 2000 [106]	Cross-sectional Pakistan (2000) N=6579	Current and lifetime contraception use	Women's level of education, husband's level of education and employment in agriculture, living standards of household	Decision making and movement autonomy	--	Decision autonomy was significantly associated with both lifetime and current contraception use; in the adjusted model the odds ratios for the highest vs. the lowest quintile were 1.8 (1.4–2.4) and 2.0 (1.4–2.8), respectively. Movement autonomy was not consistently associated with contraceptive use. Contraceptive use was strongly associated with women's education but this relation was not mediated by women's autonomy.
Fikree et al., 2001[98]	Cross-sectional (1996) Pakistan N=1020	Contraceptive use	Level of education Economic status	Mobility, decision making, discussion with husband and mother-in-law about family planning	--	Literate women with high economic status were 2.02 (95% CI 1.43-2.85) and 2.35 (95 % CI 1.22-4.52) more likely to use contraception compared to other women. Women's autonomy did not significantly influenced contraceptive use.
Al Riyami et al., 2004 [64]	NHS (2000) Oman N=7011	Contraceptive use	Education Employment	Decision making Freedom of movement.	--	Women's education had the strongest effect on use of contraception (OR 4.67, p-value <0.005).
Ayoub, 2004[188]	DHS (1996) Tanzania	Contraceptive use	Level of education	--	--	Level of education is positive and statistically significant at 1% level on both primary and secondary education

Authors	Study Design/ Data set	Health/ Health related outcome	Proxies of women's SEP	Proxies women's Empowerment	Contextual variables	Main Findings
	N=1125	Fertility rates				levels.
Pallitto & Ocampo, 2004 [18]	Cross-sectional DHS Colombia 2000	Unintended pregnancy	Wealth Index Urban/rural residence	Exposure to Intimate Partner Violence	--	Women's adjusted odds of having had an unintended pregnancy were significantly elevated if they had been physically or sexually abused (O.R. 1.4, p<0.001); the association was observed in the Atlantic and Central regions (O.R 1.7 each, <0.01), but was not significant elsewhere.
Pallitto&Ocampo, 2005[50]	Cross-sectional DHS Colombia 2000	Unintended pregnancy	Educational status Professional status	Variables related to women's autonomy were explored by aggregating them at the municipality level: Patriarchal control, intimate partner violence, decision-making.		Women's odds of having an unintended pregnancy increased in communities with high rates of male patriarchal control (OR 3.84 (95% CI 1.27-11.57), and high rates of intimate partner violence (OR 2.79 (95% CI 1.16-6.75),
Shoemaker, 2005[102]	DHS Indonesia (2005-2006) DHS N=29483	Use of modern contraceptive methods	Household wealth	--	--	Better-off women and moderately poor women had higher odds of using modern contraceptives than did extremely poor women (odds ratios, 1.6 and 1.4, respectively).
Cripe et al, 2007 [97]	Cross-sectional Peru N=2167	Unintended pregnancy	Years of education, Employment, Housing status.	Frequency of exposure to intimate partner violence.	--	Compared with non-abused women, abused women had a 1.63-fold increased risk for unintended pregnancy. Unintended pregnancy risk was 3.31-fold higher among women who experienced both physical and sexual abuse compared with non-abused women.
Stephenson et al, 2008a [101]	Cross-sectional DHS South Africa 1998 N=2262	Current use of modern contraception	Education Wealth index Employment status	Employment status, educational attainment, Community-level: control of earning, female employment, physical partner violence	Community asset score, Mean spousal age difference, Ratio male to female primary education, age at marriage, male approval of family planning	In communities where women had education and employment alternatives that delayed marriage age there was an increased likelihood of contraceptive use 0.047(0.021). Women were less likely to use of contraception if they lived in a community with higher ratio of male to female education -0.521(0.234). Residence in a community in which a high number of women report physical violence from male partner was associated with a higher likelihood of contraceptive use 2.0(0.09).
Stephenson et al, 2008b [166]	Cross-sectional National Family	Contraceptive adoption	Husband's education	Domestic violence	--	Women who experienced physical violence were significantly less likely (0.85 sig. at p<0.05) to use

Authors	Study Design/ Data set	Health/ Health related outcome	Proxies of women's SEP	Proxies women's Empowerment	Contextual variables	Main Findings
	health Survey India N=2275		Household asset ownership			contraception. Husband's education had a significant effect on contraceptive adoption for primary (1.73), secondary (1.83) and University (2.31) level (at p<0.05).
Kaggwa et al, 2008[113]	Cross-sectional DHS Mali N=7,761	Current use of modern contraception	Education Wealth index	Variables related to women's autonomy were explored by aggregating them at the women's cluster level of residence: Proportions or means of: desiring small families, births per women, exposure to family planning messages, access to piped water, discussion of family planning with partner.		The odds of contraceptive use were higher among women in the highest wealth quintile, women who approved and whose partner approved of family planning, those who had had recent discussions on family planning with their partner or others and those exposed to family planning messages (odds ratios, 1.4–2.7). At the community level, the odds of modern contraceptive use rose with the proportion of women who were exposed to family planning messages (5.5), and decreased as the mean number of births per woman rose (0.7). In the final model the community factors were no longer significant.
Emenike et al, 2008 [109]	Cross-sectional DHS Kenya 2003	Family planning, and other indicators of reproductive health	--	Exposure to intimate partner violence	--	Exposure to intimate partner violence was associated with use of family planning (Physical: OR 1.2 (1.08-1.40); Emotional OR 1.4 (1.22-1.65) Sexual OR 1.7 (1.4-2.0) and high fertility.
Gomez, 2011 [110]	Cross-sectional DHS Colombia 2005	Current use of modern contraception	Wealth index Level of education	Exposure to sexual violence	--	Sexual violence is associated with increased risk for unintended pregnancy OR 1.4, (1.1-1.8), unmet need for contraception OR 1.5, (1.1-2.0), and decreased likelihood of current contraceptive use OR 0.8, (0.6-1.0).

11.3.   Appendix 3

Figure 21 Median age at first sexual intercourse among women aged 20(25)-49 years, by current age in urban (left) and rural areas
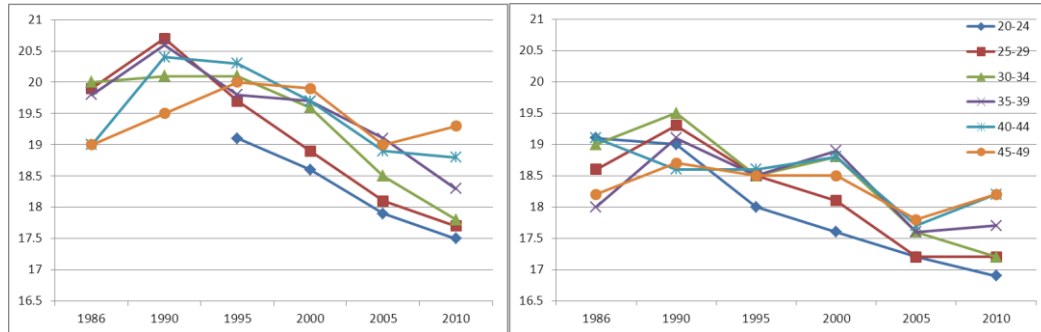
Note: No medians are shown for the youngest age groups, because less than 50 % of the respondents in age group 15-19 reported sexual intercourse.

Figure 22Median age at first marriage among women age 20(25)-49 years, by current age and in urban (left) and rural areas
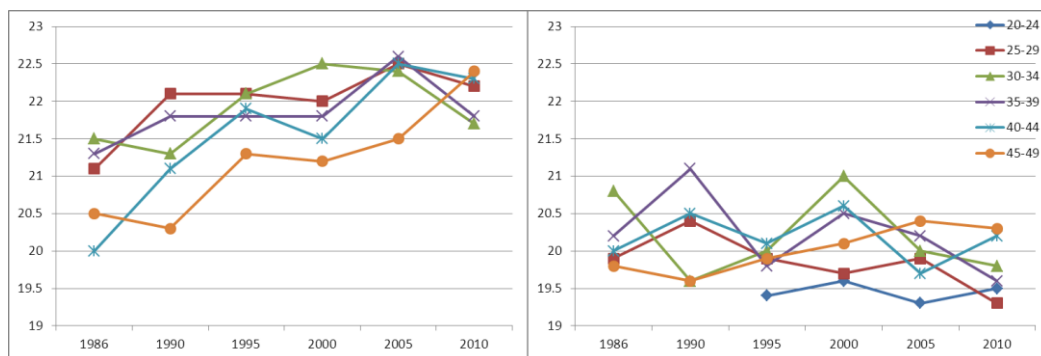
Note: No medians are shown for the youngest age groups in urban areas and for the years 1990 and 1995 in rural areas, because less than 50 % of the respondents in these age groups reported first marriage by ages 15-19.

11.4. *Appendix 4*

Sensitivity analyses exclude women who reported desire of becoming pregnant at some point in the following 2 years to account for fertility desire from 1990 until 2010. The 1986 survey did not provide information of women's fertility desires in the next two years.

Table 11.2 Sensitivity analyses age standardised prevalence rate of current non-use of contraception among fecund women in marital union (married or cohabiting) and single sexually active by measures of SEP 1990-2010

	1990		1995		2000		2005		2010	
	%	**No.**	**%**	**No.**	**%**	**No.**	**%**	**No.**	**%**	**No.**
National	30.0	(3514)	*24.0*	(4954)	*23.0*	(5358)	*21.0*	(19040)	*18.2*	(26469)
Level of education										
Higher/Secondary	27.0	(1945)	*22.0*	(2714)	*21.0*	(3154)	*20.0*	(12259)	*17.0*	(17978)
Primary	31.0	(1443)	26.0	(2031)	26.0	(1999)	22.0	(6175)	*20.1*	(7828)
None	28.5	(126)	27.2	(209)	35.1	(205)	35.0	(606)	31.0	(663)
Wealth										
Richer quartiles	26.6	(2285)	*21.0*	(2687)	*20.0*	(2952)	*17.9*	(8138)	*16.0*	(10497)
Poorer quartiles	36.3	(1229)	28.4	(2267)	28.0	(2406)	*23.0*	(10902)	*19.7*	(15972)
Physical capital										
Richer quartiles	27.0	(2240)	*21.0*	(3042)	*20.0*	(2763)	*17.9*	(8450)	*16.0*	(10868)
Poorer quartiles	35.0	(1274)	30.0	(1912)	27.4	(2595)	*23.2*	(10590)	*20.0*	(15601)
Public capital										
Richer quartiles	29.0	(2750)	*22.0*	(3279)	*21.0*	(3636)	*19.3*	(11025)	*16.1*	(14634)
Poorer quartiles	35.9	(764)	29.0	(1675)	29.3	(1722)	*22.9*	(8015)	*21.2*	(11835)

Note: Rates directly standardised to five year age groups using the pooled age distribution of the 1990 to 2010 waves. Figures in italics indicate prevalence rate at or surpassing the 2015 MDG of 75% current-use (25% current non-use) of modern contraception.

