Investigating socio-economic variations in access to chlamydia testing in young people in England

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Declaration

I, Jessica Rachel Sheringham, 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.

Abstract

In England over 2 million young people were tested for *Chlamydia trachomatis* (chlamydia) in 2010/2011 to control infection and prevent reproductive health problems. Since 2008, the National Chlamydia Screening Programme (NCSP) has delivered a significant proportion of this testing.

The main part of my thesis focused on delivery, specifically on socio-economic variations in access to chlamydia testing amongst young people. It is not known whether testing reaches people in disadvantaged socio-economic circumstances (SEC) who often have worse access to preventive healthcare yet poorer outcomes than socially advantaged groups.

Firstly, I undertook a systematic review and re-analysis of Natsal-2000 data to select suitable SEC indicators for use in young people. Living in disadvantaged areas and a lack of education were most consistently associated with a higher risk of chlamydia.

Secondly, I examined socio-economic variations in young people's access to chlamydia testing at national and local levels. Data from the NCSP's first year of national delivery indicated that chlamydia screening reached more individuals in disadvantaged areas, where positivity was also higher. A cross-sectional study informed by focus groups found that local delivery varied by service model, particularly when SEC was measured by educational participation. It also showed that other social factors need to be considered to understand how SEC may affect young people's risk of chlamydia.

The last part of my thesis evaluated the NCSP's rationale. In 2009, the National Audit Office questioned the justification for the Programme, given the lack of evidence surrounding the benefits of screening. My qualitative study revealed there was an implicit driver around improving young people's sexual healthcare underpinning the NCSP's establishment, in combination with the explicit aims of chlamydia control.

The implications of my findings with respect to the delivery of chlamydia testing are discussed in light of this implicit rationale for chlamydia screening.

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PART I. INTRODUCTION

Chapter 1. Introduction

1. Introduction

Genital *Chlamydia trachomatis* (referred to as chlamydia in the rest of the thesis) is the most commonly diagnosed bacterial sexually transmitted infection in England, with prevalence highest among young people, i.e. those under 25 years old (Health Protection Agency, 2010; Centers for Disease Control and Prevention, 2008). Most infections are asymptomatic but chlamydia may have harmful consequences, particularly for women's reproductive health. Because of its asymptomatic nature, those with the infection may also unknowingly infect others. In common with several countries, a screening programme has been developed as a major component of chlamydia control in England. The focus in England has been on maximising the overall proportion of young people tested, but it is recognised that variations in access to chlamydia control interventions may affect their effectiveness. In other preventive services people in disadvantaged socio-economic circumstances are most at risk of ill health yet least likely to access services. It is not known whether this socio-economic inequity applies to young people with respect to chlamydia control interventions.

In this section, I introduce relevant terminology and critically consider the available literature to develop the ideas examined in the thesis.

1.1. Chlamydia and chlamydia control interventions

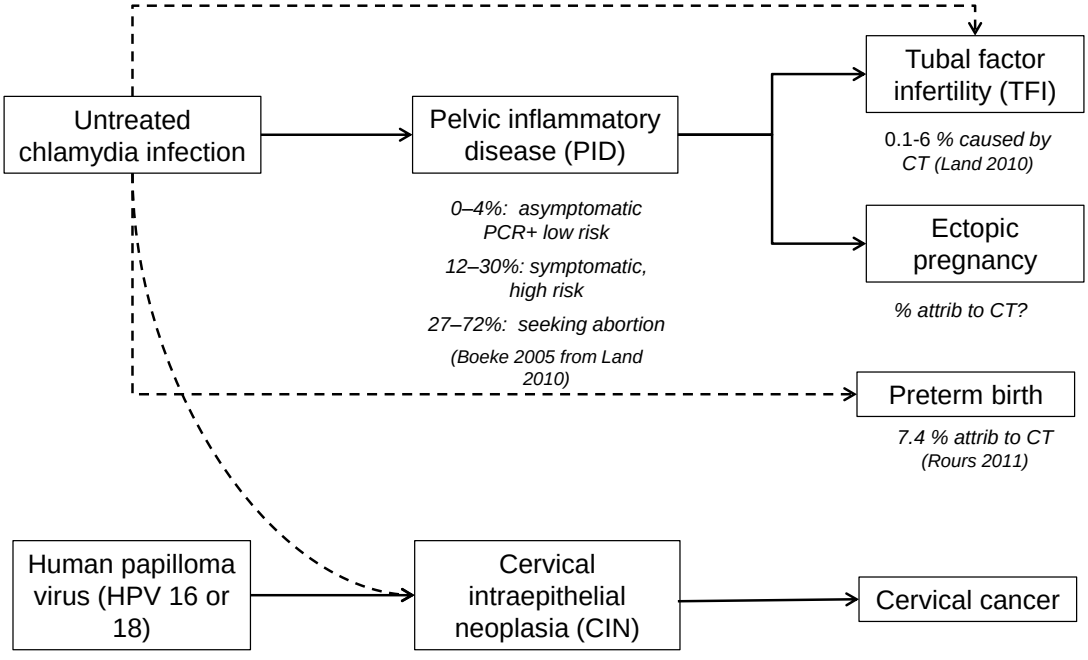
The significance of chlamydia as a public health problem is based on two properties: the natural history of the infection, in particular its propensity to cause serious reproductive ill-health; and its epidemiology, the extent to which people are at risk of becoming infected.

1.1.1. Natural history

Chlamydia is asymptomatic in up to 80% of cases (McKay et al., 2003). It most commonly causes lower genital tract infection and approximately half of cases resolve without treatment within a year of diagnosis with no long term effects (Geisler, 2010). Where it progresses to upper genital tract infection, chlamydia is thought to increase the risk of a range of poor reproductive health outcomes such as pelvic inflammatory disease (PID), tubal factor infertility and ectopic pregnancy.

However, the extent to which chlamydia is responsible for these outcomes is subject to debate. Simms and Stephenson's review (2000) summarised studies available up to 2000 and reported "between 10% and 40% of *C trachomatis* [chlamydia] cases develop PID"; 43% of ectopic pregnancies and 20% cases of infertility were caused by untreated chlamydia. Van Valkengoed et al. (2004) estimated the risk of sequelae in women with a current infection to be much lower: using data obtained from local registrations in Amsterdam, they found the risk of PID associated with chlamydia was just 0.43%, ectopic pregnancy 0.07%, and tubal factor infertility was just 0.02%. Recent reviews estimate that the progression of chlamydia to reproductive ill health to be higher than van Valkengoed's but still lower than the studies undertaken pre-2000: PID was in the region of 2-10% and tubal factor infertility 0.1-6%, with higher rates among those with symptomatic PID, co-infections and recurrent chlamydial infections (Land et al., 2010; Haggerty et al., 2010; Paavonen, 2011 – shown in Figure 1-1). Differences in study populations and testing technologies may explain the wide variation in the estimates of risk from chlamydia. Initial studies were conducted in high risk populations, i.e. women with symptoms and/or recruited from settings such as termination of pregnancy, obstetrics and gynaecology services where women are at high risk of reproductive ill health. Since the advent of Nucleic Acid Amplification Tests (NAATs), chlamydia diagnoses have come from asymptomatic, possibly lower risk women.

Figure 1-1. Chlamydia's association with harmful reproductive consequences in women (based on data available in 2011)



As Wallace et al.'s 2008 systematic review illustrated, there is an "absence of valid evidence on the attributable risk of post-infective tubal factor infertility after genital chlamydial infection" (p173). Their systematic review found only 1 paper that met inclusion criteria and even this had significant methodological limitations. The difficulty in ascertaining reproductive health effects of chlamydia is compounded by the fact that reliable estimates of PID prevalence (or its incidence following chlamydia infection) are difficult to obtain (Risser & Risser, 2007). There is no gold standard diagnostic test or even standard case definition and women's experience of the condition varies widely; some have no symptoms or slight discomfort while others may experience severe but nonspecific symptoms such as pelvic pain, inter-menstrual bleeding, or fever and vomiting (Simms et al., 2006). The more recent evidence suggests that PID is less common than previously estimated. In their data linkage study of women in Sweden, Low et al. in 2006 found a cumulative incidence (women followed from 1985-99) of 3.9% (95% CI 3.7% to 4.0%) in their population. In their trial of chlamydia screening in England, Oakeshott et al. (2008, 2010) based their sample size on an expected PID incidence of 3% after one year but found only 1.9% in their participants.

1.1.2. Epidemiology

1.1.2.1. The challenges of measuring infection prevalence and incidence

There are no population studies of chlamydia incidence but it is possible to gain some understanding of the extent to which chlamydia is present in the population from three different measures: diagnoses rates, population prevalence and positivity.

In the UK, surveillance data of diagnoses reported from clinics to the Health Protection Agency provide the primary source of up-to-date information on trends in infection diagnoses. In 2010, the HPA reported nearly 360 diagnosed cases per 100,000 people, 10 times higher than rates of *Neisseria gonorrheae* (gonorrhoea), the second most prevalent bacterial sexually transmitted infection (Health Protection Agency Centre for Infections, 2009). However, because infection is asymptomatic in most people, surveillance data cannot capture the many prevalent, undiagnosed cases in the population. In addition, because those attending clinics are likely to be

at higher risk of infection than the general population, surveillance data therefore do not reflect risk in the general population (Riha et al. 2011).

Population surveys may provide the most reliable estimates of prevalence but large-scale surveys are not possible to administer on a frequent basis (the last national survey in the UK was in 2001), and are still subject to participation bias (McCadden et al., 2005).

More recently, screening programmes have provided a measure of positivity (the proportion testing positive as a proportion of all those screened). It is not possible to equate this measure with population prevalence (because of the inclusion of repeat tests from the same individuals and selection bias amongst those choosing to be screened). This means it is also problematic to use positivity to ascertain which groups may be most at risk of infection.

1.1.2.2. At risk groups

Prevalence surveys, surveillance data and studies reporting positivity all indicate that young people (under 25 years) are at greatest risk of infection. Diagnosis rates in people aged under 25 years were over 2000 per 100,000 in 2010, five times the rate in the general population (Health Protection Agency Centre for Infections, 2009). The prevalence of chlamydia in sexually active young people in the general population is in the region of 3-6%, with young men at similar risk to women (Stein et al., 2008; Fenton et al., 2001; Goulet et al., 2010; Macleod et al., 2005).This high prevalence in young people may be partly due to higher rates of partner change in this age group than the general population (Wellings et al., 2006). Younger women may also be biologically and hormonally more susceptible to infection than older women (Brabin et al., 2005). Screening and surveillance data also indicate that there are social variations in chlamydia, most notably by ethnicity (Simms et al., 2009).

1.1.3. Strategies to control chlamydia

The European Centre for Disease Prevention and Control (2009) defines primary prevention as the first step in any chlamydia control programme. This involves promoting safer sexual behaviours such as limiting the number of partners and using condoms with new partners.

Secondary prevention of chlamydia requires accurate diagnosis, prompt treatment and partner management. Since 2007, testing in England has been routinely performed using NAATs, which have both high sensitivity and specificity, and do not require invasive examination (Skidmore, 2010; Cook, et al. 2005). Chlamydia can be treated effectively with antibiotics; azithromycin requires just one dose. Infection does not confer sufficient immunity to prevent reinfection, so effective management also includes notification of recent sexual partners for testing and treatment and advice not to have sex until seven days after effective treatment of both partners (Howie, et al. 2011).

Chlamydia testing can be delivered for diagnostic purposes, when individuals present with symptoms, for case finding or for screening purposes, to detect and treat infection in asymptomatic individuals and prevent the transmission of infection.

In England, testing occurs through the following service models:

- **National Chlamydia Screening Programme (NCSP) (providing 40% of all chlamydia tests delivered in 2010)**:The NCSP was established in phases from 2002 and has been available throughout the country from 2008. Testing is delivered through settings within healthcare such as community sexual health services and primary care. They also include a wide range of settings outside of health including the internet, pubs, clubs, sports venues, educational establishments to engage young people who do not use health services (National Chlamydia Screening Programme, 2009a). In contrast to population-based screening programmes such as cervical cancer, young people are not selected from a population register (e.g. GP lists) and invited by letter to attend for screening. Instead, under the NCSP, asymptomatic people under 25 years are offered a test ‘opportunistically’ when they use any of the venues registered to deliver the NCSP. Details of all tests performed under the NCSP are reported to the Health Protection Agency (HPA), the body responsible for managing the Programme. Services that deliver the NCSP are also registered with the HPA.

- **Genitourinary medicine clinics (GUM) (providing 49% of tests):** GUM clinics are specialist services, often located in hospital outpatient departments, provide diagnostic tests to young people presenting with symptoms of sexually transmitted infections (STIs). They may also provide treatment and testing to asymptomatic partners of individuals diagnosed with chlamydia and opportunistic tests to asymptomatic young people seeking other sexual

healthcare (for example contraception) or who indicate that they have had unprotected sex.

- **'Non-NCSP, Non-GUM' (providing 11% of tests):** A substantial minority of tests are also performed in health settings outside of GUM that do not report data to the NCSP. These may include community sexual health clinics, hospital departments, general practices and community pharmacies. These tests are normally offered to young people seeking sexual healthcare for diagnostic or opportunistic screening purposes.

Modelling studies estimate that coverage of at least 35% of the population was needed for screening to achieve a reduction in chlamydia prevalence (Turner et al., 2006). In order to reach these volumes of testing coverage, local areas have been subject to Government performance targets based on numbers of young people tested in their area. Until 2008/2009, these NHS coverage targets called 'Vital Signs' indicators counted testing performed only within the NCSP (National Chlamydia Screening Programme, 2010; National Chlamydia Screening Programme, 2009c). In 2009/2010, the targets included tests performed outside NCSP but did not include GUM. In 2010/2011, testing performed in all services was counted towards this target.

In addition, it is recognised that "it is important to know who takes part in screening programmes because this will help to understand and interpret information about their outcomes" (Heijne & Low, 2011, p454). It also may indicate whether the NCSP lives up to the NHS principle of providing equitable access to young people.

1.2. Access to healthcare and its application to chlamydia control

Before I consider evaluating access to chlamydia testing, I will draw on the work of other researchers, particularly Martin Gulliford and Maria Goddard, to outline dimensions of access to healthcare in general.

1.2.1. Access: definitions and socio-economic inequalities

"We are committed to an NHS that is available to all, free at the point of use, and based on need, not the ability to pay."

Our values, Equity and excellence: Liberating the NHS, Department of Health (2010a p7)

Equal access to healthcare has always been a central principle of the NHS. Conclusions about access to care however may depend on which definition of access is applied and how it is measured. In one of the first models developed to examine access to healthcare, Aday and Andersen (1974) focused on health service delivery and differentiated 'having access' (potential to use a service if required) and 'gaining access' (using a service). In 2002 Gulliford et al. (2002) broadened the conceptualisation of access beyond delivery to consider also relevance and equity. I have summarised my interpretation of these dimensions and their advantages and limitations for health service research in Table 1-1.

There is consistent evidence that people in disadvantaged socio-economic circumstances use preventive services less than those in more favourable circumstances despite having greater need (Dixon et al., 2007; Goddard & Smith, 2001). In contrast, amongst people in disadvantaged circumstances, there is higher use of services for acute health needs such as A&E (Dixon et al., 2007; Goddard & Smith, 2001). Dixon-Woods et al. (2006) have theorised these socio-economic variations in service use are related to differences in perceptions of health. While people in more affluent circumstances may view health as a quality to be maximised and maintained through the use of health services, people in deprived circumstances may not share this positive conceptualisation of health, viewing it instead as merely absence of disease. Their use of health services is then confined to seeking help in response to problems or crises.

Table 1-1. Dimensions of access

Dimension (definition)	Examples of indicators	Considerations: Advantages (✓) and limitations (×)
1. Quantity of health service delivery		
Availability or supply (Amount of healthcare provided or available)	Number of clinics/ clinicians per population group	✓necessary pre-condition of access (without supply, access not possible)
	Opening hours	✓widely used measure of access, feasible to quantify × patients may still experience barriers to use or poor health outcomes even when quantity of services is high × without other measures, not possible to judge that identified level of supply is adequate
Utilisation (Usage of services by patients/ public)	Number of healthcare procedures performed (e.g. chlamydia tests) per population group	✓widely used measure of access, feasible to quantify ✓Can capture impact of barriers faced by patients (e.g. costs of time off work, prescription charges) not detectable through measuring supply × mismatch may occur when individuals' recognition of their own needs for healthcare don't concur with health service providers' assessments × without other measures, not possible to judge that identified level of utilisation is adequate
Relevance, quality or appropriateness (Type and quality of services)	Type of provider, service model	✓ can help inform whether identified level of utilisation/supply is adequate OR why utilisation/supply varies between groups
	Patient satisfaction	× measurement may be subjective, can vary from patient to patient
2. Service delivery in relation to need		
Equity (equal access for equal need (Mooney, G. 1987) NB: range of alternative definitions exist)	Utilisation/supply PLUS measure of need (capacity to benefit from healthcare intervention)	**✓✓✓measure of need required to judge whether identified level of utilisation/supply is adequate** × significant conceptual and methodological difficulties in measurement and interpretation of need. Whatever definition is used, requires consideration of - population health status (e.g. risk of chlamydia), AND - effectiveness of intervention (e.g. screening).

1.2.2. Application to chlamydia testing

1.2.2.1. Inequalities in health service delivery

The ClaSS project (Chlamydia Screening Studies, a programme of research commissioned to inform chlamydia screening in England), found socio-economic inequalities in screening uptake (Macleod et al., 2005). The researchers found that young people living in deprived areas were less likely to respond to a screening invitation offered by post. It is not clear whether this difference in uptake would apply to the NCSP, where screening is offered opportunistically (i.e. face to face) through both health and non-health settings. Examining socio-economic inequalities

in sexual healthcare delivered to young people using service models similar to the NCSP has proved problematic in the past: in their review of sexual health services delivered in educational settings, Blank et al. (2010) conclude that, “many papers did not adequately describe the socio-economic status of their population. Therefore it is difficult to comment on the effectiveness of contraceptive services in reaching socially disadvantaged young people”.

To interpret socio-economic variations in supply and use of testing, it may also be relevant to consider the type of service in which young people are tested. The NCSP could be characterised as purely a preventive service. In contrast, where individuals with genitourinary symptoms have sought a diagnostic test, chlamydia testing is sought to resolve an identified healthcare problem.

1.2.2.2. Consideration of need

The authors of the ClaSS study concluded that *“*chlamydia screening has the potential to increase inequalities in sexual health” (Low et al., 2007a). Even if young people in disadvantaged socio-economic circumstances are at greater risk of chlamydia than those in advantaged circumstances, then achieving equal coverage of screening across all socio-economic groups may not be sufficient to avoid inequalities in sexual health. However, this conclusion also implicitly assumes that chlamydia screening would deliver health benefits.

Implications of Sections 1.1 and 1.2 for this thesis

Chlamydia screening is a major public health intervention in England. High volumes of testing are required for it to be successful. However, socio-economic inequalities in uptake of preventive services have been reported in a variety of preventive health services and in early studies of chlamydia screening. So, in addition to overall levels of coverage, we need to consider socio-economic variations in levels of supply and use across different models of service delivery.

In addition, to judge whether levels of supply and use are adequate, we need to understand

- socio-economic differences in the risk of chlamydia
- to what extent can screening deliver health benefits

1.3. Determinants of the spread of chlamydia and other sexually transmitted infections

In line with the principles of all infectious diseases, the rate of spread of STIs is determined by three parameters:

- β: the infectivity of the pathogen (the probability that a susceptible individual will become infected if exposed to infection).
- C: the rate of exposure between infected and susceptible individuals
- D: the duration of infection

As described by Aral (2002), these parameters (and therefore the spread of STIs) are driven by physiological and lifestyle factors:

- Physiological factors: the epidemiology of different STIs varies because of the physiological characteristics of the pathogens. In relation to β, chlamydia's longer period of infectivity compared with gonorrhoea (Althaus et al., 2010) is one explanation for why gonorrhoea is concentrated in men who have sex with men (MSM) and in areas of England such as London and Manchester, while chlamydia is more dispersed geographically and across population groups (Health Protection Agency Centre for Infections, 2009).
- Lifestyle factors: The transmission of STIs is also affected by individuals' sexual and healthcare seeking behaviours. Infectivity of a sexually transmitted (β) can be reduced through condom use. The rate of exposure (C) is affected by the numbers of sexual encounters within a given time, so a susceptible individual's rates of partner change will influence their risk of infection. The duration of infectivity (D) will be reduced if individuals can access prompt and effective treatment to clear their infection.

Aral (1999) also noted how 'distal' structural and environmental factors influence the acquisition and transmission of STIs through their effects on these lifestyle factors. She included within these influences 'social class' and 'geographical location'.

1.4. How can socio-economic circumstances contribute to the risk of chlamydia in young people?

Since Aral's model linking distal factors such as socio-economic circumstances to STDs, others have focused on these characteristics as important determinants of infection. For example in 2008 Hogben and Leichliter (pS15) assert that *"one of the*

most important social determinants of sexual health is SES [socio-economic status]." Like most of the STI literature I have studied, they draw primarily on US empirical research to make this assertion. However, socio-economic factors have also been described in European surveillance and disease control literature as key determinants of infectious diseases in general (eg Semenza et al 2010), and STIs in particular (eg Pukkula et al 2010). In the UK, there is empirical evidence amongst young people that social disadvantage is linked to an increased risk of a range of indicators associated with unprotected sex such as sexual activity at an early age, no/inconsistent contraceptive use and teenage pregnancy (Department for Education and Skills, 2006). However the association between STIs and socieconomic circumstances in the UK is not consistent; whilst some research has found higher rates of chlamydia, gonorrhoea or reported STIs amongst deprived communities than those in more affluent social circumstances (eg Shahmanesh et al. 2000, Das et al. 2005 and Monteiro et al. 2005), in other studies no, or only weak, associations have been found (eg Low et al. 2001, Fenton et al. 2005). Therefore, it may not be appropriate to assume that chlamydia transmission and acquisition in young people in England will vary by socio-economic circumstances.

Before I consider how socio-economic factors *may* affect chlamydia transmission and acquisition in young people in England, I will briefly introduce the definitions around SEC and discuss their relevance to this thesis.

1.4.1. Socio-economic circumstances: concepts and terminology

Socio-economic measures capture: the "*resources – material and social – needed to do well and stay well in the societies in which they [we] are part*."
(Graham, 2007, p40)

A range of terms - social class, social stratification, socio-economic position, socio-economic status, deprivation - are used, often interchangeably, to describe the living and working conditions of individuals, households or the areas in which they live.