Table 11.3 Sensitivity analyses age standardised prevalence rate of current non-use of contraception among fecund women in marital union (married or cohabiting) and single sexually active by measures of SEP in urban and rural areas 1990-2010

			1990		1995		2000		2005		2010	
			%	No.	%	No.	%	No.	%	No.	%	No.
		Urban	28.8	(3053)	22.3	(3634)	21.3	(3996)	19.9	(14398)	17.3	(19092)
		Rural	38.4	(461)	30.0	(1320)	30.2	(1362)	24.0	(4642)	20.2	(7377)
		Difference p-value	<0.001		<0.001		<0.001		<0.001		<0.001	
Level of education	**Urban**	Higher/Secondary	27.0	(1861)	21.2	(2425)	20.7	(2824)	19.7	(10631)	16.9	(14750)
		Primary	28.8	(1110)	21.1	(1138)	21.7	(1086)	20.2	(3486)	18.5	(4069)
		None	29.4	(82)	16.7	(71)	30.0	(86)	22.8	(281)	23.8	(273)
	Rural	Higher/Secondary	23.4	(84)	21.5	(289)	21.0	(330)	19.8	(1628)	18.0	(3228)
		Primary	38.2	(333)	30.4	(893)	32.1	(913)	24.8	(2689)	22.1	(3759)
		None	28.8	(44)	30.6	(138)	36.2	(119)	40.0	(325)	36.0	(390)
HWI	**Urban**	Richer	26.5	(2232)	20.8	(2605)	20.0	(2838)	17.8	(7792)	15.8	(10170)
		Poorer	34.8	(821)	25.1	(1029)	23.9	(1158)	22.1	(6606)	18.9	(8922)
	Rural	Richer	22.2	(53)	16.2	(82)	16.9	(114)	15.2	(346)	14.0	(327)
		Poorer	38.9	(408)	30.6	(1238)	32.1	(1248)	24.8	(4296)	20.5	(7050)
Physical capital	**Urban**	Richer	26.4	(2107)	20.4	(2675)	19.8	(2574)	17.9	(7783)	15.7	(10065)
		Poorer	33.9	(946)	26.5	(959)	23.7	(1422)	22.1	(6615)	18.9	(9027)
	Rural	Richer	31.9	(133)	22.6	(367)	17.7	(189)	17.2	(667)	13.4	(803)
		Poorer	36.7	(328)	32.2	(953)	33.1	(1173)	25.2	(3975)	21.0	(6574)
Public capital	**Urban**	Richer	28.5	(2687)	22.1	(3181)	21.0	(3473)	19.4	(10417)	16.3	(14064)
		Poorer	30.3	(366)	23.4	(453)	25.5	(523)	21.1	(3981)	20.1	(5028)
	Rural	Richer	22.4	(63)	17.6	(98)	20.6	(163)	17.1	(608)	12.1	(570)
		Poorer	39.4	(398)	31.0	(1222)	30.9	(1199)	25.2	(4034)	21.0	(6870)

Note: Rates directly standardised to five year age groups using the pooled age distribution of the 1990 to 2010 waves. Figures in italics indicate prevalence rate at or surpassing the 2015 MDG of 75% current-use (25% current non-use) of modern contraception.

Table 11.4 National, urban and rural SII (95% CI) of current non-use of contraception by SEP measures among fecund women in marital union (married or cohabiting) and single sexually active 1990-2010

		SII (95% CI)			
		Level of education	**Household wealth**	**Physical capital**	**Public capital**
National	**N**				
1990	3,514	0.08 (0.02-0.13)	0.15 (0.09-0.21)	0.16 (0.10-0.21)	0.11 (0.03-0.19)
1995	4,954	0.07 (0.02-0.11)	0.12 (0.07-0.16)	0.13 (0.09-0.17)	0.13 (0.08-0.19)
2000	5,358	0.09 (0.04-0.13)	0.13 (0.09-0.17)	0.13 (0.09-0.17)	0.16 (0.10-0.21)
2005	19,040	0.04 (0.02-0.06)	0.10 (0.08-0.12)	0.11 (0.09-0.13)	0.07 (0.05-0.10)
2010	26,469	0.05 (0.03-0.07)	0.10 (0.08-0.11)	0.10 (0.08-0.11)	0.10 (0.08-0.12)
Time trend p-value		*0.40*	*0.07*	*0.02*	*0.36*
Urban					
1990	3,053	0.05 (-0.01-0.11)	0.12 (0.06-0.19)	0.13 (0.07-0.19)	0.02 (-0.09-0.14)
1995	3,634	-0.01 (-0.06-0.05)	0.06 (-0.001-0.11)	0.07 (0.02-0.12)	0.03 (-0.06-0.12)
2000	3,996	0.006 (-0.04-0.06)	0.06 (0.004-0.11)	0.05 (-0.001-0.10)	0.09 (-0.01-0.18)
2005	14,398	-0.001(-0.03-0.02)	0.08 (0.06-0.11)	0.08 (0.06-0.11)	0.04 (0.01-0.10)
2010	19,092	0.02 (0.002-0.05)	0.09 (0.07-0.11)	0.07 (0.05-0.09)	0.09(0.06-0.11)
Time trend p-value		*0.04*	*0.61*	*0.11*	*0.15*
Rural					
1990	461	0.17 (-0.02-0.36)	N.C.	0.29 (0.14-0.44)	0.25 (0.05-0.44)
1995	1,320	0.16 (0.07-0.26)	0.20 (0.09-0.32)	0.21 (0.11-0.31)	0.21 (0.09-0.34)
2000	1,362	0.20 (0.10-0.30)	0.28 (0.18-0.39)	0.31 (0.22-0.40)	0.14 (0.01-0.27)
2005	4,642	0.15 (0.10-0.19)	0.19 (0.14-0.24)	0.19 (0.13-0.24)	0.14 (0.08-0.19)
2010	7,377	0.10 (0.06-0.14)	0.18 (0.14-0.21)	0.18 (0.15-0.22)	0.19 (0.15-0.24)
Time trend p-value		*0.39*	*0.19*	*0.18*	*0.50*

Note: All models adjusted for age (continuous and quadratic term) and marital status (single/married or cohabiting). N.C=no convergence.

Table 11.5 Sensitivity analyses national, urban and rural mutually adjusted SII (95% CI) of current non-use of contraception by SEP measures among fecund women in marital union (married or cohabiting) and single sexually active 1990-2010

		SII (95% CI)					
		Level of Education		Physical capital		Public capital	
National	**N**						
1990	3,514	-0.003 (-0.06-0.06)	0.94	0.15 (0.09-0.22)	<0.001	0.01 (-0.08-0.11)	0.77
1995	4,954	-0.03 (-0.08-0.03)	0.35	0.11 (0.05-0.17)	<0.001	0.07 (0.003-0.14)	0.04
2000	5,358	0.004 (-0.05-0.05)	0.87	0.08 (0.03-0.13)	<0.001	0.10 (0.03-0.16)	0.003
2005	19,040	-0.01 (-0.04-0.01)	0.27	0.10 (0.08-0.12)	<0.001	0.03 (0.003-0.10)	0.03
2010	26,469	0.001 (-0.02-0.02)	0.96	0.07 (0.05-0.09)	<0.001	0.06 (0.04-0.08)	<0.001
Urban							
1990	3,053	-0.002 (-0.07-0.06)	0.96	0.14 (0.07-0.06)	<0.001	-0.07(-0.20-0.06)	0.30
1995	3,634	-0.05 (-0.11-0.01)	0.10	0.10 (0.04-0.16)	0.002	-0.01(-0.11-0.09)	0.83
2000	3,996	-0.02 (-0.07-0.04)	0.51	0.04 (-0.01-0.09)	0.11	0.07 (-0.03-0.16)	0.18
2005	14,398	-0.04 (-0.06-0.01)	0.01	0.09 (0.06-0.12)	<0.001	0.01 (-0.02-0.04)	0.54
2010	19,092	-0.004 (-0.03-0.02)	0.7	0.06 (0.03-0.08)	<0.001	0.07 (0.04-0.09)	<0.001
Rural							
1990	461	0.05 (-0.16-0.26)	0.65	0.25 (0.07-0.43)	0.01	0.17 (-0.03-0.37)	0.09
1995	1,320	0.07 (-0.04-0.18)	0.2	0.17 (0.03-0.30)	0.01	0.03 (-0.14-0.19)	0.77
2000	1,362	0.09 (-0.01-0.19)	0.10	0.25 (0.15-0.36)	<0.001	0.06 (-0.05-0.16)	0.29
2005	4,642	0.08 (0.03-0.13)	0.002	0.14 (0.08-0.19)	<0.001	0.06 (0.01-0.12)	0.03
2010	7,377	N.C.		N.C.		N.C.	

Note: Adjusted for age (continuous and quadratic term) and marital status (single/married or cohabiting).

Table 11.6 Sensitivity analyses national level prevalence ratio (PR) (95% CI) of current non-use of contraception among fecund women in marital union (married or cohabiting) and single sexually active 1990-2010

	1990	1995	2000	2005	2010
N	**3514**	**4954**	**5358**	**19040**	**26469**
Level of education					
High/secondary	1	1	1	1	1
Primary	1.13 (1.01-1.27)	1.16 (1.04-1.30)	1.24 (1.11-1.38)	1.12 (1.05-1.19)	1.15 (1.08-1.22)
None	1.31 (1.01-1.70)	1.61 (1.31-1.98)	1.65 (1.31-2.08)	1.64 (1.43-1.89)	1.77 (1.57-2.00)
HWI					
Richer	1	1	1	1	1
Poorer	1.38 (1.23-1.53)	1.36 (1.23-1.50)	1.38 (1.25-1.53)	1.28 (1.21-1.36)	1.23 (1.17-1.30)
Physical capital					
Richer	1	1	1	1	1
Poorer	1.36 (1.22-1.52)	1.45 (1.30-1.60)	1.38 (1.25-1.52)	1.29 (1.22-1.37)	1.25 (1.18-1.32)
Public capital					
Richer	1	1	1	1	1
Poorer	1.20 (1.05-1.37)	1.31 (1.17-1.46)	1.39 (1.25-1.56)	1.18 (1.12-1.25)	1.27 (1.21-1.34)

Note: Adjusted for age (continuous and quadratic term) and marital status (single/married or cohabiting).

Table 11.7 Sensitivity analyses urban level prevalence ratio (PR) (95% CI) of current non-use of contraception among fecund women in marital union (married or cohabiting) and single sexually active 1986-2010

	1990	1995	2000	2005	2010
N	3053	3634	3996	14398	19092
Level of education					
High/secondary	1	1	1	1	1
Primary	1.07 (0.94-1.21)	0.99 (0.85-1.14)	1.05 (0.91-1.21)	1.02 (0.94-1.11)	1.07 (1.00-1.16)
None	1.28 (0.93-1.77)	1.15 (0.73-1.81)	1.22 (0.80-1.85)	1.15 (0.92-1.44)	1.43 (1.15-1.77)
HWI					
Richer	1	1	1	1	1
Poorer	1.28 (1.13-1.45)	1.21 (1.07-1.37)	1.20 (1.06-1.36)	1.23 (1.15-1.31)	1.19 (1.12-1.27)
Physical capital					
Richer	1	1	1	1	1
Poorer	1.26 (1.11-1.43)	1.31 (1.16-1.48)	1.18 (1.05-1.32)	1.23 (1.15-1.31)	1.19 (1.12-1.26)
Public capital					
Richer	1	1	1	1	1
Poorer	1.04 (0.84-1.28)	1.05 (0.87-1.26)	1.22 (1.03-1.44)	1.08 (1.00-1.16)	1.22 (1.15-1.31)

Note: Adjusted for age (continuous and quadratic term) and marital status (single/married or cohabiting).

Table 11.8 Sensitivity analyses rural level prevalence ratio (PR) (95% CI) of current non-use of contraception among fecund women in marital union (married or cohabiting) and single sexually active 1990-2010

	1990	1995	2000	2005	2010
N	461	1320	1362	4642	7377
Level of education					
High/secondary	1	1	1	1	1
Primary	1.35 (0.90-2.02)	1.37 (1.10-1.70)	1.35 (1.09-1.67)	1.26 (1.12-1.42)	1.22 (1.10-1.36)
None	1.36 (0.77-2.41)	1.82 (1.37-2.43)	1.82 (1.09-1.67)	2.17 (1.78-2.63)	2.08 (1.75-2.46)
HWI					
Richer	1	1	1	1	1
Poorer	1.34 (0.84-2.12)	1.66 (1.06-2.60)	1.73 (1.18-2.65)	1.54 (1.20-1.96)	1.41 (1.09-1.83)
Physical capital					
Richer	1	1	1	1	1
Poorer	1.27 (0.94-1.73)	1.49 (1.17-1.89)	1.86 (1.31-2.65)	1.47 (1.23-1.74)	1.48 (1.25-1.76)
Public capital					
Richer	1	1	1	1	1
Poorer	1.40 (0.89-2.22)	1.56 (1.07-2.28)	1.28 (0.94-1.73)	1.46 (1.21-1.76)	1.77 (1.40-2.32)

Note: adjusted for age (continuous and quadratic term) and marital status (single/married or cohabiting).

Table 11.9 Sensitivity analyses mutually adjusted prevalence ratio (PR) (95% CI) by SEP measures in national, urban and rural areas among fecund women in marital union (married or cohabiting) and single sexually active 1990-2010

		PR (95% CI)					
	Level of education				**Physical capital**		**Public capital**
	Higher/Secondary	Primary	None	Richer half	Poorer half	Richer half	Poorer half
National							
1990	1	1.01 (0.89-1.14)	1.09 (0.83-1.43)	1	1.33 (1.17-1.51)	1	1.05 (0.90-1.24)
1995	1	1.00 (0.89-1.13)	1.23 (0.99-1.54)	1	1.35 (1.20-1.52)	1	1.11 (0.99-1.25)
2000	1	1.09 (0.97-1.22)	1.34 (1.07-1.69)	1	1.20 (1.08-1.34)	1	1.22 (1.08-1.38)
2005	1	1.03 (0.97-1.10)	1.45 (1.26-1.66)	1	1.22 (1.15-1.30)	1	1.08 (1.02-1.15)
2010	1	1.06 (1.00-1.12)	1.56 (1.38-1.77)	1	1.12 (1.06-1.19)	1	1.18 (1.12-1.25)
Urban							
1990	1	0.97 (0.85-1.11)	1.14 (0.82-1.59)	1	1.34 (1.16-1.54)	1	0.91 (0.73-1.13)
1995	1	0.91 (0.79-1.06)	0.96 (0.60-1.54)	1	1.36 (1.19-1.56)	1	0.94 (0.77-1.14)
2000	1	1.01 (0.87-1.16)	1.09 (0.72-1.66)	1	1.14 (1.01-1.28)	1	1.15 (0.97-1.37)
2005	1	0.96 (0.89-1.04)	1.04 (0.82-1.31)	1	1.23 (1.15-1.32)	1	1.01 (0.94-1.10)
2010	1	1.02 (0.95-1.10)	1.29 (1.04-1.61)	1	1.13 (1.06-1.21)	1	1.17 (1.10-1.26)
Rural							
1990	1	1.35 (0.89-2.06)	1.28 (0.69-2.40)	1	1.32 (0.96-1.81)	1	1.34 (0.85-2.10)
1995	1	1.22 (0.97-1.53)	1.54 (1.13-2.10)	1	1.33 (1.03-1.73)	1	1.26 (0.86-1.85)
2000	1	1.25 (1.02-1.54)	1.65 (1.21-2.25)	1	1.72 (1.18-2.50)	1	1.03 (0.78-1.34)
2005	1	1.19 (1.05-1.34)	1.95 (1.61-2.36)	1	1.29 (1.08-1.53)	1	1.32 (1.09-1.59)
2010	1	1.16 (1.04-1.29)	1.93 (1.63-2.30)	1	1.28 (1.07-1.52)	1	1.62 (1.29-2.05)

Note: Models mutually adjusted for level of education, Physical and Public capital, age (continuous and quadratic term) and marital status (married-cohabiting/single).The HWI was not included in this model in view of collinearity, as the Physical and Public capital items are contained in the HWI.

Table 11.10 Sensitivity analyses RII (95% CI) of current non-use of contraception by SEP measures among fecund women in marital union (married or cohabiting) and single sexually active 1990-2010

		RII (95% CI)			
		Level of education	**Household wealth**	**Physical capital**	**Public capital**
National	**N**				
1990	3,514	1.36 (1.10-1.68)	1.75 (1.43-2.14)	1.81 (1.47-2.12)	1.50 (1.16-1.95)
1995	4,954	1.39 (1.12-1.73)	1.77 (1.45-2.16)	1.87 (1.53-2.30)	1.77 (1.42-2.19)
2000	5,358	1.55 (1.26-1.92)	1.87 (1.53-2.28)	1.86 (1.53-2.25)	1.97 (1.57-2.47)
2005	19,040	1.28 (1.14-1.44)	1.70 (1.53-1.89)	1.73 (1.56-1.92)	1.45 (1.29-1.62)
2010	26,469	1.37 (1.23-1.53)	1.75 (1.58-1.94)	1.77 (1.60-1.96)	1.71 (1.54-1.90)
Time trend p-value		*0.04*	*0.77*	*0.88*	*0.49*
Urban					
1990	3,053	1.22 (0.97-1.54)	1.52 (1.19-1.93)	1.51 (1.20-1.89)	1.12 (0.73-1.73)
1995	3,634	0.95 (0.72-1.25)	1.32 (1.02-1.70)	1.42 (1.11-1.81)	1.15 (0.77-1.69)
2000	3,996	1.09 (0.85-1.41)	1.38 (1.07-1.78)	1.30 (1.04-1.63)	1.54 (1.06-2.24)
2005	14,398	1.01 (0.88-1.15)	1.52 (1.34-1.73)	1.51 (1.34-1.70)	1.20 (1.03-1.39)
2010	19,092	1.14 (1.01-1.30)	1.66 (1.47-1.88)	1.51 (1.34-1.70)	1.61 (1.40-1.85)
Time trend p-value		*0.03*	*0.55*	*0.62*	*0.06*
Rural					
1990	461	1.92 (0.90-4.13)	2.93 (1.15-7.45)	2.00 (1.07-3.73)	2.16 (0.89-5.28)
1995	1,320	2.08 (1.32-3.25)	2.99 (1.47-6.12)	2.61 (1.59-4.30)	2.41 (1.26-4.60)
2000	1,362	2.13 (1.34-3.37)	2.92 (1.65-5.15)	3.64 (2.16-6.14)	1.63 (0.94-2.85)
2005	4,642	2.10 (1.60-2.76)	3.05 (2.12-4.39)	2.74 (2.05-3.66)	2.16 (1.58-2.94)
2010	7,377	1.89 (1.47-2.44)	3.40 (2.42-4.77)	3.47 (2.65-4.56)	3.73 (2.50-5.57)
Time trend p-value		*0.56*	*0.46*	*0.16*	*0.03*

Note: Adjusted for age (continuous and quadratic term) and marital status (single/married or cohabiting).

Table 11.11 Sensitivity analyses national, urban and rural mutually adjusted RII (95% CI) of current non-use of contraception among fecund women in marital union (married or cohabiting) and single sexually active 1990-2010

		Level of Education		Physical capital		Public capital	
National	**N**						
1990	3,514	1.02 (0.80-1.29)	0.14	1.74 (1.36-2.23)	<0.001	1.08 (0.81-1.45)	0.58
1995	4,954	0.96 (0.76-1.22)	0.78	1.65 (1.29-2.11)	<0.001	1.31 (1.03-1.68)	0.03
2000	5,358	1.12 (0.90-1.39)	0.33	1.47 (1.18-1.82)	<0.001	1.51 (1.18-1.93)	0.001
2005	19,040	0.99 (0.87-1.11)	0.82	1.64 (1.45-1.84)	<0.001	1.17 (1.04-1.32)	0.01
2010	26,469	1.02 (0.91-1.15)	0.70	1.52 (1.35-1.70)	<0.001	1.37 (1.23-1.54)	<0.001
Urban							
1990	3,053	1.00 (0.78-1.29)	0.99	1.70 (1.30-2.22)	<0.001	0.83 (0.53-1.30)	0.42
1995	3,634	0.80 (0.60-1.07)	0.13	1.56 (1.18-2.06)	0.002	0.94 (0.62-1.43)	0.78
2000	3,996	0.98 (0.75-1.28)	0.89	1.24 (0.97-1.57)	0.08	1.39 (0.94-2.04)	0.10
2005	14,398	0.84 (0.73-0.97)	0.02	1.59 (1.39-1.81)	<0.001	1.03 (0.88-1.20)	0.74
2010	19,092	0.97 (0.85-1.12)	0.70	1.39 (1.22-1.59)	<0.001	1.42 (1.23-1.64)	<0.001
Rural							
1990	461	1.28 (0.58-2.80)	0.54	1.68 (0.84-3.35)	0.14	1.67 (0.72-3.89)	0.24
1995	1,320	1.46 (0.91-2.35)	0.11	2.19 (1.25-3.82)	0.01	1.19 (0.61-2.33)	0.60
2000	1,362	1.67 (1.06-2.63)	0.03	3.23 (1.82-5.73)	<0.001	1.00 (0.61-1.64)	0.99
2005	4,642	1.59 (1.20-2.10)	<0.001	2.12 (1.56-2.87)	<0.001	1.62 (1.20-2.19)	0.002
2010	7,377	1.37 (1.06-1.76)	0.02	2.63 (2.01-3.45)	<0.001	2.47 (1.66-3.68)	<0.001

Note: Adjusted for age (continuous and quadratic term) and marital status (single/married or cohabiting).

Table 11.12 Sensitivity analyses absolute (SII 95% CI) and relative (RII 95% CI) effect of women's level of education on current non-use of modern contraception among women in households with low and high Public capital DHS 1990-2010 national level

	SII (95% CI)		RII (95% CI)	
	Public capital		Public capital	
	High	Low	High	Low
1990				
Adjusted 1	0.02 (-0.05-0.08)	0.24 (0.11-0.37)	1.10 (0.86-1.40)	2.38 (1.38-4.09)
Interaction		*0.002*		*0.01*
Adjusted 2	-0.03 (-0.10-0.03)	0.17 (0.05-0.29)	0.89 (0.68-1.16)	1.95 (1.12-3.38)
Interaction		*0.003*		*0.01*
1995				
Adjusted 1	-0.04 (-0.09-0.02)	0.18 (0.09-0.27)	0.84 (0.62-1.12)	2.14 (1.44-3.18)
Interaction		*<0.001*		*<0.001*
Adjusted 2	-0.08 (-0.14-0.02)	0.14 (0.05-0.22)	0.68 (0.50-0.92)	1.79 (1.20-2.67)
Interaction		*<0.001*		*<0.001*
2000				
Adjusted 1	0.003 (-0.05-0.05)	0.15 (0.06-0.25)	1.10 (0.84-1.43)	1.79 (1.25-2.58)
Interaction		*0.004*		*0.03*
Adjusted 2	-0.03 (-0.09-0.02)	0.12 (0.03-0.21)	0.92 (0.70-1.21)	1.61 (1.12-2.31)
Interaction		*0.004*		*<0.001*
2005				
Adjusted 1	-0.02 (-0.04-0.01)	0.09 (0.06-0.12)	0.93 (0.79-1.08)	1.62 (1.36-1.93)
Interaction		*<0.001*		*<0.001*
Adjusted 2	-0.05 (-0.08-(-0.02))	0.05 (0.01-0.08)	0.76 (0.65-0.89)	1.33 (1.11-1.59)
Interaction		*<0.001*		*<0.001*
2010				
Adjusted 1	0.01 (-0.01-0.04)	0.06 (0.03-0.09)	1.11 (0.96-1.29)	1.36 (1.17-1.59)
Interaction		*0.01*		*0.06*
Adjusted 2	-0.01 (-0.04-0.01)	0.03 (-0.002-0.06)	0.94 (0.80-1.09)	1.14 (0.97-1.34)
Interaction		*0.02*		*0.06*

Adjusted 1: adjusted for age (continuous and quadratic term) and marital status (single/married or cohabiting); Adjusted 2: Adjusted 1 + Physical capital (population weighted variable).