The basis for the terms I have used throughout this report come mainly from the writings of three health inequalities researchers – Hilary Graham, Mel Bartley and Nancy Krieger – who have all defined and distinguished between key terms used in this field. While broadly congruent, these writers differ in some respects. Graham (2007) uses the terms social class and socio-economic position (SEP) interchangeably, seeing them as products of the differences between health and

social research disciplines. Krieger et al. (1997) and Bartley (2004), in contrast, conceptualise social class (determined by occupational relations), as the "social location" and prefer socio-economic position to describe the distribution of resources - "occupations, income, wealth, education, and social status" - that follow from that location. Bartley further differentiates between socio-economic position, covering relative measures - class, status, relative income ('positions') and socio-economic circumstances (SEC), also encompassing 'absolute measures, such as income and ownership of assets'. Relative measures of socio-economic position lead to ordered categorical measures while SEC also encompasses absolute measures measured by continuous variables. It is also worth noting that in the UK in particular, terms such as 'deprivation', 'poverty' (and to a lesser extent 'social exclusion") are often used in studies examining socio-economic circumstances. In contrast to the broader terms of socio-economic position or circumstances, concepts relating to deprivation do not capture affluence or wealth, only the presence or the extent of deprivation. They usually refer to a lack of income or material assets but can also capture a lack of social resources; in the Indices of Deprivation 2007, Noble et al. (2008) describe deprivation as, "*unmet need, which is caused by a lack of resources of all kinds, not just financial".* Throughout this thesis, I will use the broadest term, 'socio-economic circumstances' or SEC to capture both dimensions encompassed by socio-economic position and by deprivation.

Krieger lists material and social dimensions of SEC as occupations, income, wealth, education, and social status. Measures of social capital and other types of deprivation e.g. access to services, crime can overlap with indicators for SEC. While they are sometimes used as indicators of SEC, they do not always have a material dimension. For the purposes of this thesis these non-socio-economic dimensions of deprivation are considered outside the scope of SEC but may still be represented in composite indices of SEC.

1.4.1.1. Why does it matter which dimension is used?

Different dimensions of SEC often correlate closely with each other, so several dimensions may show similar associations with some health outcomes. However, this might lead to the assumption these dimensions are measuring the same underlying condition and, therefore, that they are interchangeable. It is important to know what dimension of SEC an indicator is measuring when:

- there is a choice of which indicators to collect. The indicators that measure the dimensions of SEC most relevant to the health outcome should be selected.

- there is conflicting evidence of associations between SEC and health outcomes. There is evidence from sexually transmitted infections that different measures can produce different associations, amongst different subpopulations. For example, Newbern et al. (2004) found family socio-economic indicators, particularly household income, to be a poor predictor of STIs amongst adolescents. The occupations of participants' mothers, however, was a stronger predictor amongst black adolescents.
- the purpose is to design public health interventions related to SEC. For example where a health outcome is more sensitive to education than income, an intervention to keep young people in school may be more effective than one offering financial incentives.

In addition, Graham (2007) argues for careful consideration of which measure to choose because the same SEC can have a different interpretation for different population groups and at different stages in the life course. Her argument applies particularly well to the interpretation of socio-economic measures in young people. Young people's circumstances change substantially from the ages of 15 to 24, as they move from childhood to adulthood, particularly in terms of their own educational participation and employment, forming intimate relationships and living independently.

The SEC measure chosen is important, therefore, and needs to have some salience to the causal mechanisms by which SEC may affect the risk of chlamydia. In addition it should be informed by empirical research to find out which indicators are sensitive to variations in young people's risk of chlamydia. A more detailed discussion of the measures available is presented in 1.4.2.6.

1.4.2. Developing a model based on the literature

1.4.2.1. Why develop a model?

There are no models proposed that link SEC and chlamydia, but US researchers such as Sevgi Aral, Matthew Hogben and Jami Leichliter have developed models for other STIs amongst the general population. These are useful but because of the differences in disease characteristics and population differences outlined above, they are not directly applicable to chlamydia in young people in England. Therefore, I draw on these models in combination with empirical research on young people's sexual behaviour and health outcomes to develop a working model that links linking SEC and chlamydia in young people in England.

1.4.2.2. Individual sexual risk behaviours and SEC

As Aral observed in 1999, “the predominant focus of sexually transmitted disease (STD) epidemiology has been on the attributes and behaviours of individuals” (Aral, 1999, p262), i.e. individuals in poorer socio-economic circumstances would be more at risk of acquiring or transmitting chlamydia because they are less likely to use condoms consistently, more likely to have higher numbers of sexual partners, and less likely to receive prompt treatment if they do acquire an STI.

Individual level SEC and behaviour: The age at which young people become sexually active determines when they become susceptible to STIs and to some extent it may also be predict their risk of STIs at a later age too (Kaestle et al. 2005). According to data from the 2000 National Survey of Sexual Attitudes and Lifestyles (Natsal), SEC is associated with early sexual experience in the UK, both in terms of age at which young people first have sex and whether they use contraception at this encounter (Wellings et al. 2001). The adjusted odds of first intercourse before age 16 years were 3 times higher for men and women that left school at aged 16 with qualifications compared with those staying in education post 17 years. It is noteworthy that associations were not the same regardless of which socio-economic dimension was used; associations were stronger for measures of educational participation and achievement than measures of parental social class. Stovel et al. (2008) describe several studies which report that young people’s sexual behaviour is more reliably and strongly associated with education than other social measures such as family income. They propose that engagement with school promotes aspirations in young people. This motivates them to conform to social expectations around sexual behaviour because this conforming behaviour enables them to realise the opportunities that educational participation confers. This argument is supported by a study in Scotland by Henderson et al. (2008) where pupils aged 11-14 years old were followed up until they were 16 years old. This research found that poorer attitudes to school and reduced aspirations to remain in education were associated with an increased prevalence of sexual experience when they were 16 years old in both boys and girls. However, they also found that over and above individual socio-economic factors, the wider socio-economic environment in which young people inhabit was associated with early sexual experience.

The teenage pregnancy literature in England also indicates that educational factors are strongly associated with pregnancy in 15-17 year old girls (Department for Education and Skills, 2006). Allen et al. (2007) and Bonell et al. (2005) have used data from a study of peer-led sex education (the RIPPLE trial) to examine the pathways linking education with teenage pregnancy. They find no empirical evidence that health literacy leading to a lack of knowledge of sexual health and reproduction is responsible for more risky sexual behaviours in those leaving education early. Instead, teenage pregnancy was more closely related to a dislike of school and low expectations for remaining in education. It is important to bear in mind that teenage pregnancy as an outcome differs from chlamydia in under 25s; it has more long-term social consequences, and there are different primary and secondary preventive strategies that could be employed. Still, it does suggest that measures of educational engagement and participation may be of greater relevance to outcomes associated with unprotected sex than material resources. In addition, it suggests that education exerts its effects, not through sexual health literacy, but through other means such as through effects on aspirations.

In relation to STIs, Annang et al. (2010) also found that lower educational participation was associated with higher predicted risk of gonorrhoea and chlamydia in young American women using data from the National Longitudinal Study of Adolescent Health survey in the US. However, they found that higher rates of risky sexual behaviour did not fully explain higher chlamydia prevalence amongst those with different educational experience. Black women – at greater risk than white women across all educational groups – were more likely to report using condoms and had fewer sexual partners than their white counterparts.

Area-level SEC and behaviour: There is also empirical literature about young people in the USA that links higher rates of risky sexual behaviour with living in disadvantaged areas. In contrast to individual SEC factors, there is no consensus as to why disadvantaged areas may lead to higher STIs/risky behaviours. Browning (2008) amongst others propose that concentrated disadvantage leads to communities characterised by a lack of social cohesion, which is associated with little community monitoring of young people. They find evidence in the US that these circumstances lead to higher numbers of sexual partners amongst young people that the community in other, less disadvantaged areas can moderate through enhanced surveillance. However, Burgard & Lee-Rife's multilevel study in South Africa (2010) does not support this theory. They found that while socio-economically disadvantaged areas were associated with a higher prevalence of unprotected sex and early sexual debut, this association was not moderated by community monitoring. They conclude this US-based theory may not apply universally, and suggest that the links between youth sexual behaviour and community characteristics could vary so substantially across contexts that general theories may be inappropriate.

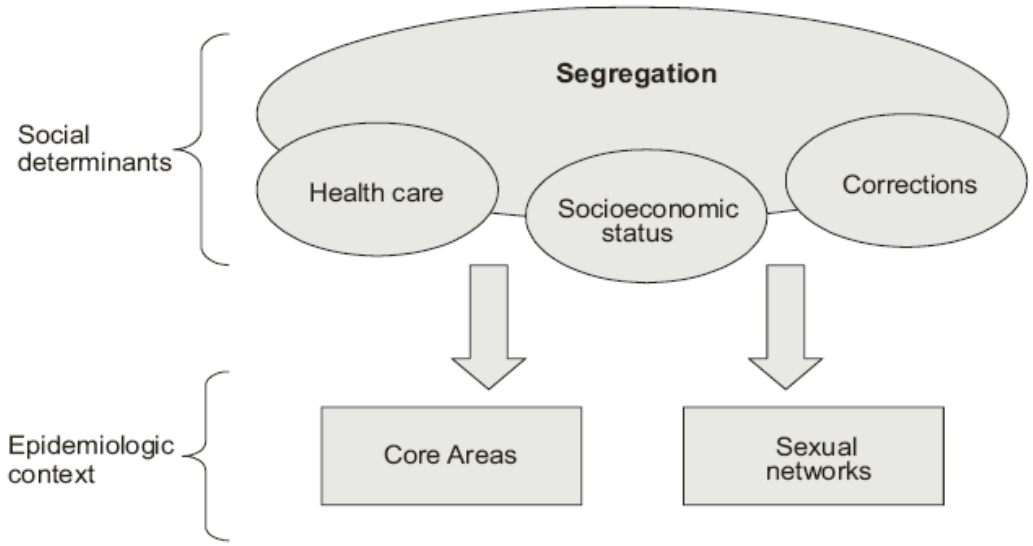
Area and individual-level SEC: Akers' 2011 qualitative study is the only study to examine how disadvantaged areas affect disadvantaged youth. They conclude that a lack of safe spaces to socialise in deprived areas, combined with deficits in community monitoring, creates sexual opportunities for disadvantaged young people. This theory has not been tested quantitatively and was conducted in black communities in rural areas of the US so its relevance to the UK is also untested.

1.4.2.3. Population-level explanations

In relation to STIs, Aral (1999) noted that, "one person's health outcome is highly dependent on other persons' health outcomes", so population-level determinants also need to be considered. She described this move from individual risk behaviours as a "paradigm shift" in the approach to explaining the association with SEC (p262). In relation to the parameters determining STI transmission, the rate of exposure to infection depends not only on an individual's partner numbers but also on their partners' sexual partnership history and the prevalence of infection in their sexual network. Similarly, the duration of infection is not solely determined by an individuals' healthcare seeking behaviours, but on the extent to which treatment is available in their area. As shown in Figure 1-2, Hogben and Leichliter (2008) refined Aral's population framework to explain the role of SEC in the racial inequalities in STIs observed in the USA, when individual differences in sexual risk behaviours are

absent or controlled for. In their model, segregation has a reciprocal and overlapping relationship with social and epidemiological determinants such as SEC. This model shows two of the dominant population-level explanations for socio-economic variations in STIs to emerge from the literature: sexual networks and access to healthcare.

Figure 1-2. Hogben and Leichliter's model of STD-related social determinants and related epidemiologic context, 2008



Sexual networks*:* In Aral and Hogben's models, the characteristics of the sexual network in which people belong affect their risk of STIs. Ward's 2007 review of the importance of networks illustrated how variations in network structure and size may influence risk of STIs. There is some empirical evidence that networks matter over and above behaviour; as Fichtenberg's research from 2009 shows, individuals with only one partner are at five times greater risk of chlamydial infection if their partner has more than one partner than if they are in an exclusively monogamous relationship.

Several researchers propose that variations in sexual networks may drive socio-economic inequalities in the prevalence of STIs. Hogben and Leichliter (2008) describe how segregation into socially disadvantaged areas can lead to networks comprising individuals with high risk of STI, so every sexual encounter has a greater risk. In a European study, Vuylsteke et al. (1999) also proposed that educational settings may determine sexual networks through their influence on social networks created in school and extracurricular activities.

However, there is little empirical evidence linking variations in sexual networks to socio-economic inequalities in STIs, particularly chlamydia. This is partly because of

the immense challenges in obtaining comprehensive sexual networks even with labour intensive methods (Fichtenberg et al., 2009).

Healthcare: As described in 1.2, socio-economic inequalities in supply and use of chlamydia testing are counter to the principles of the NHS. In addition, as Hogben and Leichliter's 2008 model proposes, socio-economic inequalities in access to treatment may also drive socio-economic inequalities in prevalence. This is because lack of healthcare access may result in treatment delays for infected individuals, lengthening the time available for infection to be transmitted.

1.4.2.4. Are SEC influences on sexual health the same for all social groups?

SEC may affect individuals' risk of STIs differently, depending on their demographic and living circumstances. The empirical research into socio-economic associations with behaviour and STIs suggest that socio-economic variations in sexual health vary by gender and ethnicity (Wight, et al., 2006; Annang et al., 2010; Marston & King, 2006).

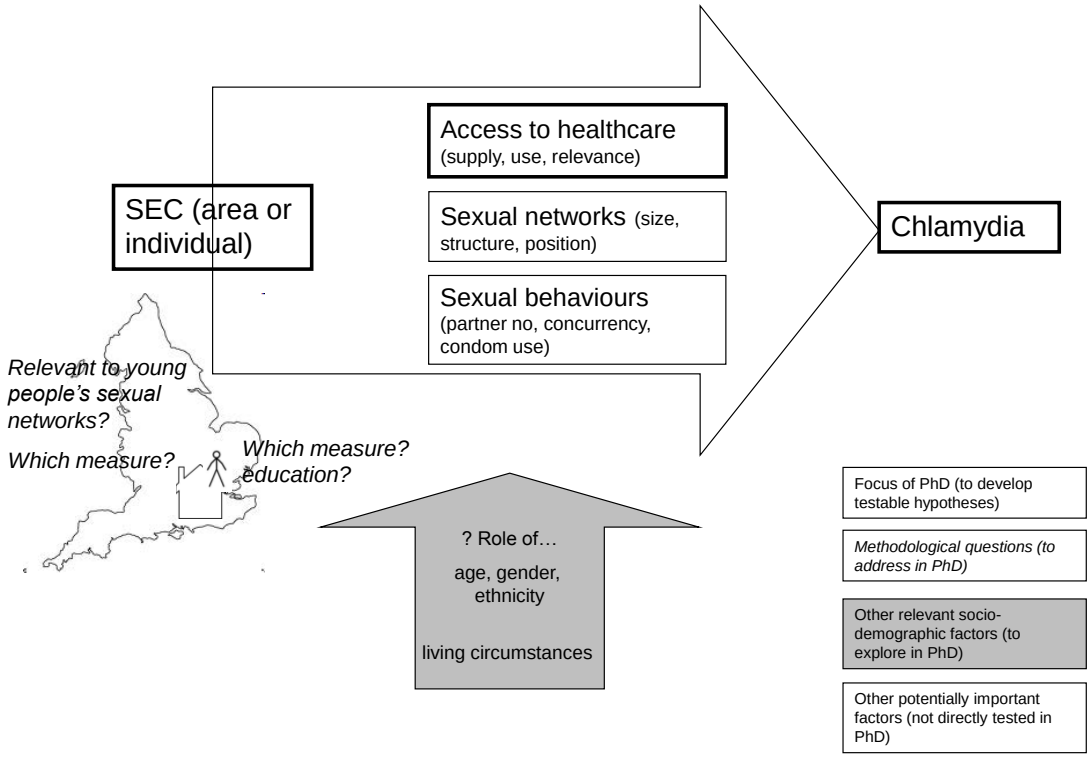
In their systematic review of teenage pregnancy literature from 2008, Harden et al. found disengagement with education is often coupled with problematic home environments and family relationships. Wight et al's in-depth longitudinal analysis of factors affecting the sexual behaviour of young people followed up from the ages of 13/14 years to 15/16 years in Scotland in 2006 found that that family structure was closely correlated with processes such as parental monitoring and sexual experience; teenagers not living with either or both parents were more likely to have sexual experience at young ages. Their study also illustrates the complexity of the relationship between family processes and home environments.

The inter-relationship between home environments, SEC and sexual health in young people over 16 years has been subject to less investigation. However, this is a time of immense transition in living circumstances for many young people, with many leaving the parental home temporarily or permanently. Ford et al. (2002) found in a survey of just under a thousand people aged 16-25 in five areas in England that 48% left home aged 18-19 and 39% had made their first move out of the family home before aged 18. As they observe, the majority of students (comprising 30% of 18-19 year olds) have frequent planned moves into rented or communal housing, returning periodically to parents but vulnerable young people may have unplanned, frequent moves out of the family home.

1.4.2.5. Working model of SEC and chlamydia in young people in England

I propose that young people's SEC (at area-level, individual-level or a combination of the two) may interact with other socio-demographic factors to influence their risk of chlamydia through three pathways shown on Figure 1-3. Some of these elements may be directly testable in this thesis (e.g. the link between access to healthcare and SEC, shown in bold). Others may not be feasible to test but remain plausible and important explanations. There are also methodological questions (shown in italics) in relation to selecting the most appropriate measures of SEC to develop this model.

Figure 1-3. Working model linking SEC at area and individual levels with the risk of chlamydia, to be refined in studies 1-3 & 5 and tested in studies 4 and 6.



1. If disadvantaged areas have restricted **access to healthcare**, the duration of infection in individuals will be longer, increasing the risk of transmission and the risk of chlamydia to people in these areas.
2. Disadvantaged individuals or individuals living in disadvantaged areas may be part of **sexual networks** with high infection prevalence, leading to higher risk of infection for anyone in these networks, independent of sexual behaviour. This theory assumes that young people still do have relatively localised sexual networks.

3. Individuals with lower educational participation may have a higher risk of chlamydia because they are more likely to engage in **higher risk sexual behaviours**. This may be linked to reduced engagement with education, leading to lower aspirations and reduced motivation to conform to safer sexual behaviours. At an area level, higher risk sexual behaviours may be normalised in disadvantaged areas if society-level constraints are not present.

1.4.2.6. Selecting appropriate SEC indicators to examine access to chlamydia testing in young people

SEC measures are available at individual, household and area levels. I will focus on the range of measures available at individual and area levels because household measures (most commonly taken from the SEC of the father or highest earner in the family) in young adults can be incomplete if they do not know their parents' details, leading to inconsistent results and biased findings. It is also because measures based on parental or family circumstances – even if possible to collect - may not be relevant in young people who no longer live with their parents. In addition, measures of parental SEC have been found to be less sensitive to inequalities in young people's health than other measures. For example, West & Sweeting (2004) found that family SES is much less important than other factors in youth culture for health outcomes. Koivusilta et al. (2006) also found that young adults' personal social position (school performance) was a better discriminator of health outcomes than parental circumstances.

1.4.2.6.1. Socio-economic dimensions at individual level

The most widely used dimensions at an individual level are occupation, income and education. I will briefly consider their relevance and validity as measures in young people and their relevance to this project.

Occupation: As Bartley (2004) describes, the primacy of occupation as a measure of SEC comes from Weberian theories of social structure that place the labour market as the primary determinant of life chances. Empirical research supports this theory; occupational grades correlate well with a variety of health outcomes as seen in the range of findings from Whitehall studies I and II summarised by Bell et al., 2004. In England, occupation is collected in the census and death certificates. It is the basis of social class measures such as the Registrar General Social Class system, once very widely used in social epidemiology, and other more recently used classifications such as the National Statistics Socio-Economic Classification also

known as NS-SEC (Office for National Statistics, 2005). However, the relevance of their own occupation as a discriminator of socio-economic circumstances in young people is limited given that only 52.5% of people aged 16-24 years are currently in employment, and students - unclassified in NS-SEC - comprise nearly 40% of 16-24 year olds (Office for National Statistics, 2010b).

Income: Income is arguably the most important determinant of material assets such as home ownership. However, there are various reasons why it may not be appropriate to collect income information as a measure of SEC in young people. Income has different meanings for different cohorts and its interpretation is complicated by the need to consider welfare supplements and entitlements. Moreover, how much people earn can be sensitive information. In surveys, non-response is often higher for questions about income than other survey questions (Yan, et al., 2010). In addition, young people's current income is not an accurate measure of socio-economic circumstances of destination. Earnings rise significantly for all groups from early twenties but more so for graduates; at ages 21-22 years, earnings are higher for non-graduates than graduates and similarly at 23-24 years. But by 26 years, graduates earn more than non-graduates (Prospects.net, 2005).

Education: Krieger (1997) describes education as "among the most widely used indicators of SEP". It is relatively straightforward to collect and interpret. Graham (2007) notes that "education anticipates rather than represents adult social position. It lies on the pathway linking parental social class (class of origin) and own social class (class of destination)". With respect to young people, who have not reached their 'destination', this is an advantage. She also quotes strong evidence that higher educational participation is linked to social class of origin and this association has grown over time even as participation has increased across all social groups.

Subramanian et al. (2006) observe that educational participation is a less meaningful measure for younger age children who have not yet completed their education. While in England, educational level can still act as a discriminator in populations as young as 16 years, the interpretation of levels of educational participation needs to be age specific. For example, in those aged under 18 years, being out of education may indicate social exclusion because over 80% of this age group are currently in education. Amongst those aged 18-24, educational participation may provide a measure of socio-economic gradient because only approximately 30% are still in education (Office for National Statistics, 2010b).

Graham (and others) observe that the impact of SEC exposures and benefits is determined by other social factors, such as gender and ethnicity. Graham quotes several examples of this from empirical research, including a study by Berthoud & Blekesaune from 2006 which found that for a given level of education, rates of employment are lower in women than men. Social factors may affect the nature of the educational experience, and potentially the benefits and protection it confers; Graham observes that individuals from poorer SEC are more likely to choose a university near the parental home (so they can continue to live with parents), are less likely to complete their course, and more likely to choose a vocational course. As data from Galindo-Rueda et al. (2004) show, individuals from poorer areas are less likely to attend 'old universities' than those from affluent areas, and this trend is getting stronger. In addition, coming from an affluent family background confers opportunities on individuals beyond education, such as favourable social connections.

1.4.2.6.2. Measuring SEC at area level

SEC measures of the area in which individuals live are widely used in studies of health inequalities.