Table 11.13Sensitivity analysis absolute (SII 95% CI) and relative (RII 95% CI) effect of women's level of education on current non-use of modern contraception among women in households with low and high Public capital in urban areas DHS 1990-2010

		SII (95% CI)					RII (95% CI)			
		Public capital			**Interaction**		**Public capital**			**Interaction**
	n	**High**	**n**	**Low**	**p-value**	**n**	**High**	**n**	**Low**	**p-value**
1990										
Adjusted 1	2687	0.02 (-0.05-0.09)	366	0.29 (0.10-0.48)	0.01	2687	1.14 (0.90-1.46)	366	2.57 (1.18-5.59)	0.05
Adjusted 2		-0.03 (-0.10-0.04)		0.21 (0.03-0.39)	0.01		0.91 (0.70-1.19)		2.30 (1.06-5.01)	0.03
1995										
Adjusted 1	3181	-0.03 (-0.09-0.03)	453	0.14 (-0.02-0.31)	0.04	3181	0.84 (0.63-1.14)	453	1.90 (0.89-4.07)	0.05
Adjusted 2		-0.08 (-0.14-(-0.01))		0.11 (-0.05-0.28)	0.03		0.71 (0.52-0.97)		1.68 (0.78-3.60)	0.04
2000										
Adjusted 1	3473	-0.01 (-0.06-0.05)	523	0.06 (-0.09-0.21)	0.41	3473	1.03 (0.78-1.36)	523	1.32 (0.71-2.44)	0.46
Adjusted 2		-0.03 (-0.08-0.03)		0.04 (-0.11-0.20)	0.40		0.94 (0.70-1.26)		1.23 (0.66-2.29)	0.43
2005										
Adjusted 1	10417	-0.02 (-0.05-0.01)	3981	0.03 (-0.02-0.08)	0.39	10417	0.93 (0.79-1.09)	3981	1.19 (0.93-1.52)	0.10
Adjusted 2		-0.05 (-0.08-0.02)		-0.004 (-0.05-0.04)	0.12		0.78 (0.66-0.91)		0.99 (0.77-1.27)	0.11
2010										
Adjusted 1	14064	0.02 (-0.01-0.04)	5026	0.03 (-0.01-0.07)	0.57	14064	1.11 (0.95-1.29)	5026	1.14 (0.91-1.44)	0.82
Adjusted 2		-0.01 (-0.03-0.02)		0.005 (-0.04-0.05)	0.65		0.97 (0.83-1.14)		0.99 (0.79-1.25)	0.88

Adjusted 1: adjusted for age (continuous and quadratic term) and marital status (single/married or cohabiting); Adjusted 2: Adjusted 1 + Physical capital (population weighted variable)

Table 11.14 Sensitivity analysis absolute (SII 95% CI) and relative (RII 95% CI) effect of women's level of education on current non-use of modern contraception among women in households with low and high Public capital in rural areas DHS 1990-2010

		SII (95% CI)						RII (95% CI)			
		Public capital			Interaction			Public capital			Interaction
	n	High	n	Low	p-value	n	High	n	Low	p-value
1990											
Adjusted 1	63	0.09 (-0.56-0.73)	398	0.17 (-0.05-0.38)	0.82	63	1.20 [0.07-21.5]	398	1.66 (0.78-3.51)	0.83
Adjusted 2		0.02 (-0.62-0.66)	398	0.02 (-0.19-0.23)	0.99		1.11 [0.06-19.9]	398	1.30 (0.57-2.99)	0.92
1995											
Adjusted 1	98	-0.01 (-0.21-0.19)	1222	0.16 (0.05-0.27)	0.15	98	1.10 (0.26-4.61)	1222	1.98 (1.21-3.24)	0.44
Adjusted 2		-0.08 (-0.26-0.09)	1222	0.09 (-0.03-0.21)	0.09		0.73 (0.19-2.90)	1222	1.56 (0.94-2.58)	0.31
2000											
Adjusted 1	163	0.14 (-0.06-0.33)	1199	0.21 (0.09-0.32)	0.58	163	2.53 (0.76-8.34)	1199	1.92 (1.18-3.12)	0.75
Adjusted 2		0.11(-0.10-0.32)	1199	0.08 (-0.03-0.19)	0.83		1.56 (0.49-4.95)	1199	1.67 (1.04-2.70)	0.89
2005											
Adjusted 1	608	0.04 (-0.07-0.14)	4034	0.16 (0.10-0.21)	0.45	608	1.04 (0.45-2.39)	4034	2.14 (1.61-2.85)	0.10
Adjusted 2		-0.02 (-0.12-0.09)	4034	0.11 (0.05-0.17)	0.03		0.78 (0.33-1.83)	4034	1.73 (1.29-2.31)	0.08
2010											
Adjusted 1	570	0.03 (-0.06-0.11)	6807	0.10 (0.06-0.14)	0.13	570	1.91 (0.63-5.86)	6807	1.75 (1.37-2.23)	0.95
Adjusted 2		-0.04 (-0.12-0.04)	6807	0.04 (0.0004-0.09)	0.05		1.44 (0.48-4.37)	6807	1.34 (1.05-1.71)	0.98

Adjusted 1: adjusted for age (continuous and quadratic term) and marital status (single/married or cohabiting); Adjusted 2: Adjusted 1 + Physical capital (population weighted variable).

Figure 23Sensitivity sample: predicted probabilities (95% CI): effect of women's level of education by level of Public capital on current non-use of contraception at the national level DHS 1990-2010
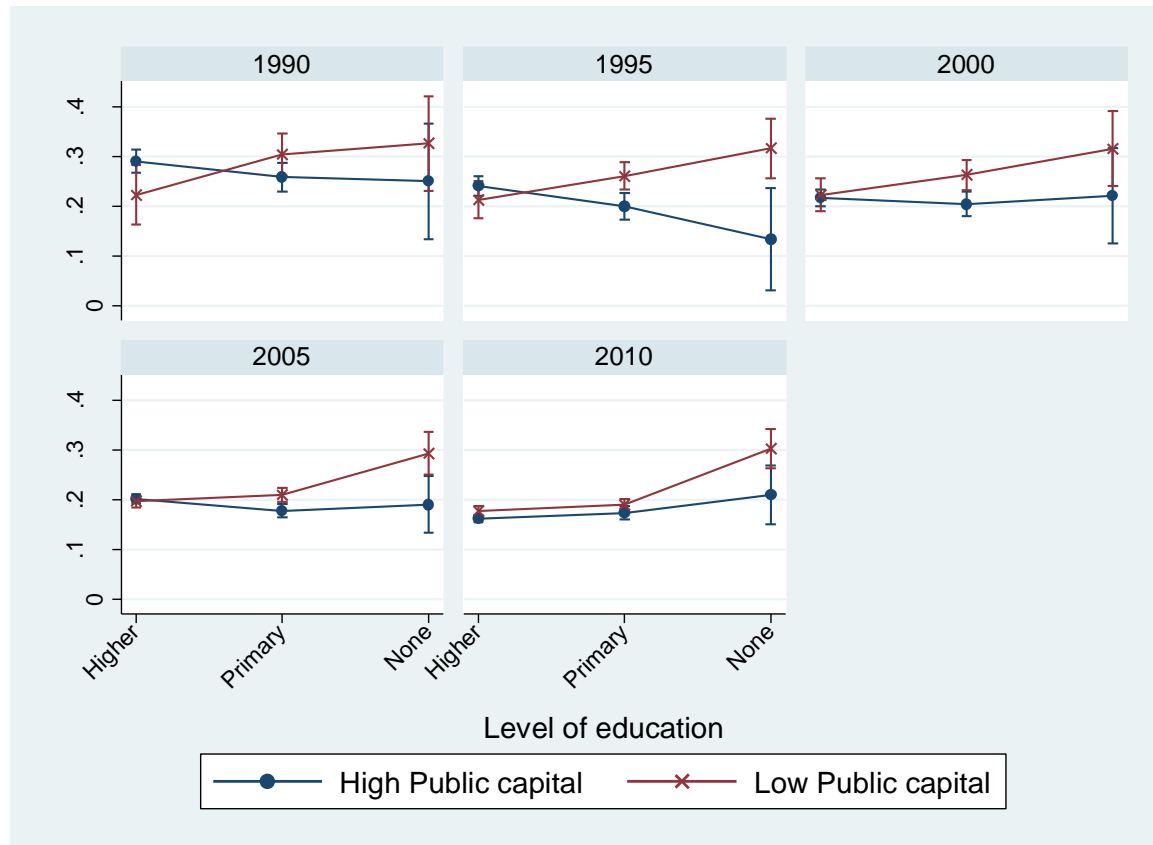
Note Higher level of education refers to reported achieved secondary and higher levels of education.

Figure 24Predicted probabilities (95% CI): effect of women's level of education by level of Public capital on current non-use of contraception in urban (above) and rural (below) areas 1990-2010
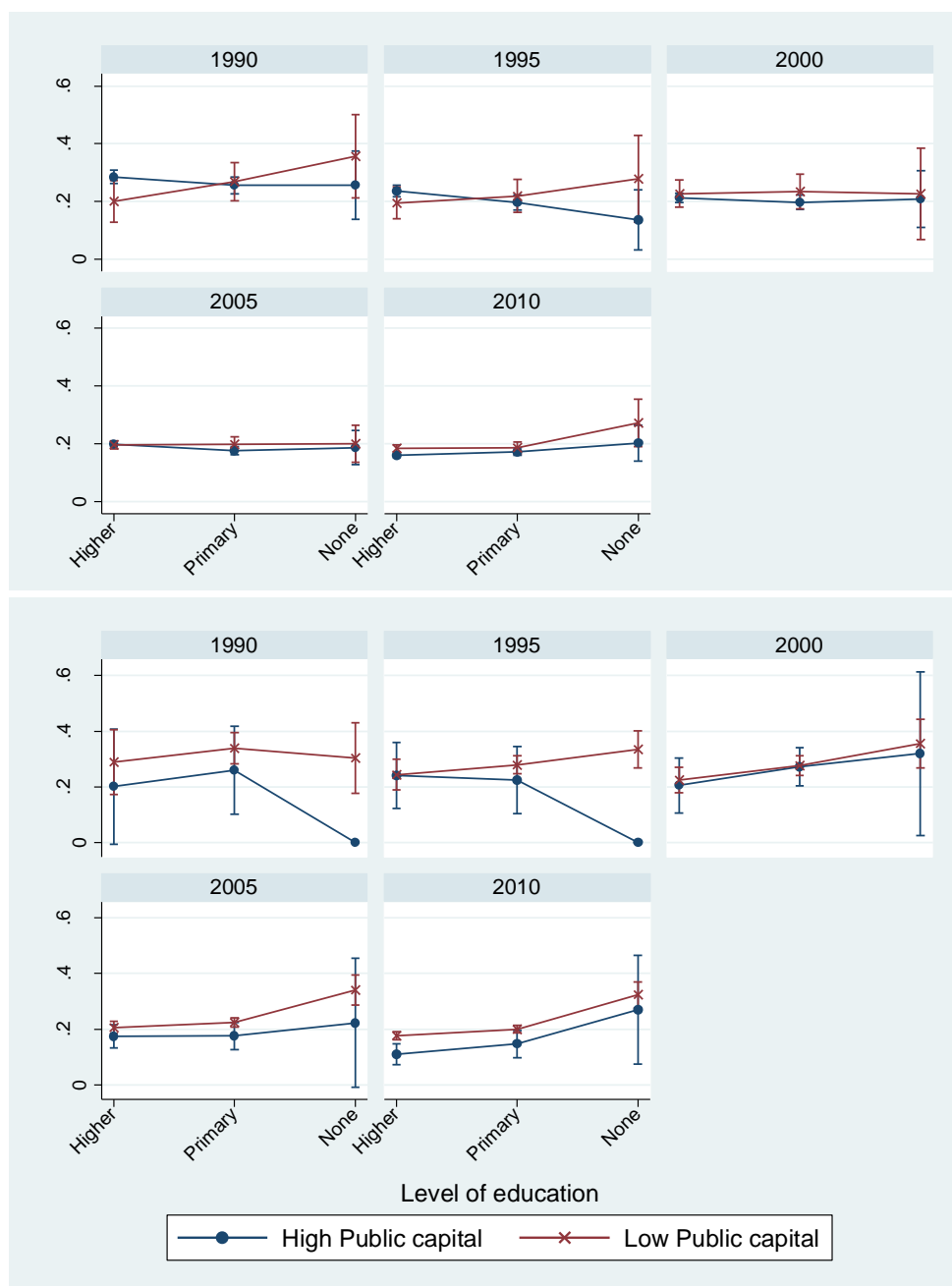
Note Higher level of education refers to reported achieved secondary and higher levels of education.