Area-level measures have sometimes been employed as proxies for individual socio-economic markers when individual socio-economic data are not available. The validity of this use rests on the assumption that individuals conform to the socio-economic profile of their residential area but this assumption is not always valid. The greater value of area-level measures of SEC lies in their capacity to examine area-level socio-economic influences on health. Living in an area with a high prevalence of high unemployment, for example, may affect an individual's wellbeing, even if they themselves are employed (Subramanian et al., 2006). Area-level measures may have particular relevance to infectious disease, where one's environment is a major determinant of the extent of exposure to pathogens.

At an area level, researchers have used single-component SEC measures such as the percentage of the population employed. Composite indices at area level have also been developed to capture a range of circumstances in one measure. A range of criteria have been proposed for evaluating composite indices (Carr-Hill & Chalmers-Dixon, 2005; Krieger et al., 1997; Abbas, Ojo, & Orange, 2009; N Krieger, 1992). In this section, I consider some of the criteria below in general terms and also examine the relevance to young people and access to chlamydia screening. A

table of selected publicly available indices used in the UK with their advantages and disadvantages with respect to validity and practicality is in Appendix 2.

i. **Valid and reliable measures:** I am not going to examine the statistical properties of indices. I will limit my consideration of which indices to choose from those with demonstrable reliability and validity.
ii. **Sensitive to gradients in the health outcome examined**: evaluating the construct validity of a measure involves assessing whether it detects predicted associations. It is not known whether there are socio-economic inequalities in chlamydia infection, so it is not possible to test for 'predicted' association in this case. However, we are seeking to find an indicator that can identify SEC inequalities if they exist, so the measures most sensitive to variations in infection are required.
iii. **Practical**: encompassing the ease of use and the extent to which indices are publicly available. In previous research we have examined the validity and responsiveness of ACORN, a commercial geodemographic tool, for examining socio-economic inequalities in chlamydia and screening in young people in combination with The Indices of Multiple Deprivation (IMD). Our study (Sheringham et al. 2009) indicated that it has some validity as a measure of SEC in young people and provided additional information on inequalities in chlamydia screening and infection in combination with IMD. However, this thesis seeks to develop methods that could be used routinely in the NHS to monitor variations in access, so I have limited consideration of viable options to indices that are available to all without cost.
iv. **Available at an appropriate geographical unit**: associations observed in area-level analyses can be different when geographical boundaries are chosen (Openshaw, 1984). Flowerdew et al's 2008 study of the modifiable areal unit problem (MAUP) using British census data, found the association between limiting long term illness varied according to which boundaries were used. This problem may not extend to all health conditions in all geographies however; Stafford et al. (2008) found that using different area boundaries in within two boroughs of London did not alter area-level associations with obesity and several health behaviours such as alcohol intake, smoking, walking and self-rated health. They conclude that administrative boundaries, even though there may be little conceptual basis for their use, did not lead to substantially biased findings but it is not clear whether this also applies to infectious diseases. Alternatively, it may be appropriate to conceptualise

areas differently. Macintyre et al. (2002) challenges the use of arbitrary administrative spatial geographical boundaries: census-defined units can have limited relevance to residents, who consider their geographical boundaries differently. Cummins et al. (2007) extend Macintyre's challenge of arbitrary spatial boundaries to propose a 'relational' approach to research of place. In this approach:

- individuals are mobile, both on a daily basis and over their life course, as opposed to the conventional view which assumes they are fixed in residential communities. This may have particular relevance to young people (see section v below)
- places can be nodes in networks rather than areas with geographical boundaries
- different individuals and groups vary in how they perceive and experience the same contextual features (area attributes are not culturally neutral).

v. **Relevant for young people:** Area-level measures that are validated and sensitive to variations in the general population may not be appropriately applied if young people do not engage with their local area in the same way as the general population. There is evidence that some young people engage in highly variable ways with their local area, and in different ways to the general adult population. Groups such as higher education students have a high degree of residential mobility and typically move frequently between short-term rentals, returning periodically to parents (Ford et al., 2002). This can result in lower exposure to their local area (and therefore to the SEC of their immediate surroundings) because they spend little time in or near their place of residence and higher engagement with other areas: for some young people who move frequently, their environment encompasses more than just their own residential area, opening opportunities for using resources and developing networks in areas outside of their residential locus. In contrast, other young people can have very strong attachments to their local area. In their qualitative study of young people's attachment to place in 2007, Green and White identified young people 'trapped by space', with localized, narrow outlooks which limited their capacity to seek opportunities beyond their local area and constrained their social networks. In addition, the use of social networking sites has radically changed the way the majority of young people maintain and develop their social networks

(Subrahmanyam et al. 2008). It has the potential to affect geographical sexual network patterns but there are major gaps in our knowledge of their role in young people's sexual relationships (Subrahmanyam & Greenfield, 2008).

Implications of Section 1.3 for this thesis

To examine SEC variations in the risk of chlamydia, we need a model that specifically applies to chlamydia amongst young people. Theoretical models developed for sexual behaviour, sexual health outcomes and STIs indicate plausible pathways by which education at an individual level and socio-economic disadvantage at an area level may affect young people's risk of chlamydia.

Some socio-economic measures used in the general population may not be appropriate to use in young people. Indicators of individual education provide the most promising candidates for individual-level measures because they are more relevant than income or employment to the lives of young people. However, educational participation and achievement have different meanings for young people of different ages and their effects may vary depending on other social factors. These considerations indicate that educational participation should not be used uncritically as a measure of SEC in young people. In addition, we may need to take account of other socio-demographic factors to understand the effect of education on young people's health outcomes.

Area-level composite measures need to be available at an appropriate geographical level and need to be relevant to the ways in which young people engage with their environment (in the choice of 'local' area). In particular, we need to understand young people's use of local area in forming relationships in the context of their use of social networking sites.

1.5. To what extent can screening deliver health benefits?

In the 1990s observational data from countries such as Sweden where screening was available found that positivity - the proportion of screening tests with positive results - initially fell after screening was introduced, and that was in line with reductions in ectopic pregnancies (Egger, et al., 1998). Two trials showed similarly promising findings: Scholes et al. (1996) and Ostergaard et al. (1999) both found reductions in the incidences of PID following chlamydia screening. However, since these observational studies, chlamydia positivity has increased in both Sweden and

USA, despite increases in screening coverage (Sylvan & Christenson, 2008; Fine et al., 2008). Systematic reviews have also highlighted methodological flaws that compromise the validity of early trials (Low, et al. 2009).

This evidence contributed to the National Audit Office's challenge to the rationale for a chlamydia screening programme in England (The Comptroller and Auditor General, 2009). Since this report, more inconclusive evidence has emerged. For example, the English prevention of pelvic infection trial found only a non-significant reduction in PID following screening (Oakeshott et al., 2010). This was partly due to difficulties in recruiting sufficient numbers of participants, leading the researchers to reduce the sample size so the study was under-powered. Similarly, Andersen et al's trial also published in 2010 using linked data from the Danish Health Registry found no significant differences in PID, ectopic pregnancy, infertility or birth outcomes, or male fertility outcomes. However, as Soldan & Berman (2011) observe, less than 30% of young people invited for testing accepted the offer, thus limited the study's external validity and again underpowering the trial to detect an impact.

Implications of Section 1.4 for this thesis

Empirical research does not provide conclusive evidence that chlamydia screening reduces infection prevalence or prevents reproductive ill health. In addition, as section 1.1.1 outlined, the role of chlamydia in causing poor reproductive health outcomes is also uncertain. When the evidence base around chlamydia and chlamydia control is subject to so much debate, it raises an important question of why screening for chlamydia was introduced in England.

1.6 Aims and objectives of this thesis

Aims

Part 1: Socio-economic variations in delivery

1) To identify the most appropriate indicators of socio-economic circumstances (SEC) for use in young adults to assess the need for chlamydia screening
2) To use these identified indicators of SEC to examine socio-economic variations in young people's access to chlamydia testing

Part 2: Public health implications of the NCSP and chlamydia testing

3) To examine the rationale for why a national programme of screening for chlamydia was introduced in England

Objectives

Part 1

Aim 1. To identify the most appropriate indicators of socio-economic circumstances (SEC) to use in young adults to assess the need for chlamydia screening

I will conduct a systematic literature review (**Chapter 2**) and an analysis of a subsample of 18-24 year olds tested for chlamydia in Natsal-2000 (**Chapter 3**) to:

- examine associations between SEC and chlamydia in young people
- identify and critically appraise the range of dimensions of SEC used.

Aim 2. To examine socio-economic variations in young people's risk of chlamydia and access to chlamydia testing

I will conduct a secondary analysis of the NCSP in 2008 (**Chapter 4**) to examine the relationship between young people's residential area socio-economic circumstances, risk of chlamydia infection (measured by positivity), and access to testing (measured by screening coverage and supply) at a national level.

To compare local SEC variations in delivery and positivity across different service models at area and individual levels, I will conduct a cross-sectional study (**Chapter 6**), informed by focus groups (**Chapter 5**), to understand how young people in

diverse social circumstances use their local environment and social networking sites to form sexual relationships.

Part 2

Aim 3: To examine the rationale for chlamydia screening in England

I will conduct a qualitative theory-driven evaluation (**Chapter 7**) to:

- track the context in which the NCSP was considered, established and implemented
- understand what drove the introduction of a national chlamydia screening programme

Finally, I will summarise the implications of these findings for public health and make recommendations for further research.

PART II. IDENTIFYING APPROPRIATE SOCIO-ECONOMIC MEASURES

Chapter 2. Systematic review

Chapter 3. Secondary analysis of Natsal-2000

Implications for the working model developed in the thesis

2. Are young people in disadvantaged socio-economic circumstances at greater risk of chlamydia? Systematic review of existing empirical research

2.1. Introduction

As Chapter 1 summarised, there is a perception that people in disadvantaged SEC are at greater risk of poor sexual health. It is not clear whether this perception is also true for chlamydia. Higher diagnosis rates have been consistently reported in socially disadvantaged areas (Schleihauf, Watkins, & Plant, 2009; Kerani, Handcock, Handsfield, & Holmes, 2005; Klovstad & Aavitsland, 2009). However, studies of varying quality, have reported that the perceptions held by clinicians and young adults that people in socially disadvantaged circumstances are more likely to have chlamydia, was not always borne out (Foley, et al., 1999, Ford, et al., 2004).Moreover, the National Survey of Sexual Attitudes and Lifestyles (Natsal-2000), the first representative probability sample of the British population to examine chlamydia prevalence tested by NAATS also found no association with social class (Fenton KA et al., 2001). Navarro et al.'s systematic review in 2002 of chlamydia prevalence considered SEC as a potential confounder and also did not find evidence of an association. However, this was undertaken before the widespread adoption of NAATs to diagnose chlamydia so the dependence on older techniques with lower diagnostic sensitivity, (Watson et al., 2002) could have biased findings. It is also possible that results from the Natsal-2000 analysis (of 18-44 year olds) do not apply to people under 25 years.

2.1.1. Aims and objectives

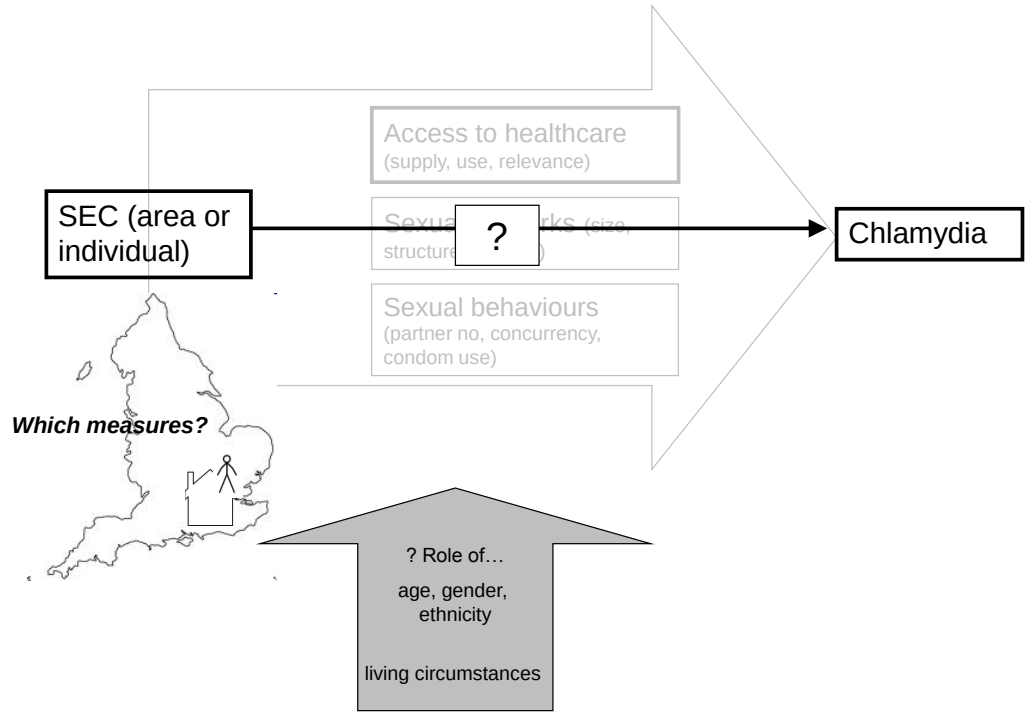
The aim of this study, therefore, was to synthesise from existing published research what is known about the association between SEC and chlamydia. My objective was to use systematic review methods to address the following questions:

- Is there an association between SEC and the risk of chlamydia prevalence, diagnosis rate or positivity in young people (aged between 15 and 24 years)?

- If there is an association, which dimensions of SEC, and at which level (individual, group, area) have been found to be most strongly and consistently associated with the risk of chlamydia?
- What other factors (e.g. population, setting, study design) affect the strength of these associations?

I sought to use the findings of this study to develop my working model (see Figure 2-1) to identify which indicators of SEC are most sensitive to variations in the risk of chlamydia.

Figure 2-1. Components of the working model, to be developed in Chapter 2



Contributions of others to this study: I undertook the searches and critical appraisal component of the review jointly with Sue Mann (SM), consultant in sexual health at Kings College Hospital. Her role in the study is described throughout the chapter.

2.2. Methods

2.2.1. Search strategy

The review followed PRISMA guidelines for reporting systematic reviews as described by Moher et al., 2009.

The search was initially carried out in February 2009. I searched the following library databases for peer-reviewed articles: Medline, Embase, Psychinfo, Social Policy and Practice, Web of Knowledge, EBSCO, Cinahl and Scopus. I developed a search strategy which included a range of terms related to chlamydia and SEC, encompassing over-arching terms (e.g. socio-economic position, status, circumstances), individual dimensions (e.g. income, occupation, education), and concepts closely related to SEC (e.g. inequality, deprivation). I generated my search strategy terms by conducting a scoping review of potentially relevant literature and recording the range of terms used to describe chlamydia and SEC. The search strategies used are in Appendix 3. An expert in systematic reviews based at Royal Free Hospital, London reviewed the search strategy for quality assurance. The database searches were also carried out by SM to ensure that consistent results were retrieved. Each search was exported to a Reference Manager database, with duplicates removed.

To ensure all relevant articles were identified, I also hand-searched the following sources for relevant literature:

- Centers for Disease Control surveillance reports (www.cdc.gov/std/stats/default.htm)
- Infectious Disease Research network STD research initiated 2003/2004 (http://idrn.org/research_mapping_exercise/)
- South West Public Health Observatory (lead public health observatory for sexual health in England)
- www.library.nhs.uk/publichealth
- Health Protection Agency website - www.hpa.org.uk
- NCSP website R&D page: http://www.chlamydiascreening.nhs.uk/ps/rd/ukrd.html

Screening: SM and I assessed articles retrieved by the search as to whether they met the criteria described in Table 2-1. The criteria were developed following a non-systematic search of 1-2 databases and refined in consultation with my supervisor panel and SM.

I carried out screening in two stages. First, I excluded references where the article's title did not meet inclusion criteria (e.g. outside geographical areas of

interest). Second, I screened the abstract in the remaining records, to exclude studies which did not meet the inclusion criteria. If the same socio-economic association was reported in more than one paper for the same study population, I selected the paper with the most comprehensive data for inclusion.

Table 2-1. Review inclusion and exclusion criteria

	Include	Exclude
Study area	UK, North America, Australia, New Zealand and Western Europe	Eastern Europe, Turkey, Israel, Greenland, Inuit communities
Population	Human Gender: male female or aggregated Age: 15-24 at least part of study population Ethnicity: any	Animal studies Age: study sample is all either over 25 or under 15 years old.
Outcome	Chlamydia diagnoses: prevalence, incidence, reinfection & transmission	Non-STI chlamydiae e.g.congenitally acquired infections *C Pneumoniae* , *Psittaci trachomatis;* LGV; chlamydia measures reported only as aggegrated outcomes with other STIs.
Exposure	Studies that report any measure of area, household or individual SEC	No numerical measure of correlation for chlamydia and SEC reported
Study design	Observational – cohort, cross sectional Ecological – study of routine data Intervention, baseline CT prevalence by SEC reported	Case-control excluded where sample selected on the basis of chlamydia diagnosis Single case studies
Methods	chlamydia diagnosis by nucleic acid amplification techniques A combination of NAATS plus EIA.	Self reported infections, chlamydia diagnosed by clinical exam, culture, enzyme immunoassays (EIAs), direct immunofluorescence (DFA)
Language	English	other languages
Currency	1999 and after	Before 1999 (to align with widespread use of NAATS for chlamydia)

For quality assurance, SM undertook screening on a 15% sample of records from the entire database. Where SM and I had initially made discordant decisions about inclusion, these references were subjected to closer reading

and the application of the inclusion/exclusion criteria discussed. In order to identify any missing references not retrieved by the search, the list of references proposed for full review was circulated to the supervisor panel and Professor Jackie Cassell.

2.2.2. Data extraction and appraisal

As Sanderson, et al's 2007 review of appraisal tools illustrates, there is no recommended tool to rate observational studies. I developed a rating tool based on published guidance (Sanderson et al., 2007; Petticrew & Roberts, 2006; EPPI-Centre, 2009; Moher et al., 2009). This includes measures of generic study quality, adapted from SIGN (the Scottish Intercollegiate Guidelines Network, 2009) and assessment of the relevance of the study topic, methods and population to the research question. Our assessment of relevance focused on the following:

- *Aims:* We recorded whether SEC was a primary focus of the study. This was a key consideration partly because it may have determined whether the study was adequately powered to detect a significant association if one existed.
- *Population:* We recorded the extent to which the study population was comparable to young people in England (e.g. similar age, ethnicity profile). This also involved assessment of whether study participants reflected those eligible to take part, so we recorded completion rates. Given that responses to surveys are often lower amongst people in lower SEC (Carr-Hill et al., 1996), we also recorded whether/how potential sources of selection bias were addressed.
- *Exposure:* We assessed the validity of the SEC data collected. We took into account the extent to which the measure used was a valid or validated measure of SEC, whether the indicator discriminated within the population (i.e. were all participants characterised within one category?) and the extent to which SEC information was available or collected from the study population.

The tool was piloted by SM and me. A final version is in Appendix 3. SM and I independently appraised and rated all studies that met the inclusion criteria and discussed discordant results to agree final ratings. A study's overall rating was based on the lowest rating of relevance or quality. Studies could only be rated

as high overall if they were both relevant to the research question and of high quality.

We considered individual-level and ecological study designs separately. Individual-level studies encompassed cross-sectional and longitudinal studies where individuals were tested for chlamydia and were assigned an SEC measure, either based on their individual responses to SEC questions or based on their educational setting or residential area.

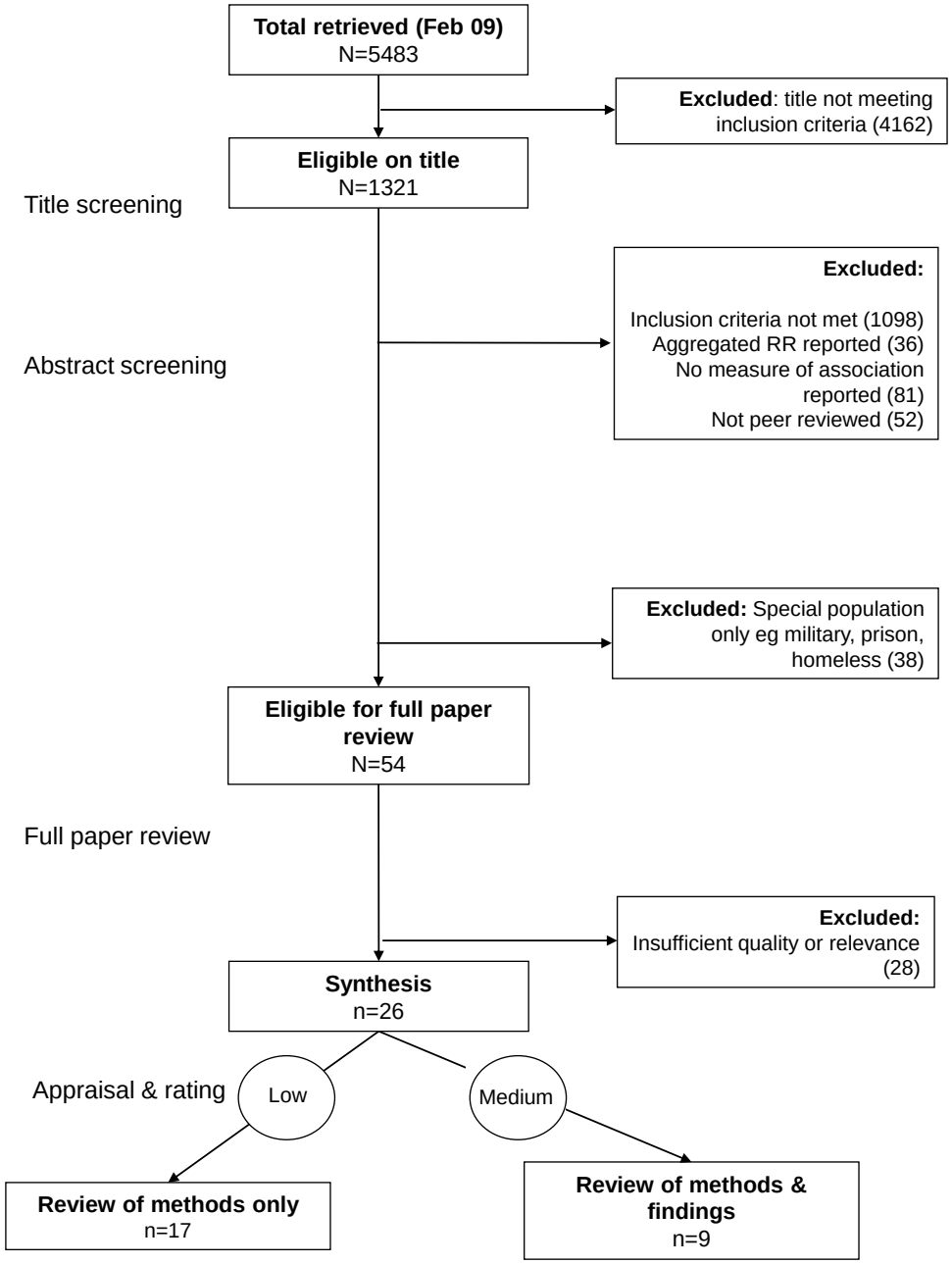
I describe all studies included in the review but report socio-economic associations with chlamydia only for those studies rated high/medium overall.

2.3. Results

2.3.1. Search and screening

Of 5,480 citations, 54 papers were reviewed and 26 met the inclusion criteria. Although nine studies were rated high quality, none of these papers were highly relevant to the study question. We therefore judged nine papers of medium and the remaining 17 papers of low quality and relevance (Figure 2-2).

Figure 2-2. Flowchart of reference retrieval, exclusions and inclusions



2.3.2. Population and methodological characteristics of included studies

2.3.2.1. Individual-level studies

The methods and population characteristics of 18 individual-level studies are reported in Table 2-2.

Aims: None of the individual-level studies had the primary purpose of addressing the review's research question. Therefore, none of the studies included were highly rated.

Populations: Six of the studies were conducted in Britain, four in Europe, 13 in USA, 1 in Canada and the remaining two studies were conducted in Australia. Most papers reported data on men and women separately. Five studies reported data on women only, and one on men only. Although papers were only included if people aged 15-24 formed at least part of the study population, the age range varied. For example, only 26% of Natsal-2000 were under 25 years (Fenton et al., 2001). Lower-rated studies included only a minority of the target population for chlamydia screening, e.g. Andersen et al. (2003) included participants only aged 21-23 years, or their study population had limited relevance to the general population e.g. Zenilman et al.'s study (2002) was conducted in amongst military employees.

Study quality was affected by the completeness of data collected and the extent to which eligible populations participated. In the medium-rated studies, response rates were as high as 89% e.g. in Stein et al.'s 2008 analysis of The National Longitudinal Study of Adolescent Health (Add Health).Only Fenton et al. (2001) reported weighting for differential response rates by socio-economic group. Some studies with large sample sizes and relevant populations were rated lower it was not possible to ascertain response rates (e.g. Williamson et al., 2007)

Measurement of SEC: There was extensive diversity in methods used to assess SEC exposure. Studies using measures at the individual level most commonly used educational indicators, but income and occupation were also used. Four studies used composite area-level indicators: Macleod et al. (2005) reported associations by the Index of Multiple Deprivation (IMD) of participants' general practice; Williamson et al. (2007) and Norman et al. (2004) used the Carstairs Index. Three studies collected data on more than one socio-economic variable. Stein et al. (2008) reported associations in Add Health between chlamydia and dimensions of education, employment and poverty; Todd et al. (2001) reported findings using employment and receipt of benefits. In Natsal-2000 several SEC indicators were collected from participants but Fenton et al. (2001) reported associations with respondents' social class only.

With respect to education, indicators of individuals' participation or achievement were used in different ways. Stein et al. (2008) used a dichotomous measure: graduated high school or not. Götz et al. (2005) compared risk by low (lower secondary school only), intermediate (higher secondary levels) or high participation (higher vocational training or university). Asbel et al. (2006) and Vuylsteke et al. (1999) used a contextual-level measure, comparing the risk of chlamydia by school type. In Asbel et al., the reference was 'magnet' schools (a public school offering a specialized curriculum, often with high academic standards), compared with other school types (e.g. vocational schools, for specific trade skills).

Studies were rated lower when proxies for socio-economic indicators e.g. health insurance (Geisler et al., 2006), military rank (Zenilman et al., 2002) were used. They were also rated lower when measures had limited construct validity , such as the measure of 'stable or unstable employment' used in Verhoeven et al., 2003 or when the completeness of SEC data could not be ascertained (e.g. Norman et al., 2004).

Table 2-2. Individual-level studies: Population and methodological characteristics

Study reference	Design	Study population	Sample size	Overall chlamydia prevalence	SE measure (A/I = area or individual)	Association reported	Notes, inc. risk of bias, confounding
Rated medium							
Stein et al., 2008	Cross-sectional survey	Geography: USA Setting: Add Health survey (schools) Age range: 18-26 yrs	10,928 ♂: 5074 ♀: 5854	 5.10% 3.90%	Poverty (I) Employment (I) Education (I)	Odds ratio (unadjusted)	Response rate: test results available for 89% of those sexually experienced
Asbel et al., 2006	Cross-sectional survey	Geography: USA Setting: schools Age range: 12-20 yrs	19,394 ♂: 9988 ♀: 9406	 2.50% 8.10%	school type - (A)	Odds ratio	Uptake of screening: ~65% of students attending the schools voluntarily tested Limited validity of school type as an SE measure
Macleod et al., 2005	Cross-sectional study	Geography: Britain Setting: primary care Age range: 16-24 yrs	3,569 ♂: 1083 ♀: 1437	 2.80% 2.60%	Index of Multiple Deprivation (A)	Coefficient of the odds of testing positive for chlamydia	Low response (uptake of screening: <30%). SEC of practice valid for young people?
Fenton et al., 2001	Cross-sectional survey	Geography: Britain Setting: population Age range: 18-44 yrs*	5026 (study pop) Responses: ♂: 1474 ♀: 2055	 2.7%* 3.0%*	Social class (I)	Odds ratio	*Prevalence for 18-24 years, (26% of study) but odds ratio reported for entire population. Analysis weighted for differential response rate by SEC but SEC measure excludes ~30% not in employment.
Götz et al., 2005 (plus data from Van Bergen et al., 2005)	Cross-sectional survey	Geography: Netherlands Setting: population Age range: 15-29 yrs	6,303 ♂: 1999 ♀: 4304	 2.00% 2.60%	Education (I)	Odds ratio	Response rate 41%. SEC analysis limited to sexually active population

Table 2-2. Individual-level studies (continued). Papers rated low on quality or relevance

Study reference	Design	Study population	Sample size	Overall chlamydia prevalence	SE measure (A/I = area or individual)	Association reported	Notes, inc. risk of bias, confounding
Rated low							
Dunne et al., 2008	Cohort study	Country: USA Settings: GU clinic, primary care, prison, community Age range: 15-35 yrs	♂: 272	13%*	Education (I)	Odds ratio	* Reports incidence of repeat infections not prevalence
Williamson et al., 2007	Cross-sectional survey	Geography: Britain Setting: kits in pharmacists, record stores, drop-ins, testing in FE college, SHS Age range: 13-25 yrs	4475 ♂: 682 ♀: 3793	12.30% 10.60%	Carstairs Index (A)		Can't assess uptake rates for testing, % which were re-tests, or whether study pop representative of target pop.
Geisler et al., 2006	Cross-sectional survey	Geography: USA Setting: Add Health survey (schools) Age range: 18-26 yrs	♂: 4473 ♀: 4874		Health insurance (I)		Health insurance a proxy for SEC but not a direct measure. SEC measures in Add Health captured in Stein et al 2008.
Miller, 2005	Cohort study	Country: USA Setting: antenatal/TOP Age range: not given	♀: 752	17.80%	Employment status (I)		Incidence of repeat infection amongst positives= 13.3%. Conducted in a deprived area, so no range of SEC. SEC information missing on 20% of study population.
Norman et al., 2004	Cross-sectional survey	Country: Britain Setting: antenatal/TOP Age range: 20-30 yrs	2817 ♀:2817	4.4% (antenatal 20-24y); 12.6% (TOP under 20 y)	Carstairs Index (A)	Odds ratio	SE tangential to purpose of study. Completeness of residential information not reported.
Verhoeven et al., 2003	Cross-sectional survey	Country: Belgium Setting: primary care Age range: 15-40 yrs	♀: 787	5.00%	Occupation (I), Education (I)	Risk difference (X^2)	Stable/unstable employment not a validated measure of SEC and limited relevance to under 25s.

Table 2-2. Individual-level studies (continued). Papers rated low on quality or relevance

Study reference	Design	Study population	Sample size	Overall chlamydia prevalence	SE measure (A/I = area or individual)	Association reported	Notes, inc. risk of bias, confounding
Rated low (continued)							
Andersen et al., 2003	Cross-sectional survey	Country: Denmark Setting: population Age range: 21-23 yrs	2208 ♂: 1033 ♀: 1175	 6% 7.30%	Education (I)	Odds ratio	Prevalence includes those not sexually active; population does not include most of age group of interest to this review
Heal et al., 2002	Cross-sectional survey	Country: Australia Setting: general practice Age range: 18-24 yrs	508 ♂: 127 ♀: 381	 5%	Education (I)	Odds ratio (unadjusted)	OR derived by JS from data reported in the paper. Not possible to examine adjusted rates.
Zenilman et al., 2002	Cross-sectional survey	Country: USA Setting: army medical centre Age range: 64% u30	2860 ♂: 2038 ♀: 822	 19.10% 14.10%	Military rank (I)	Risk ratio (unadjusted)	Military population may not be comparable to general population. Military rank not a standard SEC measure & may be confounded by age
Todd et al., 2001	Cross-sectional survey	Country: USA Setting: Emergency Dept Age range: 18-30 yrs	312 ♂: 132 ♀: 168	 5.4 11.4	Employment status (I), receipt of benefits (I)	Risk ratio (unadjusted)	Small sample size, population not closely comparable to UK
Klausner et al., 2001	Cross-sectional survey	Country: USA Setting: population Age range: 18-29 yrs	♀: 1314	3.20%	Income (H)	Risk difference	Prevalence includes those not sexually active; conclusions not supported by results displayed
Radcliffe, Ahmad, Gilleran, & Ross, 2001	Case-control	Country: USA Setting: GUM clinic Age range: 20-30 yrs	2198 ♂: 1084 ♀: 1114	*	Occupational group (I)	Odds ratio	*case-control, therefore not possible to obtain overall prevalence. SEC measure not validated and limited relevance to under 25s.
Vuylsteke et al., 1999	Cross-sectional survey	Country: Belgium Setting: schools Age range: 16-23 yrs	♀: 2784	1.40%	School type (A)	Odds ratio	Restricted analysis to just sexually active but school type not a validated measure of SEC

2.3.2.2. Ecological studies

The methods and population characteristics of 8 ecological studies are reported in Table 2-3.

Aims and quality limitations of ecological studies: Four ecological studies had a primary focus on chlamydia and SEC. We rated these studies as medium. We did not rate any ecological studies as high quality because of the limited scope in ecological studies to ensure the completeness of data or to adjust for potential confounding factors. In addition, in all ecological studies, data were obtained from health services, primarily STI clinics. Individuals visiting clinics are likely to be at higher risk of STIs than other inhabitants in their respective areas, so findings are unlikely to apply to the general population.

Population: Of the medium-rated studies, all provided some information on their populations. Two out of four took account of differences in population composition between areas. Krieger et al. (2003) standardised for age of the population, Evenden et al. (2006) conducted multiply adjusted analysis to account for the number and proportion of young people in each area. In the four low rated studies, there was no information on gender and age of those diagnosed and few studies included information on the structure of the denominator population. This may affect findings because areas with higher concentrations of young people may have higher diagnoses rates per 100,000 of the general population than areas with lower concentrations of young people.

Measurement of SEC: As with the individual-level studies, there was extensive diversity in the range of SEC measures used in ecological studies. Three out of four medium-rated ecological studies used more than one socio-economic measure. In the most extensive, Krieger et al. (2003) reported a relative index of inequality (RII) and an incidence rate ratio (IRR) for 11 different measures of SEC at three different area levels in two US states. Evenden et al. (2006) reported nine different analyses using domains from Office for National Statistics area-level data, individual socio-economic measures (e.g. car ownership) and a model with educational deprivation, adjusted for demographic factors. Bush et al. (2002) reported analyses by education, employment, housing and income. McNamee et al. (2008) used one validated composite index, the Index of Relative Socio-economic Advantage/Disadvantage.

Table 2-3. Ecological-level studies: Population and methodological characteristics

Study reference	Geography, Dataset & population	Sample size	Overall measure of chlamydia risk	SE measure	Area level	Measure reported	Notes, inc. risk of bias
McNamee et al., 2008	Geography: Australia, Victoria Datasets: Testing: Medicare Australia (GP n=72,000); Melbourne STI centre (n=9,800) Notifications: Disease Surveillance Scheme VA (n=7006) Population: 15-60+ years, 26% 15-24 years	72,000 tests (18,738 in 15-24 year olds)	10.5% (positivity)	Index of Relative socioeconomic advantage/ disadvantage[1]	Collection district: (av pop: 1000)	OR difference in positivity (by age group and gender)	Analyses adjusted for access to services but no other population factors
Krieger et al., 2003	Geography: USA, Massachusetts Dataset: STI surveillance notifications data[2] Population: 85% 15-44	26,535 notifications 6,016,425 population	35.8-172.1 notifications per 100,000 (age-standardised rate)	Single dimensions: wealth (% high value homes) working class (%) crowding (% >1/room) low education (% <high school) household income (quintile) Poverty (% <federal poverty income def'n) GINI Coefficient (quintile)	census tract (av. pop: 4000) block group (av. pop: 1000) zip code (av. pop: 30,000)	Incidence rate ratio (IRR) relative index of inequality (RII)	Findings age-standardised Potential for under-reporting of chlamydia in high SES areas.
	Geography: USA, Rhode island Dataset: STI surveillance notifications data[2] Population: 85% 15-44	4,473 notifications 1003, 464 population (1990)	56.6-366.6 notifications per 100,000 (age-standardised rate)	Composite Indices: Index of Local Economic Resources Townsend Index SEP1, SEP Index[3]			

[1] 40 variables on income, education, housing, occupation, employment, other (eg broadband, car, single parent)
[2] Testing symptomatics, following exposure, as part of HIV testing, case contacts, gynae exam.
[3] Created for the study - a composite categorical variable based on percent < poverty, working class, and expensive homes

Table 2-3. Ecological-level studies: Population and methodological characteristics (continued). Medium-rated studies

Study reference	Geography, Dataset & population	Sample size	Overall measure of chlamydia risk	SE measure	Area level	Measure reported	Notes, inc. risk of bias
Rated medium							
Bush, Henderson, Dunn, Read, & Singh, 2008	Geography: Canada, Calgary Dataset: STD mgt system notifications	5,541 ♂: 1683 ♀: 3858	5541 mapped cases of chlamydia (no denominator population given)	Detached Houses Median household income Owned dwelling Employment rate University (% as highest schooling)	census tract (av pop: 5,000)	Correlation coefficient	Not adjusted for potential confounders. Examined bias due to missing postcodes (ns) but potential for under-reporting in high SES areas. Method of diagnosing chlamydia not clear.
Evenden et al., 2006	Geography: Britain, Portsmouth Dataset: opportunistic screening Population: ♀, aged 15-24yrs	♀:11,140	9.00% (positivity)	ONS ranked: Income Employment Education, skills and training Housing Child poverty Composite Deprivation Individual variables: car ownership, social class, income support, job seekers allowance	Electoral ward (av pop: 5500)	Correlation coefficient	Multivariable analysis carried out, to adjust for age structure of the population
Rated medium (continued)							

Table 2-3. Ecological-level studies: Population and methodological characteristics (continued). Low-rated studies

Study reference	Geography, Dataset & population	Sample size	Overall measure of chlamydia risk	SE measure	Area level	Measure reported	Notes, inc. risk of bias
Rated low							
Kaplan, Crespo, Huguet, & Marks, 2009	Geography: USA, Chicago Dataset: public health records	77 areas	765.5 diagnoses per 100,000 population	% unemployed % high school graduates % income below poverty line	Community areas (av pop: 38,000)	Correlation coefficient	Described reported chlamydia diagnoses as incidence. No demographic information about denominator population or those diagnosed.
Dolan & Delcher, 2008	Geography: USA, Virginia Dataset: STD mgt system	111,947	No figure given. 94.9-599.9 diagnoses reported per 100,000 population (unadjusted)	Poverty	Census tract (av. pop: 4000)	Age standardised rate ratio	Described reported chlamydia diagnoses as incidence Used Geocoding methods of analysis and subject to similar risks of bias (see Krieger). No demographic information about denominator population or those diagnosed.
Kufeji, Slack, Cassell, Pugh, & Hayward, 2003	Geography: Britain, Nottingham Dataset: primary care Population: Under 15- over 30	♀: 7172	1.3 chlamydia isolations per 1000 registered women	Townsend Index	General practice (av pop 6,500)	difference in isolation rate (p value)	P value only given for SEC association (0.04) SEC of practice valid for young people? Limited demographic information about denominator population or those diagnosed.
Holtgrave & Crosby, 2003	Geography: USA Dataset: public health records	Not given	Not given	poverty, income inequality	State	R^2	No demographic information about Potential for under-reporting of chlamydia in high SES areas.

2.3.3. Associations between chlamydia and SEC

2.3.3.1. Individual-level studies

As shown in Table 2-4, three out of five medium-rated studies found a higher risk of chlamydia in individuals in poorer socio-economic circumstances. No studies reported a higher risk in individuals in more affluent circumstances. Associations were more commonly found when studies used measures of education (4/5 analyses were statistically significant) than when other socio-economic variables were used (only 1/8 was statistically significant).

There were no consistent patterns by service setting or country. Associations varied by gender within studies; e.g. Stein et al. (2008) found statistically significant associations in men by education (men that did not graduate high school were 2.2 times more likely to have chlamydia than those that did) and employment status (men not in employment were 1.8 times more likely to have chlamydia than men with a job), but found no association in women using any measure.

2.3.3.2. Ecological studies

As shown in Table 2-5, in three out of four ecological studies, young people living in more socio-economically disadvantaged areas were at higher risk of chlamydia. In the fourth study, McNamee et al. (2008) found no association in 15-24 year olds overall, but did find that chlamydia positivity was higher in 20-24 year olds living in disadvantaged areas than those in advantaged areas. There was little consistency in which measures produced strongest associations. In Krieger et al. (2003), chlamydia diagnoses were higher in areas with poorer SEC for all of the SEC measures examined but the strength of these association varied by state, area level and measure. Bush et al. (2002) reported strongest associations by income and housing (47% and 48% of the variation was explained by these indicators) and weakest associations by education (just 11% of variation was explained by university attendance). In contrast, Evenden et al. (2006) found strongest associations with education: when educational deprivation was included in a model also containing child poverty and the population age distribution, these factors explained 65% of the variance in chlamydia prevalence.

Table 2-4. Medium-rated individual-level studies: Associations between SEC and chlamydia prevalence

Study	Gender	Association	SE measure[b]	Reference group	OR [95% CI]for comparison groups
Fenton, 2001 (UK)	Men	0	Social class (I)	I&II	III: 1·10 [0·47–2·56] IV: 1·32 [0·31–5·57] V: 0·79 [0·27–2·32]
	Women	0	Social class (I)	I&II	III: 0·72 [0·17–3·05] IV: 1·26 [0·49–3·23] V: 0·98 [0·32–2·98]
Macleod J, 2005 (UK)	Men and women	0	Index of Multiple Deprivation (A)	*10% decrease in risk with 10 reduction in deprivation(ns)*	
Götz, 2005 (Netherlands)	Men and women	+	Education (I)	High participation	Low: 2.8 [1.8-4.4] Intermediate: 1.9 [1.2-3]
Asbel LE, 2006 (USA)	Men	+	School type - (A)	Magnet school	Neighborhood 4.4 [2.1–8.8] Vocational 2.9 [1.3–6.4] Special admission 3.2 [1.4–7.5] Disciplinary 8.9 [4.0–19.6]
	Women	+	School type - (A)	Magnet school	Neighborhood 2.3 [1.8–3.0] Vocational 2.7 [2.0–3.6] Special admission 2.1 [1.5–2.9] Disciplinary 5.2 [3.7–7.5]
Stein CR, 2008 (USA)	Men	0	Poverty (I)	Can pay rent/ utilities	Can't pay 1.1 [0.5-2.5]
		†	Employment (I)	Has a job	No Job: 1.8 [1.2-2.8]
		†	Education (I)	Graduated high school	Did not graduate: 2.2 [1.3-3.6]
	Women	0	Poverty (I)	Can pay rent/ utilities	Can't pay 1.4 [0.8-2.5]
		0	Employment (I)	Has a job	No Job: 1.3 [0.9-1.8]
		0	Education (I)	Graduated high school	Did not graduate: 1.4 [0.9-2.1]

Key:

+ = statistically significant: lower SEC associated with greater chlamydia risk (multiply adjusted – most commonly for age and ethnicity)

† = statistically significant: lower SEC associated with greater chlamydia risk (bivariate analysis)

- = lower SEC associated with lower chlamydia risk

0 = no significant association (adjusted or bivariate)

Table 2-5. Medium-rated ecological studies: Associations between SEC and chlamydia positivity or diagnoses rates

Study reference	Geography, dataset & pop	Analysis	Socioeconomic measure	Association
Bush et al., 2008	Geography: Canada, Calgary	Correlation coefficient, r (*p*)	Detached Houses	-0.69 (*<0.01*)
			Median household income	-0.65 (*<0.01*)
	Dataset: STD mgt system notifications		Owned dwelling	-0.39 (*<0.01*)
			Employment rate	-0.22 (*0.06*)
			University (% as highest schooling)	-0.34 (*<0.01*)
Evenden et al., 2006	Geography: England, Portsmouth	Correlation coefficient r^2	ONS ranked:	+
			Income	
			Employment	
			Education, skills and training	r^2=0.65
	Dataset: GU and Screening trial datasets		Housing	(produced when education combined with ratio of 20-24yrs to ward pop, child poverty, no. 16-17 yr olds)
			Child poverty	
			Composite Deprivation	
	Population: Women, aged 15-24yrs		Other: car ownership, social class, income support, job seekers allowance	
McNamee et al., 2008	Geography: Australia, VA	OR		**0**
	Datasets: Testing (Medicare Australia; Melbourne STI centre) & Disease Surveillance Notifications	Subgroup: differences in prevalence (most-least)	Index of relative socioeconomic advantage/ disadvantage (quartiles)	All: OR = 1.00 (0.97 to 1.03) 15-19yrs: 0 ♂: 1.4 (p>0.05) ♀: 1.0 (p>0.05) 20-24 yrs: † ♂: 3.7 (p<0.001) ♀: 2.5 (p<0.001)
Krieger et al., 2003	Pop: 15-60+y, 26% 15-24 y	Incidence rate ratio (IRR - shown here with *95% CIs*)		†
	Geography: USA, Massachusetts [1]	relative index of inequality (RII)	working class (%)	4.0 (*3.4-4.7*)
	Dataset: STI surveillance notifications data		household income (quintile)	7.4 (*6.2-8.9*)
			Poverty (% <fed poverty income def'n)	5.8 (*5.2-6.5*)
			GINI Coefficient (quintile)	3.0 (*2.6-3.5*)
	Population: 85% 15-44		wealth (% with high value homes)	2.2 (*1.9-2.6*)
			crowding (% >1/room)	5.3 (*4.4-6.4*)
			low education (% <high school)	6.8 (*5.0-7.6*)
			Townsend Index	7.1 (*5.9-8.5*)
			Index of Local Economic Resources	7.1 (*6.1-8.4*)
			SEP measure 1	7.7 (*6.1-9.6*)
			SEP Index	7.6 (*6.4-9.1*)

Key

+ = statistically significant: lower SEC associated with greater chlamydia risk (multiply adjusted – most commonly for age and ethnicity);

† = statistically significant: lower SEC associated with greater chlamydia risk (bivariate analysis)

- = lower SEC associated with lower chlamydia risk

0 = no significant association (adjusted or bivariate

[1] Both Rhode Island and Massachusetts showed significant associations, but IRR for Massachusetts only shown

2.4. Discussion

2.4.1. Main findings

In this systematic review examining SEC associations with the risk of chlamydia, I found:

- in ecological studies, diagnoses rates and chlamydia positivity were generally significantly higher in young people living in socio-economically disadvantaged areas
- associations in individual-level studies were weaker and more mixed; prevalence of chlamydia was significantly higher in disadvantaged young people when SEC was measured by education than other SEC indicators e.g. employment and income.