11.5.   *Appendix 5*

Table 11.15Crude national, urban and rural SII (95% CI) for current non-use of contraception among women in marital union (married or cohabiting) and single sexually active DHS 1986-2010

	Level of education	Household wealth	Physical capital	Public capital
National				
1986	0.06 (-0.02-0.14)	0.21 (0.13-0.29)	0.20 (0.12-0.28)	0.21 (0.12-0.31)
1990	0.04 (-0.02-0.10)	0.16 (0.10-0.21)	0.16 (0.10-0.22)	0.13 (0.05-0.21)
1995	0.01 (-0.04-0.06)	0.11 (0.07-0.16)	0.13 (0.09-0.18)	0.12 (0.06-0.17)
2000	0.04 (-0.01-0.08)	0.11 (0.07-0.16)	0.12 (0.08-0.16)	0.13 (0.07-0.19)
2005	-0.003 (-0.03-0.02)	0.10 (0.08-0.12)	0.11 (0.09-0.13)	0.07 (0.05-0.10)
2010	0.01 (-0.01-0.03)	0.09 (0.07-0.11)	0.09 (0.07-0.11)	0.10 (0.08-0.12)
Urban				
1986	-0.005 (-0.09-0.08)	0.31 (0.08-0.53)	0.15 (0.05-0.25)	0.17 (0.01-0.33)
1990	0.01 (-0.06-0.07)	0.14 (0.08-0.21)	0.14 (0.08-0.21)	0.07 (-0.04-0.18)
1995	-0.05 (-0.11-0.00)	0.07 (0.01-0.13)	0.13 (0.09-0.17)	0.12 (0.06-0.17)
2000	-0.03 (-0.08-0.02)	0.07 (0.02-0.13)	0.06 (0.01-0.11)	0.11 (0.02-0.21)
2005	-0.04 (-0.07-(-0.02))	0.09 (0.06-0.12)	0.09 (0.06-0.11)	0.04 (0.01-0.08)
2010	-0.02 (-0.04-0.001)	0.08 (0.06-0.11)	0.06 (0.04-0.09)	0.11 (0.08-0.14)
Rural				
1986	0.08 (-0.13-0.28)	0.31 (0.08-0.53)	0.18 (-0.01-0.36)	0.25 (-0.03-0.54)
1990	0.14 (-0.10-0.38)	0.46 (0.22-0.71)	0.26 (0.10-0.41)	0.30 (0.09-0.51)
1995	0.06 (-0.06-0.17)	0.17 (-0.01-0.34)	0.20 (0.08-0.34)	0.17 (-0.01-0.35)
2000	0.12 (0.01-0.23)	0.25 (0.13-0.37)	0.29 (0.18-0.39)	0.10 (-0.03-0.23)
2005	0.06 (0.001-0.11)	0.20 (0.14-0.26)	0.21 (0.15-0.26)	0.15 (0.09-0.21)
2010	0.03 (-0.01-0.07)	0.19 (0.14-0.24)	0.20 (0.15-0.24)	0.20 (0.14-0.25)

Table 11.16Crude national, urban and rural PR (95% CI) for current non-use of contraception among women in marital union (married or cohabiting) and single sexually active DHS 1986-2010

	Level of education			Household wealth		Physical capital		Public capital	
	Higher/ Secondary	Primary	None	Richer	Poorer	Richer	Poorer	Richer	Poorer
National									
1986	1	1.12 (0.97-1.28)	1.10 (0.83-1.46)	1	1.36 (1.19-1.57)	1	1.37 (1.19-1.56)	1	1.37 (1.19-1.59)
1990	1	1.02 (0.92-1.13)	1.22 (0.97-1.54)	1	1.34 (1.22-1.48)	1	1.31 (1.18-1.45)	1	1.20 (1.06-1.35)
1995	1	1.01 (0.91-1.11)	1.25 (1.04-1.51)	1	1.24 (1.14-1.36)	1	1.34 (1.23-1.46)	1	1.20 (1.10-1.32)
2000	1	1.07 (0.97-1.18)	1.37 (1.12-1.68)	1	1.27 (1.16-1.39)	1	1.28 (1.17-1.40)	1	1.27 (1.15-1.40)
2005	1	0.97 (0.92-1.02)	1.37 (1.20-1.55)	1	1.21 (1.15-1.28)	1	1.22 (1.16-1.29)	1	1.14 (1.09-1.20)
2010	1	1.00 (0.95-1.05)	1.52 (1.36-1.70)	1	1.16 (1.10-1.21)	1	1.16 (1.11-1.22)	1	1.23 (1.17-1.29)
Urban									
1986	1	1.01 (0.87-1.19)	0.88 (0.53-1.45)	1	1.26 (1.05-1.50)	1	1.23 (1.03-1.47)	1	1.24 (1.00-1.53)
1990	1	0.96 (0.85-1.07)	1.19 (0.89-1.58)	1	1.33 (1.19-1.48)	1	1.29 (1.15-1.44)	1	1.10 (0.93-1.31)
1995	1	0.90 (0.80-1.02)	0.94 (0.63-1.40)	1	1.18 (1.06-1.31)	1	1.25 (1.12-1.39)	1	1.06 (0.90-1.26)
2000	1	0.93 (0.82-1.05)	1.13 (0.80-1.59)	1	1.17 (1.05-1.31)	1	1.16 (1.04-1.29)	1	1.21 (1.04-1.41)
2005	1	0.93 (0.86-0.99)	0.95 (0.77-1.19)	1	1.19 (1.12-1.26)	1	1.19 (1.13-1.26)	1	1.09 (1.02-1.16)
2010	1	0.96 (0.90-1.02)	1.28 (1.05-1.56)	1	1.13 (1.07-1.19)	1	1.12 (1.06-1.18)	1	1.23 (1.17-1.30)
Rural									
1986	1	1.09 (0.77-1.52)	1.16 (0.78-1.73)	1	1.20 (0.75-1.93)	1	1.30 (1.02-1.66)	1	1.47 (0.86-2.52)
1990	1	1.25 (0.85-1.86)	1.32 (0.77-2.26)	1	1.48 (0.98-2.26)	1	1.27 (0.96-1.68)	1	1.55 (1.01-2.38)
1995	1	1.05 (0.87-1.27)	1.29 (1.00-1.67)	1	1.29 (0.79-2.10)	1	1.47 (1.17-1.84)	1	1.30 (0.87-1.93)
2000	1	1.19 (0.98-1.45)	1.50 (1.12-2.00)	1	1.58 (1.13-2.21)	1	1.70 (1.28-2.27)	1	1.18 (0.92-1.52)
2005	1	1.00 (0.90-1.11)	1.65 (1.40-1.95)	1	1.35 (1.08-1.68)	1	1.36 (1.16-1.58)	1	1.35 (1.15-1.60)
2010	1	1.00 (0.92-1.09)	1.61 (1.39-1.85)	1	1.30 (1.04-1.62)	1	1.33 (1.15-1.53)	1	1.50 (1.25-1.80)

Table 11.17 Crude national, urban and rural RII (95% CI) for current non-use of contraception among women in marital union (married or cohabiting) and single sexually active DHS 1986-2010

	Level of education	HWI	Physical capital	Public capital
	RII (95% CI)	RII (95% CI)	RII (95% CI)	RII (95% CI)
National				
1986	1.22 (0.94-1.57)	2.03 (1.56-2.63)	1.90 (1.47-2.45)	1.94 (1.46-2.57)
1990	1.13 (0.94-1.36)	1.67 (1.40-2.01)	1.70 (1.41-2.05)	1.48 (1.18-1.87)
1995	1.05 (0.88-1.26)	1.52 (1.29-1.80)	1.66 (1.40-1.97)	1.50 (1.25-1.79)
2000	1.16 (0.97-1.39)	1.59 (1.33-1.90)	1.64 (1.38-1.95)	1.60 (1.32-1.96)
2005	0.99 (0.89-1.09)	1.52 (1.39-1.67)	1.59 (1.45-1.75)	1.33 (1.20-1.47)
2010	1.03 (0.94-1.12)	1.50 (1.37-1.63)	1.50 (1.38-1.64)	1.56 (1.42-1.70)
Urban				
1986	0.98 (0.73-1.33)	1.78 (1.25-2.53)	1.67 (1.20-2.32)	1.73 (1.06-2.80)
1990	1.02 (0.83-1.24)	1.61 (1.30-1.99)	1.60 (1.30-1.98)	1.25 (0.89-1.77)
1995	0.81 (0.65-1.02)	1.33 (1.06-1.65)	1.40 (1.14-1.72)	1.21 (0.85-1.71)
2000	0.88 (0.71-1.09)	1.36 (1.08-1.71)	1.30 (1.06-1.60)	1.51 (1.09-2.10)
2005	0.83 (0.75-0.93)	1.45 (1.30-1.62)	1.45 (1.30-1.61)	1.20 (1.05-1.37)
2010	0.90 (0.81-1.01)	1.45 (1.30-1.61)	1.33 (1.20-1.47)	1.60 (1.42-1.79)
Rural				
1986	1.22 (0.70-2.12)	2.66 (1.01-7.01)	1.66 (0.94-2.96)	2.13 (0.77-5.29)
1990	1.51 (0.72-3.17)	3.83 (1.59-9.19)	2.26 (1.29-4.05)	2.89 (1.17-7.14)
1995	1.21 (0.82-1.79)	2.11 (0.91-4.89)	2.31 (1.36-3.93)	1.82 (0.92-3.61)
2000	1.55 (1.02-2.37)	2.41 (1.47-3.95)	3.09 (1.97-4.85)	1.42 (0.89-2.28)
2005	1.27 (1.00-1.62)	1.52 (1.39-1.67)	2.62 (1.98-3.45)	1.88 (1.43-2.48)
2010	1.14 (0.95-1.37)	2.47 (1.86-3.28)	2.63 (1.08-3.32)	2.72 (1.97-3.76)

11.6. *Appendix 6*

Table 12.19 presents the results of the tests for departure from linear trends p-value for all models using the SII and the RII. Figure illustrates the test for Level of education at the national level from 1986 until 2010.