However, the conclusions I can draw are limited because this search retrieved no high quality studies of direct relevance to the research question. The review also highlights the extensive diversity in the measures of socio-economic exposure currently in use in the field.

2.4.2. Methodological considerations

2.4.2.1. Strengths

By adopting rigorous exclusion criteria, I excluded important sources of potential measurement bias. Most importantly, I excluded a number of studies that reported aggregated risks of chlamydia with other STIs (most commonly gonorrhoea) by SEC (e.g. Ford et al. in 2004). The aggregation of several STIs as one outcome might lead to an impression that chlamydia is also socio-economically determined. As this review shows, this is not necessarily accurate.

2.4.2.2. Limitations

The systematic review used a search strategy to pick up title words, abstract words and keywords using as many synonyms as possible to identify every paper where SEC and chlamydia were examined. However, because this association was not the primary purpose of many studies, SEC may not have been a keyword or mentioned in the abstract. Therefore, there was a risk that I missed papers where SEC was examined but not reported in the abstract.

Although 26 studies met the initial criteria, just nine were of sufficient quality and relevance for inclusion in the full review and none of these were of both high quality and highly relevant to the research question. This limited the extent to which I could examine factors affecting socio-economic associations with chlamydia. Also, because SEC was rarely the focus of chlamydia studies, significant associations may have been missed because they were not adequately powered for this particular exposure. Alternatively, I may have inadvertently omitted studies which examined socio-economic associations with chlamydia but did not report non-significant findings. If so, the findings may be biased in favour of a significant association between chlamydia and SEC. Reported associations may also be biased due to missing data. For example almost 20% of data were excluded from Fenton et al.'s published analysis of Natsal-2000 in 2001 due to missing a social class measure.

I did not produce a pooled estimate of the risk of chlamydia associated with SEC. This was not feasible due to the heterogeneity of study designs, methods and analyses used. However, Egger et al. (2001) have argued that meta-analysis should not be a prominent part of reviews of observational studies because it is not possible to eradicate sources of bias from observational studies so studies with large participant numbers with residual confounding could bias pooled estimates. In addition, as Chapter 1 has illustrated, different SEC indicators may capture different exposures in young people. As this review shows, associations with SEC vary when different measures are selected. Therefore, pooling the results of studies using different SEC indicators could mask variations that provide insight into the causal pathways by which SEC may affect young people's risk of chlamydia.

2.4.3. Possible explanations for the findings

The absence of a consistently strong association between chlamydia and SEC contrasts with associations found for other bacterial STIs and HIV in the US (Hogben & Leichliter, 2008) and for other indicators of sexual health (eg teenage pregnancy and early sexual intercourse) amongst young people in the UK.

Higher chlamydia diagnoses rates in deprived areas reported in ecological studies may be due to differential testing and reporting rather than true differences in prevalence. Alternatively, these associations could be due to a concentration of deprived individuals at greater risk because of their own circumstances. It was not

possible to examine whether area associations existed over and above individual associations because no study included both individual and area-level measures. However, Biello et al's small study published since this review was undertaken (2011) compared individual and area-level socio-economic associations with repeat chlamydia infections. Neighbourhood associations were found in the absence of individual-level effects, leading the authors to conclude that the influence of neighbourhood environment on multiple chlamydia diagnoses is independent of individual factors.

We observed variations in associations within study populations by gender and age indicating that socio-economic disadvantage may have varying effects on different groups of young people. Goulet et al.'s analysis of national cross-sectional survey data from 18-44 year olds in France published in 2010 also found variations gender, with higher prevalence of chlamydia in women with lower education, but not in men.

2.4.4. Implications for Chapter 3

The conclusions I could draw from the analysis of published data on the association between chlamydia (prevalence, or positivity) and SEC in young people were limited due to the lack of high quality studies that directly address this question.

However, the review indicated that associations may depend on which measure is used. While there was some limited evidence from Stein's population prevalence studies from the US, there was no published evidence within a single study population in the UK. While Fenton et al.'s analysis of Natsal-2000 reported findings by social class only, several different indicators of SEC were collected in the survey, so analysis of the survey raw data may indicate associations vary in a UK population of 18-24 year olds when different SEC measures are used.

3. Analyses of Natsal-2000 data

3.1. Background

The National Survey of Sexual Attitudes and Lifestyles (Natsal) is a large representative, probability sample of the British population to provide information on sexual behaviour, fertility, contraceptive use and sex-related diseases across the UK. The first survey was conducted in 1990. The second survey (Natsal-2000) was conducted in 2000 on over 11,000 participants and for the first time, it included urine testing for chlamydia using NAATs on a subsample of 18-44 year olds. NatCen (National Centre for Social Research), University College London, and the London School of Hygiene and Tropical Medicine are currently collecting data for the third Natsal survey (Natsal-2010) (Centre for Sexual Health and HIV, 2010).

As discussed in Chapter 1, analyses of Natsal data from 2000 for participants aged 16-44 years indicates that participants who left school by age 16 years were more likely to have their first heterosexual experience by age 16 than those remaining in education aged 17 and over. There were also significant associations between educational participation and non-use of contraception at this first encounter too. However, the associations with social class of parent and early sexual experience were weaker.

Contributions from others: Cath Mercer, Centre for Sexual Health and HIV, kindly provided access to the dataset and advice on analysis of survey data.

3.2. Objectives

I will analyse a subset of the Natsal-2000 dataset comprising 18-24 year olds to:

- evaluate the strengths and limitations of different SEC markers with respect to the feasibility of collection and relevance for this population
- identify which (if any) markers are sensitive to socio-economic variations in chlamydia prevalence

My analysis was focussed on chlamydia prevalence but because only half the study participants were offered a chlamydia test, I explored whether other markers of sexual health collected in Natsal-2000 could be suitable proxies for chlamydia prevalence in this subpopulation.

3.3. Methods

3.3.1. Dataset and data management

I obtained a dataset of Natsal-2000 survey participants under 25 years (n=680) who had a chlamydia test result(Catherine Mercer, 2010).

3.3.1.1. SEC variables

I selected markers of SEC related to education, social class and area deprivation. The full description of variables is set out in the Natsal-2000 codebook,(Erens B et al., 2001) but I have summarised the generation of the SEC variables I used below.

With respect to education, participants were asked a series of questions on levels of achievement, covering whether they had obtained any qualifications and the highest qualification achieved, and the age they completed education. These data were also combined in the Natsal-2000 dataset to generate a derived variable of distinguishing those who left school with and those who left without qualifications.

Variables on social class were derived from questions on occupation. Participants were asked a series of questions on their most recent occupation(s) and the occupations of their parents. This information was used to assign the occupations of individuals and their parents to the Registrar General Social Class categories:

I - Professional occupations

II - Managerial and Technical occupations

III - Skilled occupations

(N) non-manual

(M) manual

IV - Partly-skilled occupations

V - Unskilled occupations

Unclassified

Participants' postcode was used to assign the Index of Multiple Deprivation score. The quintile was available for all participants.

I generated dichotomous variables for all variables except the derived variable of educational participation & achievement, where I retained three categories (Table 3-1.

Table 3-1. SEC variables generated for analysis of data

SEC Dimension	Variable	Reference category	Comparison group
Education	Educational participation	left_ed_under18	ed18+
	Left education with/without qualifications	left 16noqual	left16some qual
			left 17+somequal
Social class	RG Social class (respondents or parents) a	IIIm-V	I&II&IIInm
	RG Social class (respondents or parents) b (kw)	IV-V/unemployed	I&II&III
Area deprivation	IMD	*most* deprived 20%:	all other quintiles
	IMD	*least* deprived 20%:	all other quintiles

3.3.1.2. Sexual health variables

I selected the variable for prevalent CT infection (the result of a chlamydia NAATS test in a subsample of participants).

In addition, I included the following sexual health variables

- **Experience of STI diagnosis:** asks whether individuals have ever had an STI and if so which STI (Note: those reporting thrush only are considered as “no”).
- **Age at 1st heterosexual intercourse**: asks the age at which individuals first had heterosexual sex.
- **“Unsafe” sexual behaviour**: individuals reporting 2+ partners and no condoms used in the last year.

3.3.2. Analysis

In the dataset, weights have been generated to take account of non-response with respect to providing a urine sample, as described in Erens B et al., 2001; Fenton KA et al., 2001; and Johnson et al., 2001. I have applied these survey weights to take account of nonresponse but have also generated unweighted analyses to examine responses and associations within Natsal-2000 participants.

I used a Pearson chi-squared test for association to examine whether participants' individual-level socio-economic characteristics (social class, parental social class and educational experience) were associated with the socio-economic characteristic of their residential area (measured by IMD). I conducted this analysis unweighted.

I used a Pearson chi-squared test for association to examine whether participants' responses to questions on their sexual behaviour, experience of STIs or age at first sex were correlated with testing positive for chlamydia.

Feasibility of collection

I produced a weighted and unweighted frequency distribution of each variable across the sample, to:

- examine how much data are missing or non-applicable
- examine the capacity of the indicator to discriminate within the population.

Correlation between SE variables: I also examined associations between different SEC variables at area and individual levels to assess the extent to which these variables were capturing similar circumstances in young people.

Sensitivity to detecting variations in chlamydia positivity: I examined associations between all the SEC markers, grouped as binary variables, and the chlamydia test result, excluding data where there was no conclusive result.

3.4. Results

3.4.1. Sample characteristics

The Natsal-2000 dataset of 18-24 year olds comprises 680 respondents that had a chlamydia test (Table 3-2).

Table 3-2. Age and gender distribution of the sample

	Unweighted count	Weighted count (%)
Gender		
male	301	388 (51.59)
female	379	364.1 (48.41)
Age (yrs)		
18	85	100.7 (13.4)
19	101	106 (14.1)
20	101	122 (16.22)
21	111	135.2 (17.98)
22	89	81.05 (10.78)
23	90	93.73 (12.46)
24	103	113.3 (15.07)
Total	680	752.1 (100)

3.4.2. Information collected on SEC markers from 16-24 year olds

As shown in Table 3-3, nearly 20% were excluded from the respondent's social class, using either dichotomous measure, mainly because they were in education. In contrast, just 0.3% were excluded from educational participation because they did not give an answer.

The distribution of respondents by educational participation and social class (parental or respondents' own) across each quintile of deprivation is shown in Table 3-4. There was no significant association between any of the individual measures and area-deprivation, suggesting that in the Natsal-2000 population at least, young people that were socially disadvantaged at an individual level were no more likely to live in disadvantaged areas than those in more favourable circumstances.

Table 3-3. Distribution of socio-economic categories across the sample

SEC measure	Unweighted	Weighted	% (a)	% (b)
Parent's social class				
professional/managerial	133	146.9	I-IIInm: 43.8	I-III:70.1
managerial/technical	127	150.2		
skilled non-manual	34	32.5		
skilled manual	175	201.7	IIIm-V: 41	IV/V unem: 21.8
partly skilled & unskilled	98	106.9		
never had a job	47	51.4	n/a (a): 15.2	n/a (b): 8.3
Didn't live with either parent	23	19.9		
unclassified/army/other	20	18.2		
can't say	16	16.3		
not answered	7	8.2		
Respondent's social class				
professional/managerial	10	9.7	I-IIInm: 38.0	I-III: 57.6
managerial/technical	80	84.7		
skilled non-manual	183	191.4		
skilled manual	108	147.4	IIIm-V: 42.7	IV/V unem: 24
partly skilled	149	149.7		
unskilled	22	23.7		
Not in employment	6	6	n/a (a): 19.4	n/a (b): 18.4
Not in employment (in ft education)	119	133.9		
unclassified/army/other	1	2.3		
not answered	2	3.3		
Left education before 18 years				
Stayed in education 18+ years	367	415.5	55.2	
Left education under 18 years	312	334.2	44.4	
not answered	1	2.4	0.3	
Left school at 16 with/without passing any exams/ gaining any qualifications?				
Left school at 16 without passing any exams/gaining any qualifications	57	48.3	6.4	
Left school at 16 having passed some exams/gained some qualifications	176	197.5	26.3	
Left school aged 17+	446	504.7	67.1	
Not answered/don't know	1	1.5	0.2	
IMD quintiles				
1st quintile (least deprived)	133	162.8	21.6	
2nd quin	109	117.6	15.6	
3rd quin	140	151.8	20.2	
4th quin	113	129.3	17.2	
5th quintile (most deprived)	183	186.9	24.9	
no data	2		0	
Total	680	748.5	100	

Table 3-4. Correlations between Natsal-2000 socio-economic variables

		Quintiles of the Index of Multiple Deprivation					Total	p value
		Q1 (least deprived)	Q2	Q3	Q4	Q5 (most deprived)		(X^2 test)
Educational participation								
ed18+	n	78	52	75	61	100	366	
	%	*58.65*	*47.71*	*53.57*	*53.98*	*54.64*	*53.98*	
left_ed_	n	55	57	65	52	82	311	
	%	*41.35*	*52.29*	*46.43*	*46.02*	*44.81*	*45.87*	
not answered	n	0	0	0	0	1	1	
	%	*0*	*0*	*0*	*0*	*0.55*	*0.15*	0.69
Parental social class (a)								
I&II&III	n	59	47	49	37	67	259	
	%	*44.36*	*43.12*	*35*	*32.74*	*36.61*	*38.2*	
IIIm-V	n	53	44	68	60	81	306	
	%	*39.85*	*40.37*	*48.57*	*53.1*	*44.26*	*45.13*	
Not appl/ not ans	n	21	18	23	16	35	113	
	%	*15.79*	*16.51*	*16.43*	*14.16*	*19.13*	*16.67*	0.55
Respondent social class (a)								
I&II&III	n	18	16	20	15	21	90	
	%	*13.53*	*14.68*	*14.29*	*13.27*	*11.48*	*13.27*	
IIIm-V	n	88	70	104	79	119	460	
	%	*66.17*	*64.22*	*74.29*	*69.91*	*65.03*	*67.85*	
Not appl/ not ans	n	27	23	16	19	43	128	
	%	*20.3*	*21.1*	*11.43*	*16.81*	*23.5*	*18.88*	0.07

3.4.3. Relationship between SEC and chlamydia prevalence

Amongst the 680 participants of the Natsal-2000 sample that were tested for chlamydia, 24 tested positive. Table 3-5 gives the prevalence of chlamydia by each socio-economic variable. The small number of chlamydia cases in this sample limits the conclusions that can be drawn from any analysis using these data, and it is likely that it is not sufficiently powered to detect a significant relationship if one exists. However, it does suggest that different conclusions could be reached depending on which measure of SEC is used.

In relation to education, there was a statistically significant association between a positive chlamydia test result and leaving school before 18 years. Those leaving education by 16 years had a similar prevalence of chlamydia whether they had obtained qualifications or not, whilst those staying on in education had a reduced odds (although this was not statistically significant at p=0.05). This is weakly suggestive evidence that participation may be a more important protective factor than achievement.

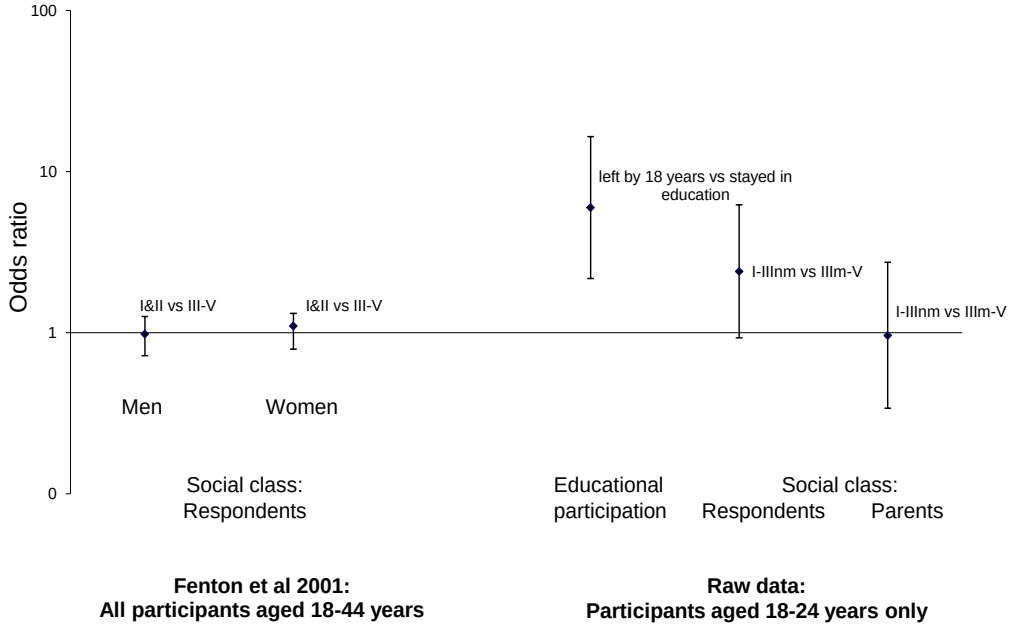
There was no statistically significant association with parental or respondent social class (using either dichotomous variable). However, there was a higher prevalence of chlamydia amongst respondents in social classes IIIm-V. In relation to area deprivation, there was no statistically significant association with chlamydia and no suggestion of a socio-economic gradient.

Table 3-5. Associations with chlamydia prevalence in Natsal-2000

SEC measure	Positive chlamydia result (%)	[95% CI]	N weighted, unweighted
Respondent's social class, a			
I&II&IIInm	1.86	[0.53;3.18]	94.34, 90
IIIm-V	4.35	[1.69;7.01]	512.2, 462
Respondent's social class, b			
i/ii/iii non-manual/iii manual	2.58	[0.96;4.21]	285.8, 273
iv-v	4.85	[1.32;8.38]	320.8, 279
Parent's social class, a			
I&II&IIInm	2.88	[0.84;4.92]	297.1, 260
IIIm-V	2.77	[0.71;4.84]	341, 307
Parent's social class, b			
i/ii/iii non-manual/iii manual	2.91	[1.24;4.59]	329.5, 294
iv-v	3.29	[0.63;5.95]	308.6, 273
Left education early			
Stayed in education 18+ years	0.91	[0.11;1.70]	415.5, 367
Left education under 18 years	5.2	[2.51;7.89]	334.2, 312
Left with/without qualification			
Left 16 years, no qualifications	5.98	[-0.71;12.67]	48.3, 57
Left 16 years, some qualifications	5.09	[1.32;8.86]	197.5, 176
Left 17+ years, some qualificatior	1.63	[0.55;2.70]	504.7, 446
Index of Multiple Deprivation Quintiles			
1st quintile (least deprived)	3.24	[0.67;5.82]	162.8, 133
2nd quintile	3.33	[-0.84;7.50]	117.6, 109
3rd quintile	2.31	[-0.16;4.79]	151.8, 140
4th quintile	1.51	[0.77;3.80]	129.3, 113
5th quintile (most deprived)	3.53	[0.36;6.70]	186.9, 183

Figure 3-1 shows the odds ratios for the whole Natsal-2000 sample, as reported in Fenton et al. (2001) and the re-analysis of 18-24 year olds for the three individual SEC measures. Those leaving school before 18 years had over four times the odds of chlamydia compared with those staying in education. In contrast, there was no association by social class amongst the whole Natsal-2000 sample or amongst 16-24 year olds (by either social class of parents or respondents).

Figure 3-1. Socio-economic associations with chlamydia prevalence: Odds ratios published in Fenton et al (2001) vs. analysis of subset of 18-24 year old participants



3.4.4. Association between chlamydia and other reported sexual health behaviours and outcomes

In Table 3-6 each sexual health outcome or behaviour is shown dichotomized into 'high' and 'low' risk, where high risk represents a positive answer to the question (i.e. those who reported ever having had an STI are classified as 'high risk'). There was no significant correlation between identification as high risk according to these characteristics and testing positive for chlamydia. Therefore, I did not explore the use of these variables as proxies for chlamydia any further.

Table 3-6. Association between chlamydia and reported sexual health behaviours and outcomes

Variable	# (%) Natsal sample = "high risk"	No. chlamydia positives in "high risk"	No. chlamydia positives in "low risk"	**Association with Chlamydia** [Chi sq'd (p)]
Ever had an STI?	60 (10.3%)	2	17	0.07 (p=1.0)
Heterosexual sex under 16 years?	187 (32%)	7	12	0.2 (p=.66)
"Unsafe" sex ?	44 (7.6%)	4	15	6.1(p=0.10)

3.5. Discussion

3.5.1. Main findings

The analysis of this small dataset suggests that it does matter which measure of SEC is selected to examine associations with the risk of chlamydia in young people. Associations were strongest when measures of educational participation were used. The analysis also highlighted that measures such as social class may be unobtainable for a significant proportion of the sample. Therefore, this measure should not be used to classify SEC in young people.

3.5.2. Methodological considerations

The small number respondents aged 18-24 who tested positive for chlamydia (n=24) in Natsal-2000 limited the statistical power and scope of this analysis. This problem was particularly acute for measures of social class, where 158 (23%) of 18-24 year old participants were in fulltime education and the majority of this group could not be assigned a social class because they were not working. I sought to minimise the limited statistical power by combining men and women and by creating dichotomous variables for each socio-economic marker, but this may have masked variations between categories or by gender. While I explored the possibility of using measures such as experience of STI diagnosis and age at first heterosexual intercourse as proxies for chlamydia prevalence, the association between them and chlamydia prevalence was low, suggesting they are not suitable as proxies for testing positive for chlamydia.