Table 11.18 Tests for departure from linear trend p-value for SII and RII models 1986-2010 national, urban and rural areas

		Level of education		Household wealth		Physical capital		Public capital	
		SII models	RII models	SII models	RII models	SII models	RII models	SII models	RII models
National	1986	0.72	0.85	0.08	0.23	0.48	0.69	0.36	0.36
	1990	0.58	0.50	0.07	0.15	0.16	0.34	*0.02*	*0.03*
	1995	*0.001*	*<0.001*	*<0.001*	*0.002*	*<0.001*	*<0.001*	0.06	0.14
	2000	*0.003*	*0.01*	*<0.001*	*0.004*	*<0.001*	*<0.001*	0.77	0.88
	2005	*<0.001*	*<0.001*	*0.005*	*0.02*	*<0.001*	*0.002*	0.28	0.18
	2010	*<0.001*	*<0.001*	*<0.001*	*<0.001*	*<0.001*	*<0.001*	*0.02*	*0.04*
Urban	1986	0.63	0.74	0.37	0.32	0.69	0.71	0.20	0.17
	1990	0.43	0.33	0.14	0.24	0.44	0.68	0.16	0.19
	1995	0.30	0.54	0.33	0.28	0.06	0.08	0.17	0.35
	2000	0.27	0.34	*0.004*	*0.01*	*0.03*	0.07	0.82	0.80
	2005	*0.04*	0.14	0.52	0.70	0.09	0.26	0.79	0.93
	2010	*0.002*	*<0.001*	*<0.001*	*0.001*	0.21	0.20	*0.003*	0.73
Rural	1986	0.98	0.86	0.05	0.10	0.48	0.48	0.82	0.74
	1990	0.42	0.57	N.C	*<0.001*	0.40	0.42	0.12	0.22
	1995	*0.01*	*0.003*	<0.001	<0.001	0.001	0.0004	0.47	0.65
	2000	0.07	0.05	0.63	0.36	0.28	0.63	0.64	0.75
	2005	*<0.001*	*<0.001*	*0.003*	*0.003*	*<0.001*	*0.004*	0.35	0.48
	2010	*<0.001*	*<0.001*	*0.04*	0.13	*<0.001*	*0.004*	0.56	0.03

P-value for linearity assumption >0.05 indicates no evidence of departure from linear trend. P-value for linearity assumption in italics suggests departure from linear trend.

Figure 25RII models: tests for departure from linear trend between women's level of education and current non-use of contraception DHS 1986-2010 National level
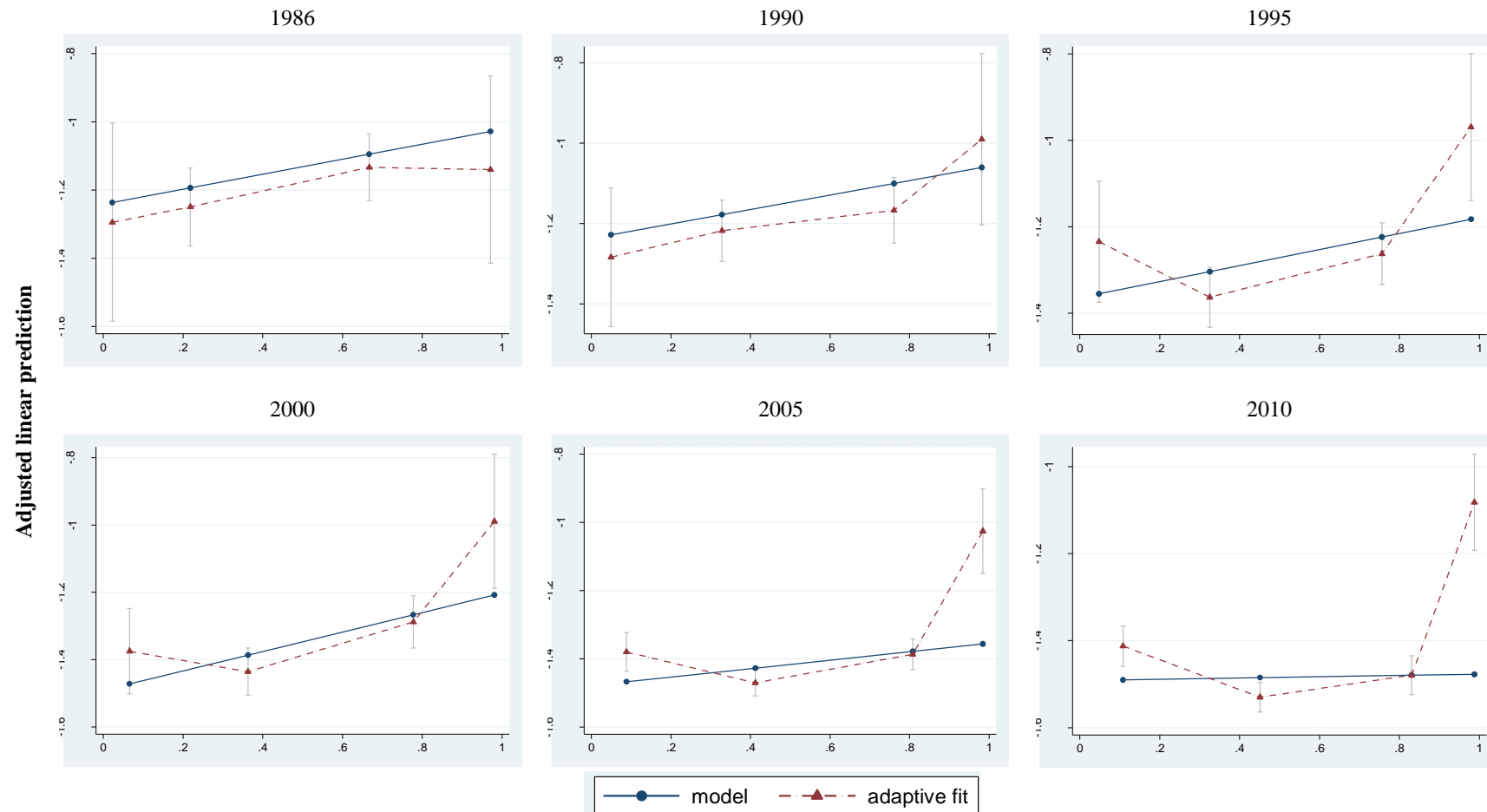
Note: All models adjusted for age (continuous and quadratic term) and marital status (single/married or cohabiting). P-value for linearity assumption test was >0.05 in 1986 and 1990 models which indicates no evidence of departure from linear trend.

11.7.   Appendix 7

PRs were compared to ORs estimates to investigate differences in the size of the effect of each measure of SEP on current non-use of contraception based on high prevalence levels (>10%) of the outcome in the Colombian DHS 1986-2010. Tables 11.18 and 11.19 show that ORs overestimate the size of the effect compared to PRs. Tables below show the example of 2005 at the national level. Results were consistent in all survey waves.

Table 11.19 Sensitivity test OR vs. PR estimates by level of education using DHS 2005

Logistic model				
Current non-use	**OR**	**Std Error**	**p-value**	**95% CI**
Primary	1			
Higher	0.77	0.040	<0.001	0.69-0.85
Secondary	0.78	0.031	<0.001	0.72-0.84
None	2.10	0.222	<0.001	1.70-2.58
2-levels model (xtmelogit)				
Current non-use	**OR**			
Primary	1			
Higher	0.76	0.042	<0.001	0.68-0.84
Secondary	0.78	0.033	<0.001	0.72-0.84
None	2.09	0.200	<0.001	1.73-2.52
Log-binomial model				
Current non-use	**PR**			
Primary	1			
Higher	0.80	0.031	<0.001	0.74-0.87
Secondary	0.83	0.024	<0.001	0.78-0.88
None	1.64	0.102	<0.001	1.45-1.85

Table 11.20 Sensitivity test OR vs. PR estimates by level of education RII using DHS 2005

Logistic model				
Current non-use	**OR**	**Std Error**	**p-value**	**95% CI**
RII (education) logistic	1.75	0.124	<0.001	1.52-2.01
2-levels model (xtmelogit)				
Current non-use	**OR**			
RII (education) logistic	1.78	0.13	<0.001	1.54-2.05
Log-binomial model				
Current non-use	**PR**			
RII (education) log	1.56	0.082	<0.001	1.40-1.73

11.8.   Appendix 8

Null models DHS 2005 and 2010

Figure 26 shows the community effects or estimated residuals for all 1,487 communities in the 2005 DHS (left) in rank order with 95% confidence intervals based on the null two-level model. All community confidence intervals include zero (mean log-odds of current non-use of contraception across all communities) which indicates that current non-use of contraception in any of these communities was not statistically above or below average (0 line).

Figure 26 (right) shows the community effects or estimated residuals for all 2,498 communities in the 2010 DHS in rank order with 95% confidence intervals based on the null two-level model. Most community confidence intervals include zero (mean log-odds of current non-use of contraception across all communities) which means that most but not all communities were not significantly different from the average community at the 5% level. There were few communities with significantly higher mean log-odds of current non-use of contraception than the average community (right hand side of Figure 26).

Figure 26Null two-level model estimated residuals for all communities in the DHS 2005 national analytical sample
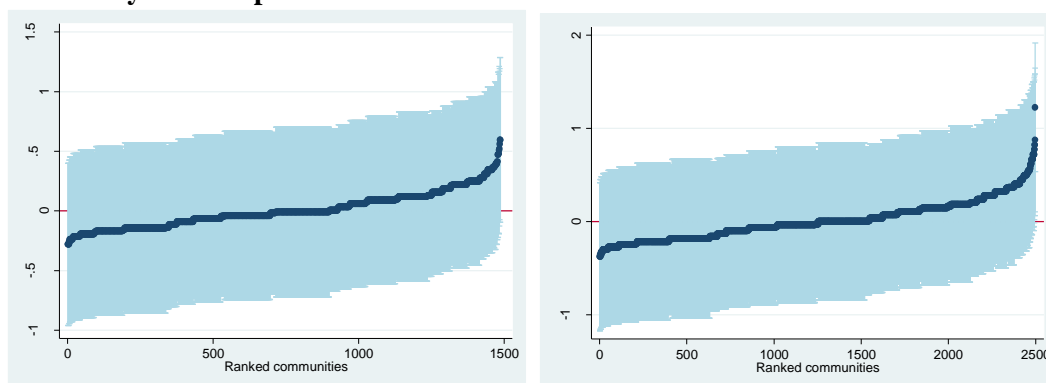
Effect of woman's age on current non-use of contraception in 2005 and 2010

Figure 28 presents the predicted log-odds of current non-use of contraception for each value of women's age in years plus a quadratic function of age in each community for years 2005 and 2010 respectively. This plot was created to examine the effect of age on a woman's odds of current non-use of contraception before adjusting for the compositional (level-1) psychosocial, family planning related characteristics and socioeconomic circumstances of interest.

In 2005, the plot illustrates that the log-odds of current non-use decreased until the mid-30s. For example, for a woman aged 33 (mean age in the national analytical sample) the log-odds of current non-use of contraception ranged from -1.70 to -0.95. This is equal to a probability of current non-use of contraception from about 0.15 to 0.28 whereas for an adolescent woman aged 15 the probability of current non-use of contraception varied from 0.39 to 0.54 depending on the community of residence in 2005.

In 2010, the plot illustrates that the log-odds of current non-use decreased until the mid-30s just as observed back in 2005. Compared to 2005, for a woman aged 33 (mean age in the national analytical sample) her probability of current non-use of contraception ranged from about 0.12 to 0.32, while for an adolescent woman aged 15 it ranged between 0.32 to 0.51.

For 2005 and 2010 the plot suggests important community effects on women's contraceptive non-use.
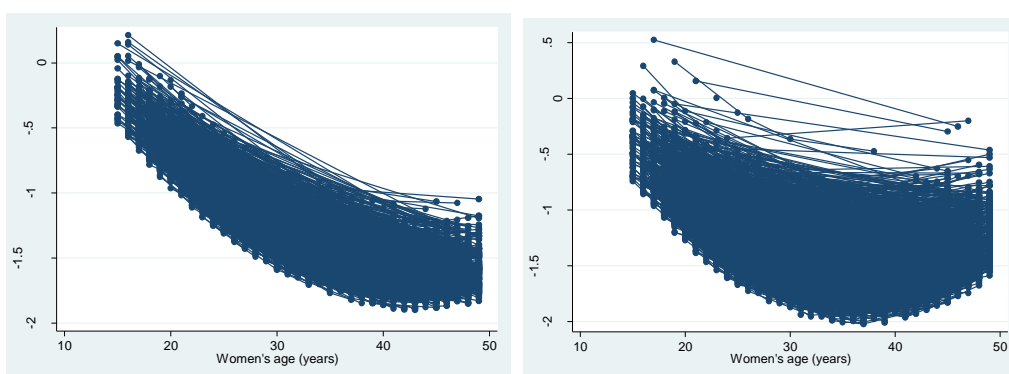
Figure 27Predicted log-odds of current non-use of contraception against women's age

DHS 2005 (left) DHS 2010 (right)

Table 11.21 Contextual effects: IPV, family planning norms and socioeconomic circumstances DHS 2005 N=9,946; communities=1,487

Community characteristics	Model 6							
Women who reported sexual abuse	0.98 (0.92-1.03)	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Women who reported any form of IPV[1]	n/a	0.99 (0.94-1.05)	n/a	n/a	n/a	n/a	n/a	n/a
Mean age at first marriage	n/a	n/a	0.95 (0.89-1.01)	n/a	n/a	n/a	n/a	n/a
Mean number of children born per woman	n/a	n/a	n/a	1.13 (1.07-1.20)	n/a	n/a	n/a	n/a
Approval of FP[2] by husbands/partners	n/a	n/a	n/a	n/a	0.94 (0.88-1.00)	n/a	n/a	n/a
Approval of FP by women	n/a	n/a	n/a	n/a	n/a	0.90 (0.85-0.95)	n/a	n/a
Mean years of education	n/a	n/a	n/a	n/a	n/a	n/a	0.93 (0.88-0.98)	n/a
Mean Public capital (high to low)	n/a	n/a	n/a	n/a	n/a	n/a	n/a	1.14 (1.09-0.24)
Random-effects parameters								
Community variance (s.e.)[3]	**0.15 (0.04)****	**0.15 (0.04)****	**0.15 (0.04)****	**0.15 (0.04)****	**0.14 (0.04)****	**0.13 (0.04)****	**0.14 (0.04)****	**0.13 (0.04)****

[1]IPV=Intimate partner violence, [2]FP=Family planning.[3]Standard error,* p-value<0.05 **p-value <0.001.

Table 11.22 Contextual effects: IPV, family planning norms and socioeconomic circumstances DHS 2005 N=7,162; communities=1,085 urban areas

Community characteristics	Model 6							
Women who reported sexual abuse	1.02 (0.96-1.09)	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Women who reported any form of IPV[1]	n/a	1.01 (0.95-1.07)	n/a	n/a	n/a	n/a	n/a	n/a
Mean age at first marriage	n/a	n/a	1.02 (0.94-1.09)	n/a	n/a	n/a	n/a	n/a
Mean number of children born per woman	n/a	n/a	n/a	1.08 (0.99-1.17)	n/a	n/a	n/a	n/a
Approval of FP[2] by husbands/partners	n/a	n/a	n/a	n/a	0.99 (0.92-1.07)	n/a	n/a	n/a
Approval of FP by women	n/a	n/a	n/a	n/a	n/a	0.95 (0.87-1.02)	n/a	n/a
Mean years of education	n/a	n/a	n/a	n/a	n/a	n/a	1.01 (0.93-1.09)	n/a
Mean Public capital (high to low)	n/a	n/a	n/a	n/a	n/a	n/a	n/a	1.10 (0.99-1.23)
Random-effects parameters								
Community variance (s.e.)[3]	**0.11 (0.05)***	**0.11 (0.05)***	**0.10 (0.05)***	**0.11 (0.05)***	**0.10 (0.05)***	**0.10 (0.04)***	**0.11 (0.05)***	**0.10 (0.05)***

[1]IPV=Intimate partner violence, [2]FP=Family planning.[3]Standard error,* p-value<0.05 **p-value <0.001.

Table 11.23 Contextual effects: IPV, family planning norms and socioeconomic circumstances DHS 2005 N=2,784; communities=402 rural areas

Community characteristics	Model 6							
Women who reported sexual abuse	0.92 (0.84-1.01)	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Women who reported any form of IPV[1]	n/a	0.96 (0.87-1.07)	n/a	n/a	n/a	n/a	n/a	n/a
Mean age at first marriage	n/a	n/a	0.82 (0.71-0.94)	n/a	n/a	n/a	n/a	n/a
Mean number of children born per woman	n/a	n/a	n/a	1.20 (1.09-1.32)	n/a	n/a	n/a	n/a
Approval of FP[2] by husbands/partners	n/a	n/a	n/a	n/a	0.86 (0.78-0.96)	n/a	n/a	n/a
Approval of FP by women	n/a	n/a	n/a	n/a	n/a	0.85 (0.78-0.93)	n/a	n/a
Mean years of education	n/a	n/a	n/a	n/a	n/a	n/a	0.74 (0.64-0.85)	n/a
Mean Public capital (high to low)	n/a	n/a	n/a	n/a	n/a	n/a	n/a	1.27 (1.17-1.38)
**Random-effects parameters**								
Community variance (s.e.)[3]	**0.23 (0.08)****	**0.24 (0.08)****	**0.23 (0.08)****	**0.23 (0.12-0.47)****	**0.19 (0.08)***	**0.18 (0.08)***	**0.20 (0.08)***	**0.16 (0.07)***

[1]IPV=Intimate partner violence, [2]FP=Family planning.[3]Standard error,* p-value<0.05 **p-value <0.001.

Table 11.24 Contextual effects: IPV, family planning norms and socioeconomic circumstances DHS 2010 N=17,400; communities=2,498

Community characteristics	Model 6						
Women who reported sexual abuse	1.01 (0.97-1.06)	n/a	n/a	n/a	n/a	n/a	n/a
Women who reported any form of IPV[1]	n/a	1.03 (0.98-1.07)	n/a	n/a	n/a	n/a	n/a
Mean age at first marriage	n/a	n/a	0.90 (0.86-0.94)	n/a	n/a	n/a	n/a
Mean number of children born per woman	n/a	n/a	n/a	1.26 (1.21-1.31)	n/a	n/a	n/a
Approval of FP[2] by women	n/a	n/a	n/a	n/a	0.91 (0.88-0.94)	n/a	n/a
Mean years of education	n/a	n/a	n/a	n/a	n/a	0.92 (0.88-0.96)	n/a
Mean Public capital (high to low)	n/a	n/a	n/a	n/a	n/a	n/a	1.21 (1.16-1.25)
Random-effects parameters							
Community variance (s.e.)[3]	**0.22 (0.03)****	**0.22 (0.03)****	**0.22 (0.03)****	**0.22 (0.03)****	**0.18 (0.03)****	**0.21 (0.03)****	**0.17 (0.03)****

[1]FP=Family planning.[2]Standard error,* p-value<0.05 **p-value <0.001.

Table 11.25 Contextual effects: IPV, family planning norms and socioeconomic circumstances DHS 2010 in urban areas N=11,509; communities=1,679

Community characteristics	Model 6						
Women who reported sexual abuse	0.98 (0.93-1.03)	n/a	n/a	n/a	n/a	n/a	n/a
Women who reported any form of IPV[1]	n/a	0.99 (0.94-1.04)	n/a	n/a	n/a	n/a	n/a
Mean age at first marriage	n/a	n/a	0.95 (0.91-1.00)	n/a	n/a	n/a	n/a
Mean number of children born per woman	n/a	n/a	n/a	1.18 (1.11-1.25)	n/a	n/a	n/a
Approval of FP[2] by women	n/a	n/a	n/a	n/a	0.95 (0.90-1.00)	n/a	n/a
Mean years of education	n/a	n/a	n/a	n/a	n/a	1.00 (0.95-1.06)	n/a
Mean Public capital (high to low)	n/a	n/a	n/a	n/a	n/a	n/a	1.31 (1.19-1.44)
Random-effects parameters							
Community variance (s.e.)[3]	**0.07 (0.04)***	**0.08 (0.04)***	**0.08 (0.04)***	**0.10 (0.04)***	**0.07 (0.04)***	**0.08 (0.03)***	**0.06 (0.04)**

[1]IPV=Intimate partner violence, [2]FP=Family planning.[3]Standard error,* p-value<0.05 **p-value <0.001.

Table 11.26 Contextual effects: IPV, family planning norms and socioeconomic circumstances DHS 2010 in rural areas N=5,891; communities=819

Community characteristics	Model 6						
Women who reported sexual abuse	1.07 (1.00-1.15)	n/a	n/a	n/a	n/a	n/a	n/a
Women who reported any form of IPV[1]	n/a	1.10 (1.02-1.18)	n/a	n/a	n/a	n/a	n/a
Mean age at first marriage	n/a	n/a	0.86 (0.79-0.93)	n/a	n/a	n/a	n/a
Mean number of children born per woman	n/a	n/a	n/a	1.34 (1.25-1.44)	n/a	n/a	n/a
Approval of FP[2] by women	n/a	n/a	n/a	n/a	0.90 (0.85-0.95)	n/a	n/a
Mean years of education	n/a	n/a	n/a	n/a	n/a	0.85 (0.77-0.94)	n/a
Mean Public capital (high to low)	n/a	n/a	n/a	n/a	n/a	n/a	1.29 (1.19-1.39)
Random-effects parameters							
Community variance (s.e.)[3]	**0.43 (0.07)**	**0.42 (0.31)**	**0.42 (0.07)**	**0.39 (0.07)**	**0.36 (0.07)**	**0.40 (0.07)**	**0.35 (0.06)****

[1]IPV=Intimate partner violence, [2]FP=Family planning.[3]Standard error,* p-value<0.05 **p-value <0.001.