3.5.3. Comparisons with other studies

In contrast to the results of Chapter 2, there was no association between living in a deprived area and chlamydia prevalence. However, cross tabs with educational participation and social class suggest that for a significant proportion of the Natsal-2000 sample living in the most deprived quintiles, their IMD quintile does not reflect their individual socio-economic circumstances (although the opposite is not true for those living in the least deprived areas).

II. Implications of Chapters 2 and 3 for this thesis

The systematic review and Natsal-2000 analyses show that the strong relationship between SEC and some sexual health behaviours and outcomes cannot be assumed to apply to chlamydia in young people. Furthermore, it matters which measure is chosen; different conclusions may be reached depending on which dimension of SEC is measured.

SEC at an area level emerged as a potentially important determinant of chlamydia infection. However, there were contrasting findings from the systematic review, where most studies showed an association between chlamydia diagnosis rates and SEC, and the Natsal-2000 analysis of the 18-24 year old subsample, where no association was found. The systematic review findings are drawn from ecological research where several studies used diagnoses rates so the higher rates in deprived areas may be explained by higher rates of testing in these areas. Moreover, even if the associations with area remain when controlled for testing rates, it is not clear from existing empirical research whether an association at area level is due to area effects or could be explained by a concentration of disadvantaged individuals. This indicates there are two questions to address in future studies. Firstly, I need to establish whether area-level associations remain when data on all those tested (not just positive diagnoses) are available. Secondly, I need to examine whether an apparent relationship with area disadvantage is due to a concentration of deprived individuals at greater risk because of their own circumstances. This requires a multilevel study including both individual and area-level measures.

With respect to individual SEC, educational participation emerged as the most suitable measure for use in future studies. It was more sensitive to variations in chlamydia prevalence than other SEC markers in both existing empirical research and in Natsal-2000. Amongst the Natsal-2000 population, it had a better rate of completion. This aligns with the theory behind the use of SEC measures discussed in Chapter 1, which recommends that educational measures should be relevant to the lives of a greater proportion of young people than measures of employment or occupation.

PART III. EXAMINING ACCESS: SUPPLY, USE AND NEED

Chapter 4. Secondary analysis of data from the NCSP in its first year of national delivery

Chapter 5. Preparatory focus group study of young people's use of social networking sites and local area to form relationships

Chapter 6. Cross-sectional survey comparing local individual and area level SEC variations in positivity and delivery across different service models

4. Secondary analysis of data from the NCSP in its first year of national delivery

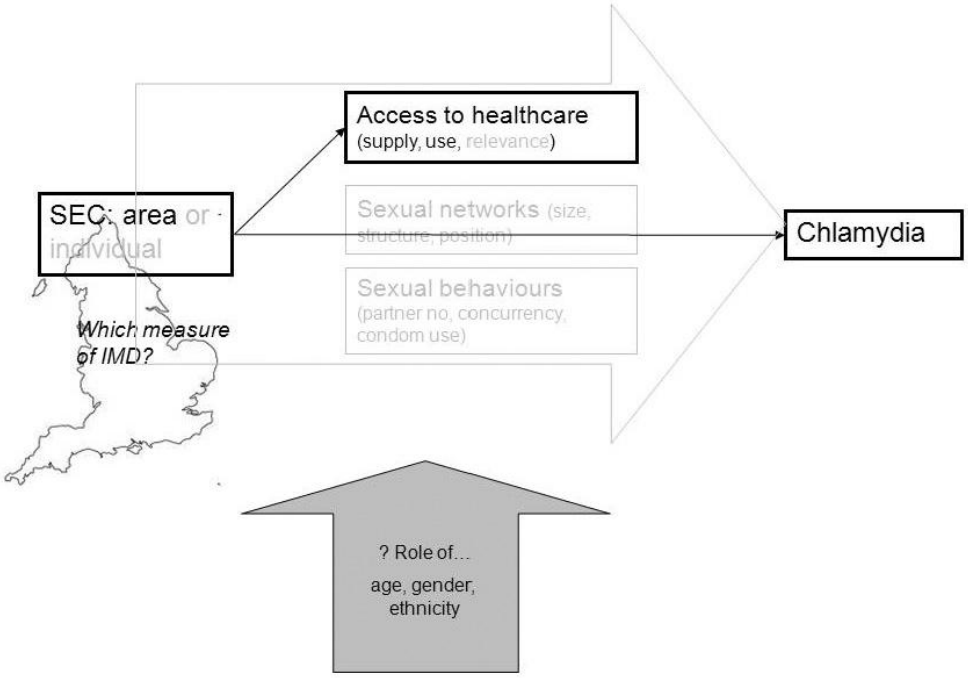
4.1. Introduction

As Part II of this thesis indicated, young people living in areas of disadvantaged SEC may be at greater risk of chlamydia than those in more affluent areas but this might be explained by higher testing rates in these areas. No particular measure of area SEC emerged from the review as most relevant or sensitive to young people's risk of chlamydia.

The NCSP was available in all areas of England by 2008 and collected information on all those tested, not just positive diagnoses. In this secondary analysis, I used data from the NCSP in 2008 to examine amongst young people (aged 13-24 years):

- how supply and use of chlamydia screening varied by area SEC
- associations between SEC of residential area and chlamydia positivity
- relative sensitivity of different SEC measures derived from the Index of Multiple Deprivation 2007 to variations in the risk of chlamydia

Figure 4-1. Working model: elements to examine through secondary analysis of NCSP data



Contributions from others: Much of this analysis has been reported in a paper (Sheringham et al., 2011) and it builds on work conducted in 2007 before the NCSP

was available across the whole country (reported in Sheringham J et al., 2009). The roles of other contributors are summarised in Appendix 8 and noted throughout the chapter.

4.2. Methods

4.2.1. Selecting an area-level marker of deprivation

From a review of composite indices available at small area level in the UK (Appendix 2), the Indices of Deprivation appear to be the most promising to subject to detailed examination. The English Indices of Deprivation were initially developed in 2000 for the Office of the Deputy Prime Minister, (now Local Communities and Government) for resource allocation in England. They were updated in 2004, 2007 and most recently in 2010. The Indices of Deprivation are based on a sound conceptual framework of deprivation, have been subject to extensive consultation and conform to the criteria in the introduction, as shown below:

Validity and reliability: The Index of Multiple Deprivation encompasses a wide definition of deprivation, not just absence of material goods. Since 2004 it has comprised indicators from 7 domains, weighted as follows:

- income (22.5%)
- employment (22.5%)
- health deprivation and disability (13.5%)
- education, skills and training (13.5%)
- barriers to housing and services (9.3%)
- living environment (9.3%);and
- crime (9.3%)

Within each domain, the indicators are either combined using a shrinkage technique, or, where indicators are measured on different scales (e.g. within the children and young people subdomain of education), using factor analysis.

In addition to the Index of Multiple Deprivation, there are also several other Indices available at LSOA level with greater relevance to specific populations: the Local Index of Child Well-Being 2009, the Income Deprivation Affecting Children Index (IDACI) and the Income Deprivation Affecting Older People Index (IDAOPI). In addition, each domain of the Index of Multiple Deprivation can be used separately.

The data used come from administrative data where possible (such as benefits systems) and are available at small-area level. For most of the indicators in the

2010 indices, they date from 2008, except where census information is used (dating from 2001).

There has been some concern that inclusion of health data as part of the index could reduce its validity for measuring health inequalities. However, Adams & White's study in 2006 found that removing the health domain from IMD had little effect on socio-economic inequalities in self-reported ill health as measured by the census.

Sensitivity to gradients in chlamydia infection Our 2007 analysis of data from the NCSP before national coverage was achieved indicated the Index of Multiple Deprivation as a whole was sensitive to gradients in the risk of chlamydia (Sheringham J et al., 2009). However, it is not known whether individual domains would be more sensitive than the combined index.

*Practicality***:** The Index of Multiple Deprivation, individual domains, indicators within each domain or the specific population indices are all freely available and can be downloaded from the Local Communities and Government website. The Indices of Deprivation can be linked to any dataset with enough postcode information to be assigned an LSOA name or code.

Availability at appropriate geographical level: Each Index is available at available at lower-level super output area (LSOA), small areas within England with a mean population of 1,500. Summary scores are also available at local authority/district level and scores, weighted for population size. They can also be created for MSOA level, which group LSOAs into areas with a mean population size of 7,200 (Office for National Statistics, 2011).

*Relevance to young people***:** Some of these domains or indices for specific populations may well have greater relevance for young people than the Index of Multiple Deprivation as a whole. Table 4-1 lists the indicators within each domain. As shown, the educational domain has more indicators with specific coverage of the 16-24 year old populations, although other indicators within this domain exclude these populations. The Local Index of Child Well-Being 2009, the Income Deprivation Affecting Children Index (IDACI) exclude young people over 16 years so may be least applicable.

Table 4-1. Indicators used in domains of the Indices of Deprivation and their relevance to young people

Index	Indicators	Coverage of 16-24yr pop'n[(1)]
Income	Adults and children in Income Support families	
	Adults and children in income-based Jobseeker's Allowance families	1
	Adults and children in Pension Credit (Guarantee) families	1
	Adults and children in Child Tax Credit families (who are not claiming Income Support, income-based Jobseeker's Allowance or Pension Credit) whose equivalised income (excluding housing benefits) is below 60% of the median.	1
	Asylum seekers in England in receipt of subsistence support, accommodation support, or both.	1
Employment	Claimants of Jobseeker's Allowance (both contribution-based and income-based), women aged 18-59 and men aged 18-64	1
	Claimants of Incapacity Benefit aged 18-59/64	1
	Claimants of Severe Disablement Allowance aged 18-59/64	1
	Claimants of Employment and Support Allowance aged 18-59/64 (those with a contribution-based element)	1
	Participants in New Deal for 18-24s who are not claiming Jobseeker's Allowance	2
	Participants in New Deal for 25+ who are not claiming Jobseeker's Allowance	0
	Participants in New Deal for Lone Parents aged 18 and over (after initial interview).	1
Health deprivation and disability	*Years of Potential Life Lost*: An age and sex standardised measure of premature death.	1
	Comparative Illness and Disability Ratio: An age and sex standardised morbidity/disability ratio.	1
	Acute morbidity: An age and sex standardised rate of emergency admission to hospital.	1
	Mood and anxiety disorders: The rate of adults suffering from mood and anxiety disorders.	1

Index	Indicators	Coverage of 16-24yr pop'n[(1)]
Income	Adults and children in Income Support families	1
	Adults and children in income-based Jobseeker's Allowance families	1
	Adults and children in Pension Credit (Guarantee) families	1
	Adults and children in Child Tax Credit families (who are not claiming Income Support, income-based Jobseeker's Allowance or Pension Credit) whose equivalised income (excluding housing benefits) is below 60% of the median.	1
	Asylum seekers in England in receipt of subsistence support, accommodation support, or both.	1
Employment	Claimants of Jobseeker's Allowance (both contribution-based and income-based), women aged 18-59 and men aged 18-64	1
	Claimants of Incapacity Benefit aged 18-59/64	1
	Claimants of Severe Disablement Allowance aged 18-59/64	1
	Claimants of Employment and Support Allowance aged 18-59/64 (those with a contribution-based element)	1
	Participants in New Deal for 18-24s who are not claiming Jobseeker's Allowance	2
	Participants in New Deal for 25+ who are not claiming Jobseeker's Allowance	0
	Participants in New Deal for Lone Parents aged 18 and over (after initial interview).	1
Health deprivation and disability	*Years of Potential Life Lost*: An age and sex standardised measure of premature death.	1
	Comparative Illness and Disability Ratio: An age and sex standardised morbidity/disability ratio.	1
	Acute morbidity: An age and sex standardised rate of emergency admission to hospital.	1
	Mood and anxiety disorders: The rate of adults suffering from mood and anxiety disorders.	1

(1) 0=excluded or mainly excluded; 1=included as part of general population; **2=specific to 16-24s**

Index	Indicators	Coverage of 16-24yr pop'n[(1)]
	Key Stage 2 attainment: The average points score of pupils taking English, maths and science Key Stage 2 exams (7-11y)	*0*
	Key Stage 3 attainment: The average points score of pupils taking English, maths and science Key Stage 3 exams (11-14y)	*0*
	Key Stage 4 attainment: The average capped points score of pupils taking Key Stage 4 (GCSE or equivalent) exams (14-16y)	*0*
Education skills and training	*Secondary school absence*: The proportion of authorised and unauthorised absences from secondary school (11-18y)	0
	***Staying on in education post 16*: The proportion of young people not staying on in school or non-advanced education above age 16.**	2
	***Entry to higher education*: *The* proportion of young people aged under 21 not entering higher education.**	**2**
	Adult skills: The proportion of working age adults aged 25-54 with no or low qualifications.	0
Barriers to housing and services	*Household overcrowding*: The proportion of all households in an LSOA which are judged to have insufficient space to meet the household's needs.	1
	Homelessness: The rate of acceptances for housing assistance under the homelessness provisions of housing legislation.	1
	***Housing affordability*: The difficulty of access to owner-occupation, expressed as a proportion of households aged under 35 whose income means that they are unable to afford to enter owner occupation.**	2
	Road distance to a GP surgery: A measure of the mean distance to the closest GP surgery for people living in the LSOA.	1
	Road distance to a food shop: A measure of the mean distance to the closest supermarket or general store for people living in the LSOA.	1
	Road distance to a primary school: A measure of the mean distance to the closest primary school for people living in the LSOA.	1
	Road distance to a Post Office: A measure of the mean distance to the closest post office for people living in the LSOA.	1

(1) 0=excluded or mainly excluded; 1=included as part of general population; **2=specific to 16-24s**

Index	Indicators	Coverage of 16-24yr pop'n[(1)]
Crime	*Violence*: The rate of violence (19 recorded crime types) per 1000 at-risk population.	1
	Burglary: The rate of burglary (4 recorded crime types) per 1000 at-risk properties.	1
	Theft: The rate of theft (5 recorded crime types) per 1000 at-risk population.	1
	Criminal damage: The rate of criminal damage (11 recorded crime types) per 1000 at-risk population.	1
Living environment	*Housing in poor condition*: The proportion of social and private homes that fail to meet the decent homes standard.	1
	Houses without central heating: The proportion of houses that do not have central heating.	1
	Air quality: A measure of air quality based on emissions rates for four pollutants.	1
	Road traffic accidents: A measure of road traffic accidents involving injury to pedestrians and cyclists among the resident and workplace population.	1
Local Index of Child Well-Being	Comprising indicators of material well-being; Health; Education; Crime; Housing; Environment; Children in need for children aged -016 or -018 in full time education.	0
IDACI	Proportion of all children aged 0-15 living in income deprived families	0

(1) 0=excluded or mainly excluded; 1=included as part of general population; **2=specific to 16-24s**

4.2.2. Datasets: NCSP, IMD 2007 and postcode directory

I examined an anonymised dataset of all screening tests conducted by the NCSP from 1 January to 31 December 2008. Testing through the Programme is offered through a range of settings registered with the NCSP including healthcare (general practice, contraceptive and sexual health services, and pharmacies) and non-healthcare locations, such as educational venues, outreach events, and youth services. The NCSP collects demographic (gender, date of birth and postcode of individual's residence), service and clinical data. Data on ethnic group and behaviour (report of a new sex partner in the previous three months; or two or more sex partners in previous 12 months) are collected but are not mandatory and are therefore not available for all screening records(National Chlamydia Screening Steering Group, 2006). Each record represents one screening test.

I assigned an area-level indicator of socio-economic deprivation by using the National Statistics Postcode Directory (Office for National Statistics, 2008) to link records with full English postcodes to the Index of Multiple Deprivation 2007 (IMD2007). Ranks of IMD2007 were grouped into quintiles of socio-economic circumstances such that SEC1 represented the 20% most deprived LSOAs and SEC5 referred to the 20% least deprived areas. An SEC quintile was also assigned to the postcode of each NCSP venue providing screening for at least 3 months of 2008 using this method.

All records with complete demographic data within the range 13-24 years were included. I divided age into five groups: 13-15, 16-17, 18-19, 20-21 and 22-24 years.

4.2.3. Analysis

Data quality: To ascertain whether the sample was biased due to missing data, I performed a Pearson chi-squared test to examine associations between records with missing or invalid postcode information, with patients' demographic characteristics and the SEC quintile of clinics where tests were performed.

Sample characteristics: I examined the distribution of SEC quintile, gender, and age group and compared these variables to the distribution in the general population aged 13-24 years.

Distribution of supply of NCSP-registered venues: I calculated the total number of registered screening venues for each 1000 13-24 year olds by SEC quintile. The NCSP groups venues into 15 different categories. I amalgamated these into types and examined variations in the type of venues offering screening by SEC quintile. The total population of 13-24 year olds by area was estimated using Office for National Statistics Small Area Population mid-year estimates at the level of LSOA (2007).

NCSP coverage: Coverage was estimated in two ways. Firstly, population screening coverage was calculated by gender by dividing the number of screening tests performed by the total population of 13-24 year olds (estimated as described above) in each SEC quintile. This approach is comparable to that used by the Health Protection Agency to monitor local NCSP delivery.

Secondly, I estimated an 'effective screening rate' as defined by Low et al. (2006) by gender and age, based on the number of tests as a proportion of the population at risk of chlamydia (i.e. sexually active young people). I derived the denominator

population by first calculating the proportion of men and women in each age group expected to be sexually active according to Natsal-2000 survey data on sexual experience,(Natcen, UCL, & LSHTM, 2009) then applying these proportions to the Office for National Statistics age-group specific total population estimates. I did not adjust the denominator population by SEC because Natsal-2000 data did not demonstrate a significant association between the age of first sexual intercourse, sexual activity and area deprivation (see Appendix 4).

I generated confidence intervals for coverage and estimated the statistical significance of differences between coverage for each quintile by applying the Pearson chi-squared test for association.

Chlamydia positivity: I calculated chlamydia positivity by gender by dividing the number of positive test results by the number of positive and negative results. I undertook logistic regression of records with complete data to investigate bivariable and multivariable associations between the odds of positivity and SEC and age group. I adjusted for the following potential confounding factors: ethnicity, behaviour (two or more partners in the previous12 months), and the screening venue (community contraceptive and sexual health services, outreach, education, youth, general practice or 'other' e.g. military, pharmacy, prison). Analyses of positivity by ethnicity, screening venue, and behaviour in the NCSP have been recently reported by Simms et al. (2009) and so are not reported here.

In addition, to examine the relative sensitivity of different domains of the Index of Multiple Deprivation on chlamydia positivity, I generated the odds ratio for positivity in the most compared with the least deprived quintiles, adjusted for potential confounding factors: ethnicity, behaviour (two or more partners in the previous12 months), and the screening venue (community contraceptive and sexual health services, outreach, education, youth, general practice or 'other' e.g. military, pharmacy, prison).

Statistical analyses were performed using Stata 10.1 (2007).

4.3. Results

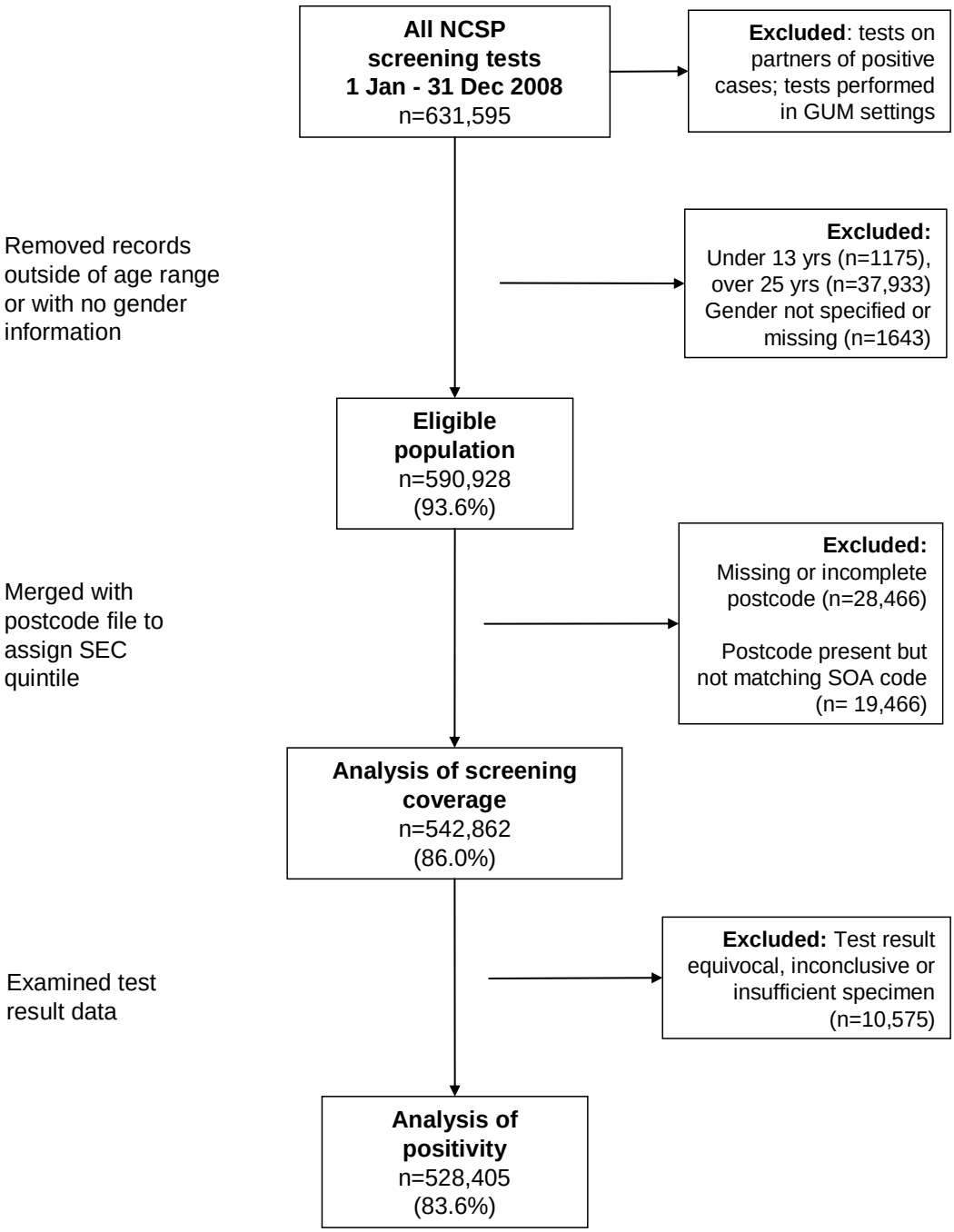
4.3.1. Data quality and sample characteristics

Of the 631,595 screening records available for analysis, 562,328 (89.1%) remained after excluding records where patients were outside the age range, or where gender

or postcode were not recorded. There were 542,862 records (86.0% of all records) with English postcodes that mapped to SEC quintiles which could be included in the coverage analysis. With respect to positivity, 528,405 records (83.6%) had a conclusive (positive or negative) result and 331,294 (52.5%), with complete data on ethnicity and behaviour, were included in the multiple logistic regression (Figure 4-2).