Table 11.27Effect of compositional (level-1) and community contextual (level-2) characteristics on women's current non-use of contraception OR (95% CI) in urban areas DHS 2005 N=7,162; communities=1,085

Fixed effects		Model 7	Model 8
Sexually abused by husband/partner			
	No	n/a	1
	Yes	n/a	0.92 (0.73-1.16)
Age			
	40-49	n/a	1
	30-39	n/a	0.99 (0.84-1.17)
	20-29	n/a	1.33 (1.13-1.58)
	15-19	n/a	1.94 (1.46-2.59)
Wants to have a child (next two years)			
	No	n/a	1
	Yes	n/a	7.40 (6.24-8.77)
Discussed FP[1] with partner (past 12 months)			
	No	n/a	1
	Yes	n/a	1.75 (1.41-2.17)
Discussed FP with friends (past 12 months)			
	No	n/a	1
	Yes	n/a	0.86 (0.75-0.97)
Husband/partner approves FP			
	Yes	n/a	1
	No	n/a	2.13 (1.58-2.86)
	Woman does not know	n/a	2.04 (1.40-2.95)
Heard of FP (last 12 months) at health centre			
	No	n/a	1
	Yes	n/a	0.79 (0.69-0.91)
	Not affiliated	n/a	1.33 (1.13-1.57)
Education			
	Secondary/Higher	n/a	1
	Primary	n/a	0.98 (0.85-1.13)
	None	n/a	0.90 (0.59-1.38)
Physical capital			
	High	n/a	1
	Low	n/a	1.32 (1.15-1.51)
Community characteristics			
Mean Public capital		1.10 (0.99-1.22)	1.04 (0.92-1.17)
Women's approval of FP		0.95 (0.87-1.03)	0.96 (0.88-1.05)
Random-effects parameters			
Community variance (s.e.)^2		**0.10 (0.05)***	**0.06 (0.05)**

[1]FP=Family planning. [2]Standard error, * p-value<0.05 **p-value <0.001

Table11.28Effect of compositional (level-1) and community contextual (level-2) characteristics on women's current non-use of contraception OR (95% CI) in rural areas DHS 2005 N=2,784; communities=402

Fixed effects		Model 7	Model 8
Sexually abused by husband/partner			
	No	n/a	1
	Yes	n/a	0.83 (0.59-1.15)
Age			
	40-49	n/a	1
	30-39	n/a	0.88 (0.69-1.14)
	20-29	n/a	1.19 (0.91-1.55)
	15-19	n/a	3.80 (2.48-5.82)
Wants to have a child (next two years)			
	No	n/a	1
	Yes	n/a	6.68 (4.94-9.04)
Discussed FP[1] with partner (past 12 months)			
	No	n/a	1
	Yes	n/a	1.31 (0.88-1.96)
Discussed FP with friends (past 12 months)			
	No	n/a	1
	Yes	n/a	0.87 (0.71-1.08)
Husband/partner approves FP			
	Yes	n/a	1
	No	n/a	1.86 (1.20-2.90)
	Woman does not know	n/a	2.85 (1.68-4.85)
Heard of FP (last 12 months) at health centre			
	No	n/a	1
	Yes	n/a	1.07 (0.85-1.35)
	Not affiliated	n/a	1.20 (0.94-1.53)
Education			
	Secondary/Higher	n/a	1
	Primary	n/a	1.20 (0.96-1.51)
	None	n/a	1.89 (1.27-2.81)
Physical capital			
	High	n/a	1
	Low	n/a	1.30 (0.94-1.80)
Community characteristics			
Mean Public capital		1.24 (1.14-1.35)	1.14 (1.04-1.26)
Women's approval of FP		0.89 (0.82-0.98)	0.90 (0.82-1.00)
Random-effects parameters			
Community variance (s.e.)[2]		**0.12 (0.07)***	**0.14 (0.08)***

[1]FP=Family planning. [2]Standard error, * p-value<0.05 **p-value <0.001

Table 11.29 Effect of compositional (level-1) and community contextual (level-2) characteristics on women's current non-use of contraception OR (95% CI) in urban areas DHS 2010 N=11,509; communities=1,679

Fixed effects		Model 7	Model 8
Sexually abused by husband/partner			
	No	n/a	1
	Yes	n/a	0.80 (0.63-1.00)
Age			
	40-49	n/a	1
	30-39	n/a	0.73 (0.65-0.84)
	20-29	n/a	0.82 (0.71-0.94)
	15-19	n/a	1.57 (1.22-2.00)
Wants to have a child (next two years)			
	No	n/a	1
	Yes	n/a	10.4 (9.11-11.9)
FP[1] messages radio, TV, news			
	Yes	n/a	1
	No	n/a	1.36 (1.19-1.56)
Heard of FP[1] (last 12 months) at health centre			
	No	n/a	1
	Yes	n/a	1.04 (0.91-1.18)
	Not affiliated	n/a	1.31 (1.16-1.48)
Education			
	Secondary/Higher	n/a	1
	Primary	n/a	0.98 (0.86-1.11)
	None	n/a	1.40 (0.99-1.67)
Physical capital			
	High	n/a	1
	Low	n/a	1.18 (1.06-1.32)
Community characteristics			
Mean Public capital(high to low)		1.30 (1.19-1.43)	1.24 (1.12-1.38)
Women's approval of FP(low to high)		0.96 (0.91-1.01)	0.95 (0.90-1.00)
Random-effects parameters			
Community variance (s.e.)[2]		**0.05 (0.04)**	**0.04 (0.04)**

[1]FP=Family planning. [2]Standard error, * p-value<0.05 **p-value <0.001

Table 11.30Effect of compositional (level-1) and community contextual (level-2) characteristics on women's current non-use of contraception OR (95% CI) in rural areas DHS 2010 N=5,891; communities=819

Fixed effects		Model 7	Model 8
Sexually abused by husband/partner			
	No	n/a	1
	Yes	n/a	0.84 (0.63-1.11)
Age			
	40-49	n/a	1
	30-39	n/a	0.53 (0.44-0.63)
	20-29	n/a	0.83 (0.68-1.00)
	15-19	n/a	1.57 (1.16-2.12)
Wants to have a child (next two years)			
	No	n/a	1
	Yes	n/a	14.2 (11.4-17.7)
FP messages radio, TV, news			
	Yes	n/a	1
	No	n/a	1.56 (1.32-1.84)
Heard of FP[1] (last 12 months) at health centre			
	No	n/a	1
	Yes	n/a	1.43 (1.20-1.72)
	Not affiliated	n/a	1.88 (1.59-2.22)
Education			
	Secondary/Higher	n/a	1
	Primary	n/a	1.21 (1.03-1.42)
	None	n/a	2.05 (1.51-2.78)
Physical capital			
	High	n/a	1
	Low	n/a	1.26 (0.94-1.69)
Community characteristics			
Mean Public capital (high to low)		1.26 (1.17-1.36)	1.20 (1.10-1.30)
Women's approval of FP (low to high)		0.92 (0.87-0.98)	0.93 (0.87-0.98)
Random-effects parameters			
Community variance (s.e.)[2]		**0.31 (0.06)****	**0.35 (0.07)****

[1]FP=Family planning. [2]Standard error, * p-value<0.05 **p-value <0.001

Table 11.31 Fixed effects Model 14 cross-level interaction DHS 2005 and 2010 National level

Fixed effects	2005	2010
Sexually abused by husband/partner		
No	1	1
Yes	0.88 (0.73-1.06)	0.82 (0.69-0.98)
Age		
40-49	1	1
30-39	0.95 (0.83-1.10)	0.66 (0.59-0.73)
20-29	1.29 (1.12-1.49)	0.83 (0.75-0.93)
15-19	2.39 (1.88-3.03)	1.65 (1.36-1.99)
Wants to have a child (next two years)		
No	1	1
Yes	7.20 (6.21-8.35)	11.6 (10.3-13.0)
Discussed FP with partner (past 12 months)		
No	1	n/a
Yes	1.64 (1.36-1.98)	n/a
Discussed FP with friends		
(past 12 months)		
No	1	n/a
Yes	0.86 (0.78-0.96)	n/a
Husband/partner approves FP		
Yes	1	n/a
No	2.07 (1.62-2.65)	n/a
Woman does not know	2.30 (1.70-3.11)	n/a
Heard of FP (last 12 months) at health centre		
No	1	1
Yes	0.86 (0.76-0.96)	1.51 (1.36-1.66)
Not affiliated	1.27 (1.11-1.46)	1.05 (0.95-1.16)
Education		
Secondary/Higher	1	1
Primary	1.02 (0.90-1.15)	1.05 (0.95-1.16)
None	1.03 (0.74-1.44)	1.67 (1.28-2.17)
Physical capital High	1	1
Low	1.30 (1.15-1.47)	1.18 (1.06-1.31)
Community characteristics		
Mean Public capital	0.96 (0.87-1.05)	1.11 (1.04-1.19)
Women's approval of FP	0.93 (0.88-0.99)	0.93 (0.89-0.97)
Random-effects parameters		
Community variance (s.e.)	**0.09 (0.04)**	**0.17 (0.04)**

11.9.   *Appendix 9*

Table 12.32 compares the direction of the asset weights derived applying PCA and MCA to the pooled sample (1986-2010) compared to specific survey year weights for 1986, 1995 and 2005. The direction of the weights is theoretically consistent i.e. relatively better living conditions such as household piped water has a positive weight vs. rain water which has a negative weight.

Table 11.32 Variables included and weights obtained from pooled and survey specific MCA

Variable	Categories	Pooled PCA	Pooled MCA	1986	1995	2005
Floor material	Soil/sand/earth	-0.26	-2.76	-2.16	-2.53	-2.78
	Wood planks	-0.08	-0.99	-0.26	-1.35	-1.43
	Brick/ceramic/tiles	0.30	1.06	1.58	0.98	1.13
	Cement	-0.10	-0.23	0.49	-0.24	-0.26
	Other	0.10	1.15	0.88	0.97	1.37
Water source	Piped water	0.34	0.62	0.79	0.69	0.63
	Rural aqueduct	-0.20	-1.24	-0.51	-1.09	-1.32
	Public tap	-0.17	-2.76	-1.49	-1.93	-1.70
	Well/open well	-0.07	-1.83	-1.85	-2.29	-1.46
	River/spring	-0.16	-2.70	-2.44	-2.27	-2.83
	Rain water	-0.18	-1.43	-0.19	-1.97	-1.55
	Tanker truck	-0.10	-1.48	-0.44	-1.01	-1.22
	Other	-0.04	0.02	-1.31	-2.10	-0.22
Toilet	Flush toilet/sewer	0.38	0.71	0.86	0.77	0.69
	Toilet septic tank/pit	-0.16	-0.81	-0.42	-0.68	-0.88
	Latrine/traditional pit	-0.10	-1.74	-0.97	-1.47	-2.14
	No toilet	-0.29	-3.03	-2.14	-2.42	-3.32
	Other	-0.08	-0.96	-0.61	-0.83	-1.05

Table 12.33 compares the household distribution (n) into household wealth (HWI) quartiles by methods of weight derivation: pooled MCA and PCA and survey specific MCA. Survey specific MCA and PCA distribution of households presents clumping in years 2000 and 2005.

Table 11.33 Distribution (n) of households according to method: pooled MCA and PCA and survey specific MCA

Quartiles	1986	1990	1995	2000	2005
			Pooled MCA		
1 (Poorest)	1088	1281	2585	2855	11259
2	1080	1709	2615	2909	10810
3	1285	2440	4438	4707	14837
4 (Richest)	818	1982	472	436	305
			Survey specific MCA		
1 (Poorest)	1089	1213	2638	2848	11348
2	1381	1830	2526	2964	10684
3	988	2154	2946	5088	14874
4 (Richest)	813	2215	2000	7	305
			Pooled PCA		
1 (Poorest)	1087	1106	2556	2849	11733
2	1108	1829	3157	2803	10984
3	1265	2710	2382	5224	14494
4 (Richest)	808	1751	2000	Empty (clumping)	Empty (clumping)

Table 12.34 presents the distribution (%) of households into quartiles for years 1986-1995 for descriptive purposes. PCA distribution of households was cross-tabulated against MCA distribution. The correlation between MCA and PCA derived quartile wealth distribution is high ($\rho > 0.88$).

Table 11.34 Household distribution (%) into quartiles PCA vs. MCA weights

MCA		PCA 1986 Q1	Q2	Q3	Q4	1990 Q1	Q2	Q3	Q4	1995 Q1	Q2	Q3	Q4
1986	Q1	**94.5**	5.5										
	Q2	5.5	**88.8**	5.7									
	Q3		6.9	**92.7**	0.4								
	Q4			1.7	**98.3**								
1990	Q1					**79.8**	20.2						
	Q2					5.0	**90.0**	5.0					
	Q3						1.4	**98.6**					
	Q4							11.5	**88.5**				
1995	Q1									**91.7**	8.3		
	Q2									7.2	**82.9**	10.0	
	Q3										17.6	**37.3**	45.2
	Q4											**100.0**	0.0