Records with missing or incomplete postcodes were significantly more common in men (9.7%) than women (7.4%), in 13-15 year olds (9.0%) than older ages (8.1%) and were more likely to come from clinics in the most deprived areas than the least deprived (9.2% versus 5.6% respectively). Compared with records with complete data, a higher proportion of those missing ethnicity and behavioural information were male (38% vs. 27%). They were slightly younger (18 years and 10.5 months vs. 19 years); and less likely to test positive for chlamydia (7.1% vs. 8.3%)($p<0.001$ – data not shown).

Figure 4-2. Flowchart of dataset inclusions and exclusions



Compared with the national population of 13-24 year olds, there was a lower proportion of men amongst NCSP attendees (31.2% were male), a lower proportion were under 16 years (7.8% vs. 23.7%) and a higher proportion were resident in deprived areas (29.4% lived in areas of high deprivation compared with 23% in the English population) (Table 4-2).

Table 4-2.Socio-demographic characteristics of NCSP attendees and the general population

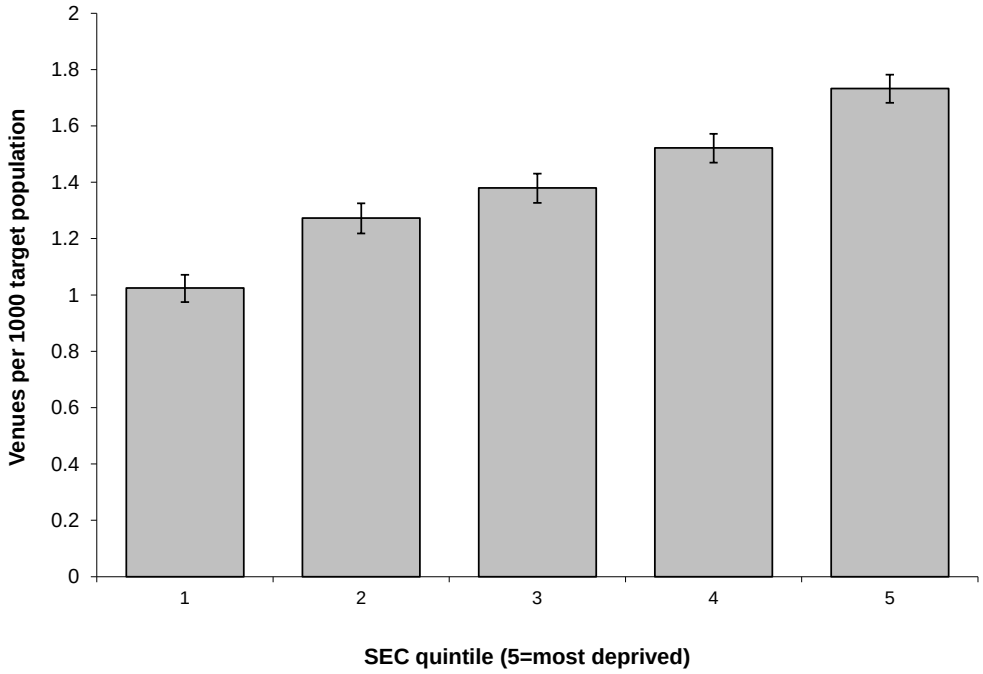
	NCSP sample		England population[1]
	No.	%	%
SEC quintile			
1 (least deprived)	74,133	13.18	18.18
2	82,971	14.75	18.17
3	97,820	17.4	19.41
4	122,813	21.84	21.1
5 (most deprived)	165,125	29.36	23.13
Missing	19,466	3.46	
Gender			
Male	175,458	31.2	51.44
Female	386,870	68.8	48.56
Age group (years)			
13-15	43,146	7.67	23.73
16-17	152,901	27.19	16.59
18-19	143,259	25.48	16.83
20-21	107,217	19.07	16.97
22-24	115,805	20.59	25.87
Total	**562,328**		

[1] National Statistics 2007 estimates used for age and sex.

4.3.1.1. Supply

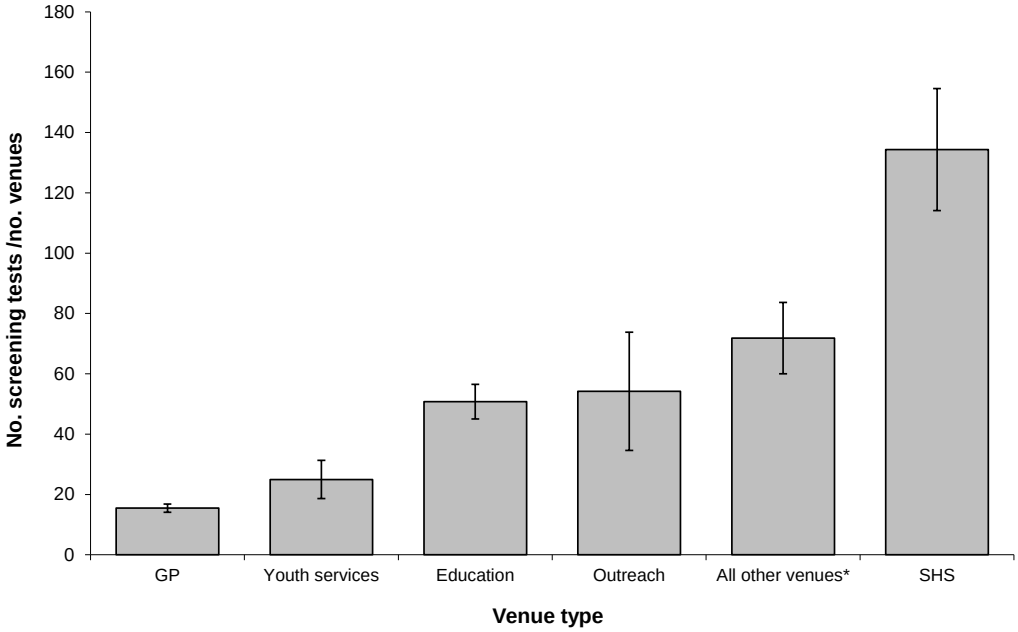
Screening venues were concentrated in deprived areas, with a total of 1.7 venues per 1000 population (95%CI 1.7-1.8) in the most deprived quintile compared with 1.0 per 1000 population (95%CI 1.0-1.1) in the least deprived quintile (Figure 4-3).

Figure 4-3. Supply of chlamydia screening: Number of registered NCSP venues per 1000 population aged 13-24 years by SEC quintile



As Figure 4-4 shows, different venue types provided varying amounts of screening in 2008, ranging from an average of 134 tests per sexual health service venue to just 15 tests per general practice venue.

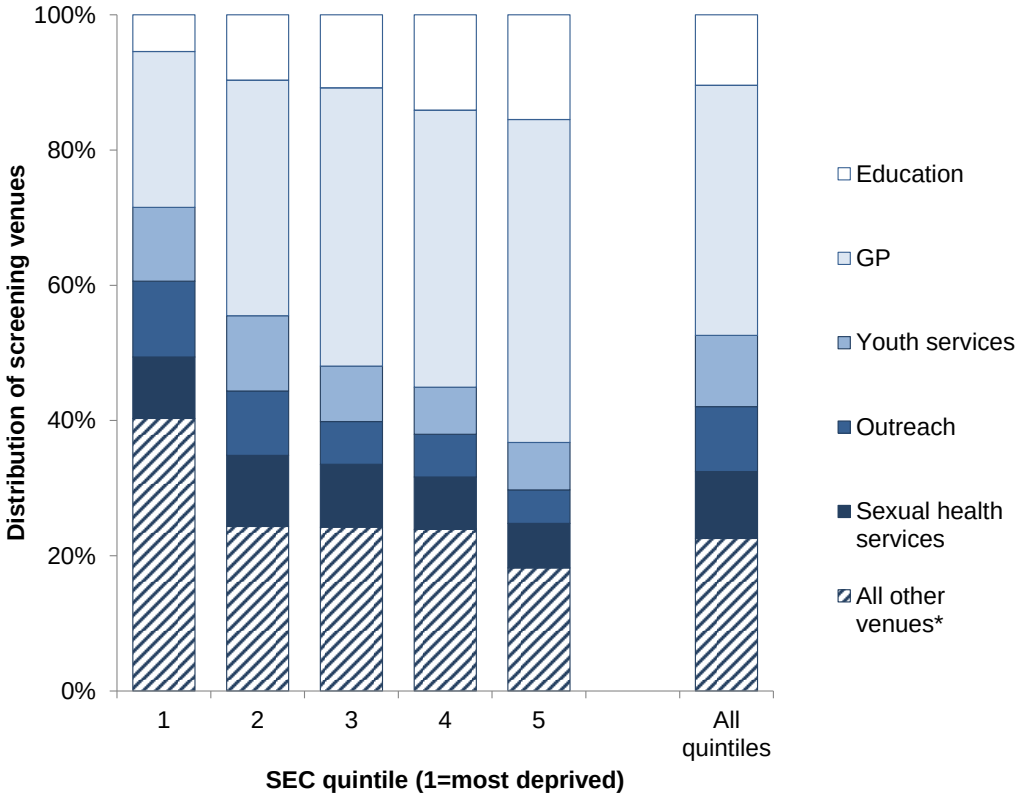
Figure 4-4. Average screening volumes by venue type



The type of venue offering screening also varied by socio-economic quintile (Figure 4-5 p=<0.001). In the most deprived areas, venue types were more evenly

distributed, with general practices (GP) accounting for 29% of venues, community sexual health and contraceptive services 12%, youth 14%, outreach 14%, and education 7%. In contrast, in the least deprived areas, general practices dominated, offering 47% of screening, and education is a more significant provider offering 15%, while community sexual health and contraceptive services, youth and outreach account for just 18% altogether.

Figure 4-5. Screening volumes by venue type in different SEC quintiles

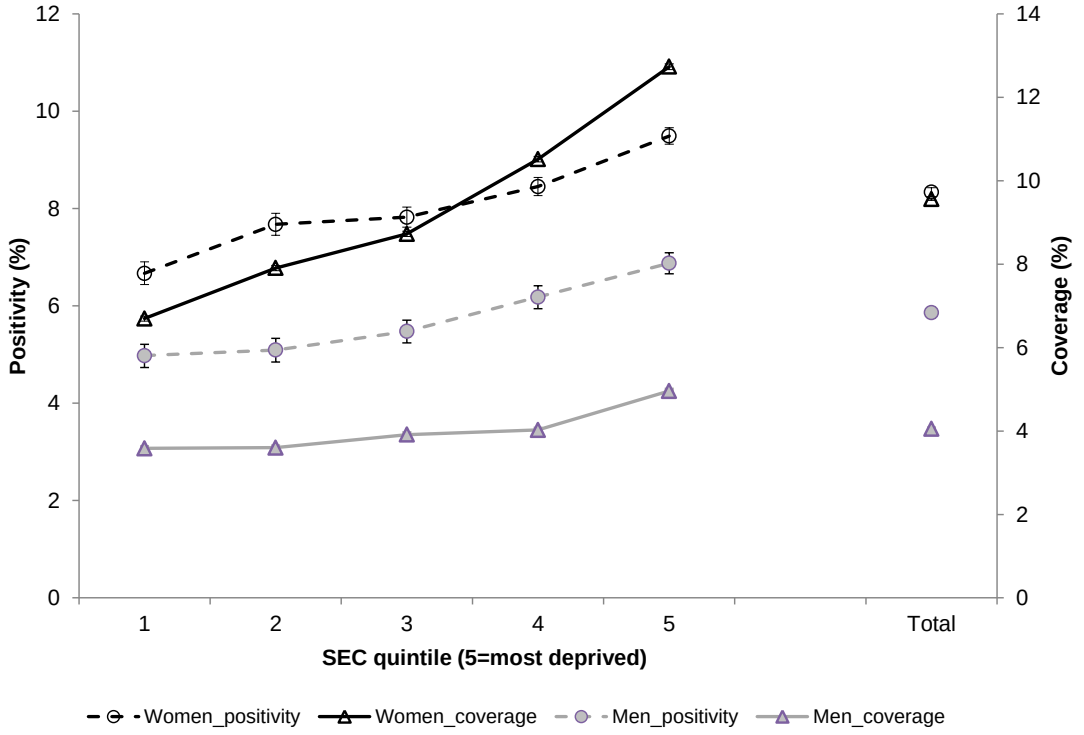


*All other venues comprise: pharmacy, screening office, antenatal/obstetrics, gynaecology/fertility, termination of pregnancy, A&E/walk-in centres, and occupational services.

4.3.1.2. NCSP target population coverage

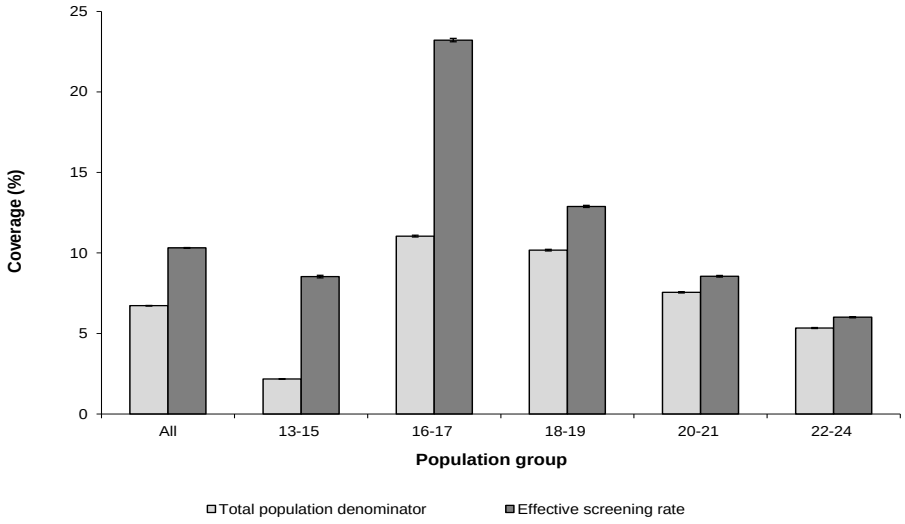
Population coverage was low in 2008: just 4.1% of men and 9.6% of women were screened. There was a significant socio-economic gradient in screening ($p<0.001$) across both genders, with highest coverage in the most deprived quintile and lowest in the least deprived quintile. However, the gradient was less steep in men than women (Figure 4-6).

Figure 4-6. Coverage and positivity in men and women



Coverage in both genders varied significantly by age ($p<0.001$), with highest coverage in 16-17 year olds and lowest in 13-15 year olds. Amongst 22-24 year old men, coverage was also very low (3%). When estimates of effective screening rates were applied instead of a total population denominator, NCSP coverage appeared higher overall (6.2% vs. 4.0% in men, 14.6% vs. 9.6% in women) and particularly so in 16-17 year old women (32.6%). It made little difference to estimates in those over 18 years (Figure 4-7).

Figure 4-7. Total coverage vs. effective screening rate



4.3.1.3. Chlamydia positivity

Positivity demonstrated a socio-economic gradient across both genders in both adjusted and unadjusted analyses. The adjusted odds of testing positive for chlamydia was 40% higher in men and women in the most deprived SEC quintile than in the least deprived quintile (Table 4-3).

While overall positivity by gender was similar (7.5% in men and 8.6% in women), men over 20 were approximately four times more likely to test positive for chlamydia than those in younger age groups. In contrast, in women, positivity was more evenly distributed, with lowest positivity in those aged 22-24 years (6.6%) and highest positivity in those aged 18-19 years (10.0%).

Table 4-3. Positivity: Associations with socio-demographic, behavioural and service characteristics

A. MEN (N= 90,219)

	% Testing Positive (95% CI)	Unadjusted odds ratio (95% CI)	Adjusted odds ratio (95% CI)*	n
Overall	7.48 [7.31; 7.65]			90,219
SEC quintile				
1st quintile (most deprived)	8.91[8.55;9.28]	1.58[1.46;1.71]	1.4[1.28;1.52]	23,662
2nd quintile	7.84[7.46;8.24]	1.38[1.27;1.5]	1.25[1.15;1.37]	18,638
3rd quintile	7.41[7.02;7.82]	1.3[1.19;1.41]	1.2[1.1;1.31]	16,966
4th quintile	6.62[6.22;7.04]	1.15[1.05;1.26]	1.14[1.04;1.25]	14,523
5th quintile (least deprived)	5.82[5.47;6.19]	1	1	16,430
Age group				
13-15	2.39[1.97;2.88]	1	1	4,595
16-17	3.98[3.74;4.23]	1.69[1.38;2.06]	2.09[1.71;2.56]	24,462
18-19	8.63[8.28;8.98]	3.85[3.17;4.68]	4.35[3.57;5.29]	24,793
20-21	10.10[9.66;10.55]	4.58[3.77;5.57]	5.12[4.2;6.24]	17,926
22-24	9.29[8.88;9.72]	4.18[3.44;5.08]	4.71[3.86;5.75]	18,443
Ethnicity				
White	7.29[7.11;7.48]	1	1	77,297
Black Caribbean	14.36[12.98;15.82]	2.13[1.9;2.39]	1.68[1.49;1.89]	2,424
Black African	8.55[7.52;9.68]	1.19[1.04;1.37]	1.03[0.89;1.18]	2,654
Black background unspecified	11.34[9.74;13.09]	1.63[1.38;1.92]	1.43[1.2;1.69]	1,438
Indian	1.28[0.55;2.5]	0.16[0.08;0.33]	0.16[0.08;0.32]	627
Pakistani	3.05[1.79;4.84]	0.4[0.25;0.65]	0.37[0.23;0.6]	557
Bangladeshi	1.70[0.55;3.92]	0.22[0.09;0.53]	0.21[0.09;0.52]	294
Asian background unspecified	3.44[2.47;4.65]	0.45[0.33;0.62]	0.48[0.35;0.66]	1,163
Chinese/other	4.74[3.38;6.45]	0.63[0.46;0.88]	0.61[0.44;0.85]	801
Mixed	8.91[7.91;9.99]	1.24[1.09;1.41]	1.13[0.99;1.28]	2,964
2+ sex partners in last 12 months				
No	4.66[4.44;4.89]	1	1	55,848
Yes	9.21[8.98;9.46]	2.08[1.96;2.2]	1.89[1.78;2]	34,371
Chlamydia test venue				
Outreach	4.71[4.37;5.07]	1.76[1.55;2]	1.57[1.38;1.78]	14,490
SHS	12.16[11.61;12.72]	4.92[4.39;5.52]	3.89[3.46;4.37]	13,517
GP	7.89[7.37;8.42]	3.05[2.69;3.45]	2.51[2.21;2.85]	10,335
Other	8.28[7.95;8.62]	3.21[2.88;3.59]	2.57[2.3;2.88]	26,217
Education	2.73[2.47;3.02]	1	1	13,868
Youth	8.95[8.44;9.48]	3.5[3.1;3.94]	3.22[2.85;3.64]	11,792

*adjusted for ethnicity, gender, behaviour and the type of screening setting.

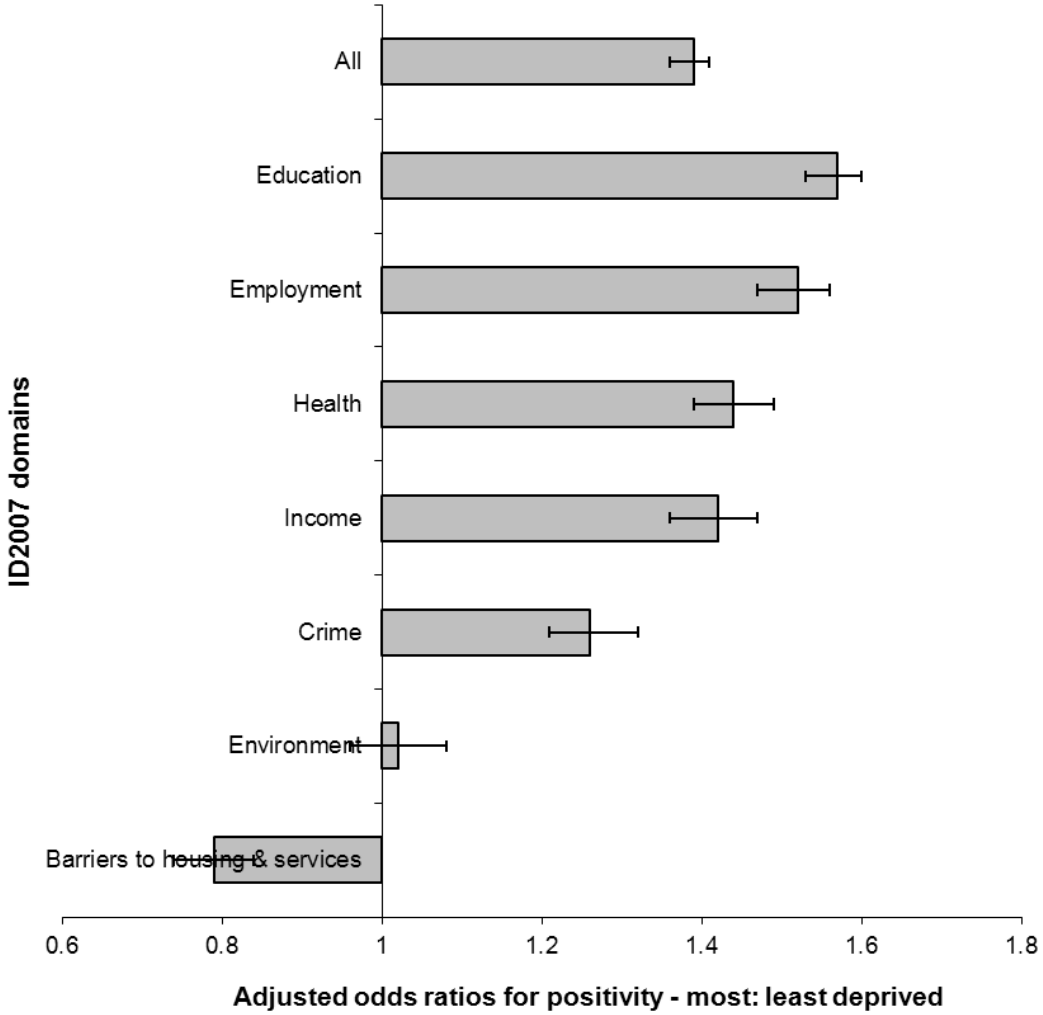
B. **WOMEN N=241,075**

	% Testing Positive (95% CI)	Unadjusted odds ratio (95% CI)	Adjusted odds ratio (95% CI)*	n
Overall	8.60[8.49;8.71]			241,075
SEC quintile				
1st quintile (most deprived)	9.75[9.54;9.97]	1.47[1.4;1.55]	1.43[1.36;1.5]	73,795
2nd quintile	8.73[8.49;8.96]	1.3[1.23;1.37]	1.27[1.2;1.34]	55,999
3rd quintile	8.28[8.02;8.54]	1.23[1.16;1.3]	1.21[1.14;1.28]	42,892
4th quintile	7.96[7.69;8.24]	1.18[1.11;1.25]	1.16[1.1;1.23]	36,856
5th quintile (least deprived)	6.85[6.57;7.13]	1	1	31,533
Age group				
13-15	6.91[6.57;7.26]	1	1	21,133
16-17	8.89[8.67;9.12]	1.31[1.24;1.4]	1.42[1.34;1.51]	63,345
18-19	10.10[9.85;10.34]	1.51[1.42;1.6]	1.64[1.55;1.75]	57,984
20-21	9.35[9.08;9.62]	1.39[1.31;1.48]	1.54[1.45;1.64]	46,153
22-24	6.61[6.40;6.82]	0.95[0.89;1.01]	1.09[1.02;1.16]	52,460
Ethnicity				
White	8.54[8.42;8.66]	1	1	209,690
Black Caribbean	12.15[11.35;12.98]	1.48[1.37;1.6]	1.41[1.3;1.52]	6,315
Black African	7.69[7.01;8.41]	0.89[0.81;0.98]	0.9[0.81;0.99]	5,735
Black background unspecified	9.98[8.91;11.14]	1.19[1.05;1.34]	1.18[1.04;1.33]	2,865
Indian	3.92[3.03;4.99]	0.44[0.34;0.56]	0.51[0.39;0.65]	1,607
Pakistani	3.98[2.8;5.46]	0.44[0.32;0.62]	0.5[0.36;0.69]	905
Bangladeshi	4.47[2.97;6.44]	0.5[0.34;0.74]	0.55[0.37;0.81]	604
Asian background unspecified	4.88[3.99;5.9]	0.55[0.45;0.67]	0.64[0.52;0.78]	2,070
Chinese/other	6.81[5.85;7.88]	0.78[0.67;0.92]	0.84[0.72;0.99]	2,452
Mixed	10.47[9.84;11.13]	1.25[1.17;1.34]	1.19[1.11;1.27]	8,832
2+ sex partners in last 12 months				
No	6.32[6.19;6.46]	1	1	114,907
Yes	11.10[10.92;11.28]	1.85[1.8;1.9]	1.83[1.78;1.89]	126,168
Chlamydia test venue				
Outreach	7.60[7.2;8.02]	1.64[1.51;1.79]	1.64[1.5;1.79]	16,652
SHS	9.71[9.5;9.92]	2.15[2;2.3]	2.16[2.01;2.32]	78,355
GP	7.66[7.39;7.93]	1.66[1.54;1.79]	1.79[1.66;1.93]	38,062
Other	8.38[8.14;8.62]	1.83[1.7;1.96]	1.93[1.79;2.08]	52,193
Education	4.77[4.47;5.07]	1	1	19,932
Youth	10.09[9.77;10.41]	2.24[2.08;2.41]	2.15[1.99;2.31]	35,881

*adjusted for ethnicity, gender, behaviour and the type of screening setting.

All domains of the Index of Multiple Deprivation 2007 except the barriers to housing and services produced a similar gradient to the overall index (Figure 4-8). Out of all domains, the educational domain was most sensitive to variations in positivity (OR=1.57 [95%CI 1.51;1.63]).

Figure 4-8. Positivity by IMD 2007 domain



4.4. Discussion

4.4.1. Main findings

In its first year of national implementation, the NCSP screened just 4.1% of men and 9.6% of women. However, both the geographical distribution of screening venues and Programme coverage were higher in the most deprived areas where chlamydia positivity was also highest.

4.4.2. Methodological challenges

Low coverage overall: The low coverage achieved at this stage of the programme's implementation limits the generalizability of the findings to the entire eligible population. This limitation is exacerbated in men, who were significantly underrepresented in the NCSP compared with the general population.

Positivity: an inadequate measure of prevalence: The NCSP cannot currently identify repeated visits by the same individual to different settings nor can it identify repeat infections. This means I was unable to examine variations in the characteristics of individuals who return for screening within a year. In addition, those screened by the NCSP are unlikely to be representative of the sexually active population of young people under 25 the UK (Riha et al., 2011). Therefore it is not possible to interpret positivity as a measure of prevalence.

Missing data: It is possible that this analysis may overestimate coverage in deprived areas if more individuals in affluent areas are unable or unwilling to provide their own postcode and therefore excluded from analysis or misclassified to a more deprived area if they provide the clinic's postcode instead of their own. In fact, I excluded more records with missing postcode data where individuals were tested in deprived areas than in affluent areas. There were 7% of records where individuals gave the screening venue's postcode as their own. In these cases, the venue postcode was more commonly in the least deprived (26.0%) rather than the most deprived (19.8%) areas. So these analyses suggest that bias due to missing data or misclassification is likely to overestimate coverage in the least deprived areas and underestimate coverage in the most deprived areas.

Given the significant variation in chlamydia positivity by ethnicity,(Simms et al., 2009) and the relationship between ethnicity and deprivation,(Graham, 2007) it would be useful to examine variations in coverage and positivity by ethnic group. Our sample was not adequately powered for a robust examination of socio-economic variations in coverage and positivity by each ethnic subgroup. Moreover, ethnicity was missing from 23% of records; this limited my capacity to draw conclusions from ethnic variations in socio-economic associations with infection and screening but adjusting for ethnicity did not significantly reduce the association between chlamydia and deprivation overall (Appendix 4).

4.4.3. Comparison with other studies

While this is the first national evaluation of the NCSP by SEC, other studies have examined chlamydia coverage and positivity and screening for other conditions by SEC.

4.4.3.1. Socio-economic gradient in screening coverage

I found that chlamydia screening was higher amongst individuals in deprived areas than in affluent areas. The analysis suggests this difference is not due to biases in

missing or inaccurate postcode data because I excluded more records due to missing postcode data where individuals were tested in deprived areas than in affluent areas. Caution must still be exercised in drawing conclusions from these results in view of the low coverage in 2008. However, the finding contrasts with previous UK studies. The ClaSS study of chlamydia screening reported lower uptake of a postal invitation for chlamydia screening by individuals in deprived areas (Macleod et al., 2005). Amongst cancer screening programmes using general practice registers to invite eligible people, screening uptake was usually lower amongst people in poorer SEC (Dixon et al., 2007; Moser, et al., 2009; von Wagner et al., 2009).

Two features specific to the delivery of the NCSP may contribute to explaining higher coverage in deprived areas:

- *Provision is concentrated in deprived areas:* A larger proportion of screening venues were located in deprived areas. Because the NCSP was gradually rolled out across England, I examined whether our findings could have been explained by earlier roll out in deprived areas. When I stratified our analysis by the year in which areas started screening, the observed relationship between coverage and deprived areas still remained. However, higher numbers of screening tests were performed in community contraceptive and sexual health services (where limited STI testing also occurs) which were concentrated in deprived areas, than primary care settings, which were distributed across all areas. This is likely to have contributed towards the higher coverage observed in these locations.
- *The NCSP uses opportunistic delivery methods:* Screening invitations sent via general practice register lists may not reach young people and socially deprived groups who are comparatively mobile, because their postal addresses may be out of date. Indeed, a feasibility study of postal screening in England (Macleod et al., 1999) found that their invitation failed to reach over 30% of young people because of inaccurate postal addresses. The NCSP's opportunistic approach - whereby young people are offered screening when they contact services for other reasons may promote screening in this highly mobile group. There is some evidence from cervical screening that mobile individuals (such as younger and more disadvantaged groups) who are not reached by postal invitations from general practice may respond to an opportunistic screening approach (Stirland et al., 1996; Millett, et al., 2002).

It is also possible that high numbers of students living in deprived areas may account for the testing in deprived areas by the NCSP. Students, not individually disadvantaged, may be living temporarily in deprived areas. It is not possible to examine this in the NCSP dataset because no data on individual disadvantage is collected.

4.4.3.2. The socio-economic gradient in chlamydia positivity

Chlamydia positivity was higher in deprived areas. This finding is broadly consistent with the findings from the systematic review, where in ecological studies, chlamydia diagnoses rates were higher in deprived areas.

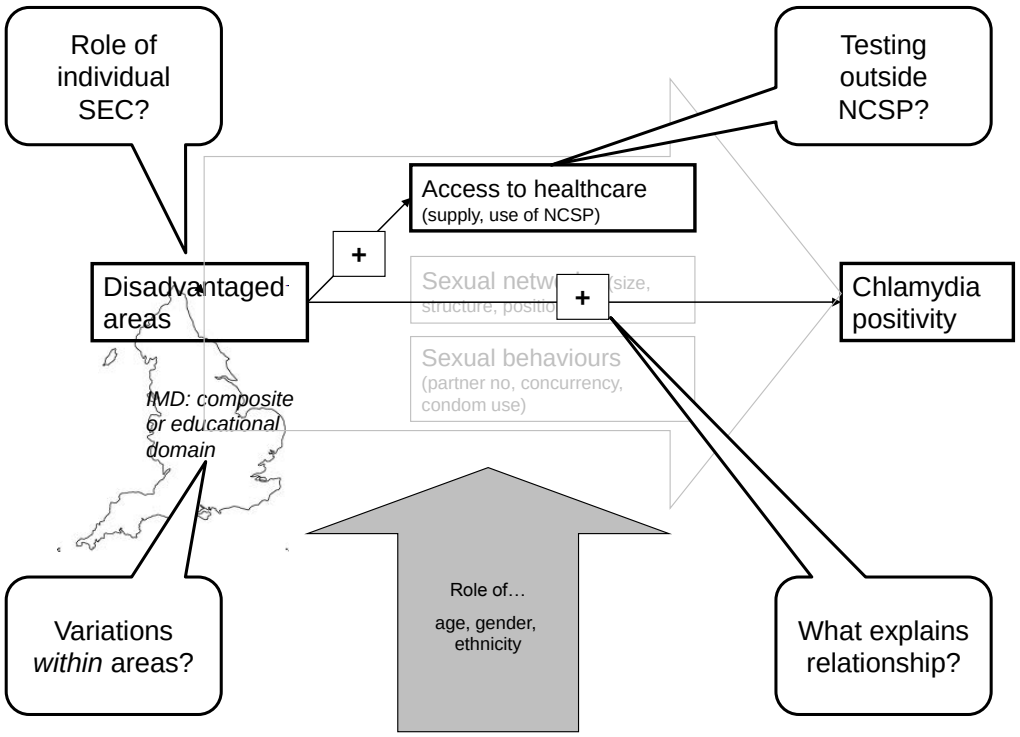
4.4.3.3. Variations in coverage and positivity by age group and gender

In common with primary care use in England (as reported in the General Lifestyle Survey Office for National Statistics, 2010a), overall screening coverage in men was half that of women. In women, coverage and positivity were broadly in line, with highest coverage in women with highest positivity. However, in men the distribution of screening was lowest in those over 20 years, although positivity was highest in this age group. GUM clinics (which are not part of the NCSP) accounted for 52% of all chlamydia diagnoses in under 25s in 2008(Health Protection Agency, 2010). Thus, the low coverage in men aged 20-24 years might be explained by their use of these clinics rather than those which are part of the NCSP.

4.5. Implications for Chapters 5 & 6

This analysis addresses the questions posed at the beginning of this chapter to develop the working model. It also prompts further questions to be explored in subsequent studies (Figure 4-9).

Figure 4-9.Working model: implications from NCSP data analysis



In its first year of national delivery, NCSP venues were concentrated in the most disadvantaged areas. Programme coverage was also highest in these areas, although it was higher in women than men, and particularly low in men aged 20-24. However, in 2008, the NCSP provided less than 30% of all chlamydia tests in England. So, to establish whether groups not accessing the NCSP are accessing other forms of chlamydia testing instead, delivery through other service models should be compared with the NCSP.

This study indicated that the NCSP was successful at reaching disadvantaged areas where positivity was highest. However, it is not known whether these associations could be explained by individual socio-economic characteristics, i.e. does screening reach disadvantaged individuals living in these areas? To what extent do area-level associations with chlamydia remain after individual SEC is taken into account? To address these questions, therefore, measures of SEC at both individual and area levels are needed. This information is not routinely collected in sexual health services so will require additional data collection.

The study provided findings at a national level. However, many decisions about the delivery of chlamydia screening are made at a local level. Therefore, to inform service planning, we also need to understand how positivity in young people varies *within* local areas.

These questions will be addressed in Chapter 6.

This analysis also reinforces the evidence from Chapter 2 that the SEC of the area in which young people live is a potentially important determinant of chlamydia. However, as Chapter 1 highlighted, little is understood about how young people currently use their local area and how this might affect their risk of chlamydia. This will be explored in a qualitative study in the Chapter 5.

5. Preparatory focus group study of young people's use of social networking sites and local area to form relationships

5.1. Introduction

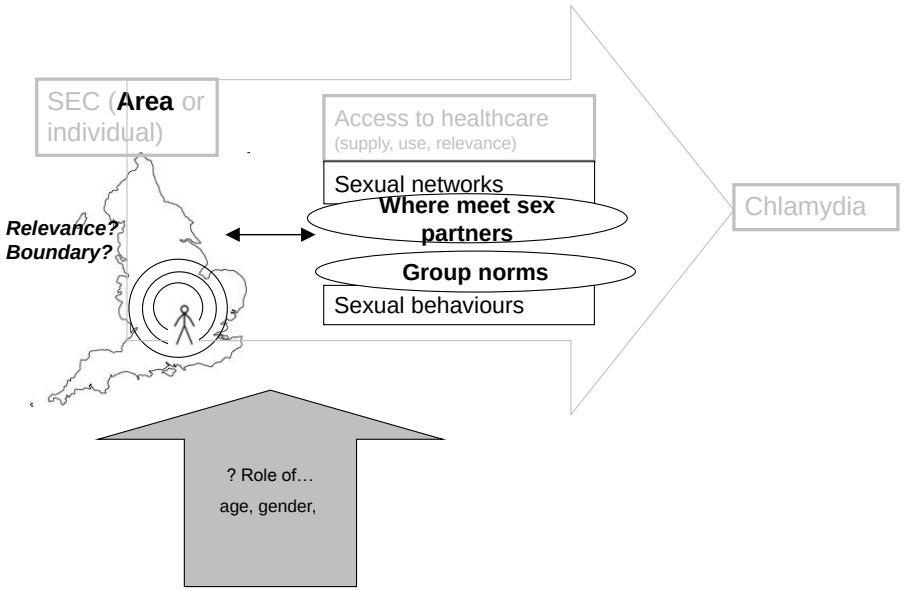
Chapter 4 indicated that young people living in more socio-economically disadvantaged areas had a higher risk of chlamydia positivity than those living in more advantaged areas. However, as discussed in Chapter 1, it is not clear how their residential area affects young people's lives.

In Chapter 4, area was defined simply using the default boundary level for IMD which was LSOA. However, as highlighted in Chapter 1, young people engage in highly variable ways with their local area, and in different ways to the general adult population. Groups such as higher education students have a high degree of residential mobility and typically move frequently between short-term rentals, returning periodically to parents (Ford et al., 2002). In addition, Macintyre et al. (2002) challenge the use of arbitrary administrative spatial geographical boundaries: census-defined units can have limited relevance to residents, who consider their geographical boundaries differently. Cummins et al. (2007) extend Macintyre et al.'s challenge from 2002 of arbitrary spatial boundaries. In this 'relational' approach, individuals may be mobile rather than fixed in residential communities.

According to the model proposed in Chapter 1, SEC associations with chlamydia may in part be due to geographical constraints on young people's sexual networks. However, in the last few years, Social Networking Sites (SNS) such as Facebook have radically changed the way that young people develop their social networks (Steinfield, et al., 2008), (Withers & Sheldon, 2008). The extent and pace of change in young people's use of these technologies may make previous research on area and the formation of social networks obsolete. In relation to STIs, there is some evidence that the use of online technologies by MSM to start relationships can normalise risky behaviours and accelerate development of STI epidemics by joining previously isolated networks (McKirnan et al., 2007). However, researchers acknowledge there are major gaps in the peer-reviewed evidence base around SNS outside of high risk groups such as MSM (Rietmeijer & McFarlane, 2009; Rice, et al., 2010).

Therefore, in order to inform my cross sectional study and to further develop my working model, I undertook a qualitative study in London to understand the cultural norms around young people's use of their local area and of SNS in forming sexual relationships (Figure 5-1).

Figure 5-1. Parts of working model to be explored in focus groups



5.2. Methods

5.2.1. Design

I selected a focus group approach because the interaction between participants in a group means they are the most appropriate method for eliciting group norms (Kitzinger, 1995). While group discussion does not offer the assurances of privacy of individual interviews there is evidence that well-run focus groups can elicit responses about sensitive topics such as sexual behaviour and provide data not generated through other methods (Wellings, et al., 2000).

In focus groups, participants have the opportunity to respond to others' comments. This is not possible in a one-to-one interview. This opportunity to interact with others is particularly important for this study, where I am seeking to identify the extent to which experiences, behaviours and perceptions are shared between group members. In focus groups, areas of consensus are more evidence where participants can agree or build on what others have said. Conversely, areas of discordance are more evident than in one-to-one interviews, where participants question or challenge others' comments, verbally, or using nonverbal gestures or laughter. In addition, as participants can

influence each other in the group, it is also possible to observe how expressed opinions can evolve or develop through the discussion.

5.2.2. Sampling and recruitment

I used a purposive sampling strategy and sought to recruit participants covering the full age range of the NCSP target population (15 - 24 years). I intended to recruit groups from the same geographical area in London (Camden). As described in London's Poverty Profile (2010-2011), Camden is a diverse borough with an ethnically diverse population and a younger population than the average for England. It combines areas of affluence such as Highgate, centres for business and retail such as Tottenham Court Road with areas of high deprivation such as Gospel Oak. I sought to keep the geographical area relatively localised across all groups in order to focus on how age and social circumstances influence young people's travel and social network usage when their geographical experiences and opportunities are similar. I sought to recruit participants with sufficiently diverse social backgrounds and residential circumstances. Within each group, I wanted individuals from the same education or employment settings, to ensure a degree of homogeneity and compatibility amongst participants (Morgan, 1998). Where possible, I tried to use naturally occurring groups where participants were already known to each other. Kitzinger (1995) describes methodological advantages of using pre-existing groups. In particular, the interactions can "approximate to naturally occurring data (such as might have been collected by participant observation)." In addition "friends and colleagues can relate each other's comments to incidents in their shared daily lives."

To access young people with diverse experiences of full time education, I set up two groups through:

- Kensington and Chelsea Further Education College: Students were attending a Health and Social Care vocational course and have obtained 4 GCSEs on average. The tutor I contacted was responsible for literacy and numeracy skills and had previously run a session for students on research methods. She offered to devote a teaching session to developing the topics guide which we incorporated into a discussion of research methods. Both students and the tutor were then prepared to use a later tutorial session for the focus group.

- UCL medical students: UCL offer a 5 year degree programme. Students are required to obtain at least 3 A-levels at A grade or equivalent and to pass a biomedical admissions test to be eligible for interview. I approached students in their second year that had opted to take a student selected component on social inequalities in health. At the module's induction session I gave a 5 minute introduction to the study and sought students' contact details to invite them to a group at a later date.

To access young people (under 20) outside of education, I contacted five Connexions services in inner London. Connexions are local authority-funded services for young people aged 13-18 to offer support and signposting for learning and employment opportunities. Connexions' clients are often vulnerable young people with diverse ethnic and social backgrounds, both in and outside of formal education. Camden's Connexions service expressed an interest in taking part, through their Youth Group Summer School in Gospel Oak and agreed to a pilot session with potential participants. I then held two single-sex groups before the youth group summer barbecue.

To access young people aged 20-24 who are not in education, initially I approached UCLH Foundation Trust, and the internal communications agreed for an advertisement to be disseminated to employees through their weekly electronic bulletin. However, this advertisement yielded no participants. I sought an ethics amendment to approach other employers and organisations and to use snowball sampling.

Employers: I approached a wide range of organisations near to UCL including shops and gyms, JobCentre Plus, Camden PCT workplace health service, Sainsbury's and a law firm. These did not yield any groups partly because it was not possible to obtain senior level support for employees to be released during work time to take part. Also, few organisations had sufficient numbers of employees young enough to be eligible.

Snowballing: I sent a request to UCL Department of Epidemiology and Public Health students, my friends and family to pass on an invitation to friends/colleagues in the age range and not in education: this resulted in several individuals willing to take part but it proved impossible to find a mutually convenient time and place for more than 2 to commit to attending.

I made contact with a sexual health outreach worker in North East London, who was extremely helpful in introducing me to a number of individuals and organisations working with young people. We were able to set up three groups:

- Straight Talking teenage parents peer education charity: the Barking and Dagenham Straight Talking coordinator took part in the group herself and invited several women in their early twenties who had children as teenagers and were working or interested to work as peer educators. On the advice of the coordinator, I arranged to hold the group in a local children's centre.
- Circle (Youth hostel): we scheduled a group with some of the hostel's residents. Unfortunately, the night before it was scheduled to take place, most of the residents were excluded from the hostel following a fight. As a result, this group had to be cancelled.
- Male peer outreach workers: Matt, a semi-professional footballer, working in his year off between college and university on a construction site, agreed to take part in the group and recruit a group of his friends. We scheduled a group at a nearby school.

Before the groups, I met as many potential participants as possible to provide written and verbal information on the study's aims, topics to be covered, how the findings will be used and their rights as a participant. When I couldn't meet them directly, I sent information sheets through the peer recruiter.

I gave each participant a voucher of £10 for a leading high street shop (the choice was advised by the peer recruiter or potential participants themselves), provided refreshments, reimbursed travel expenses and childcare support where required.

5.2.3. Developing the topic guide

5.2.3.1. Content and purpose

The topic guide for the groups is in Appendix 5. I focused on three topics with relevance to addressing my research question:

- use of local area for socialising & perceptions of 'local': the purpose of this topic was to explore the boundaries of the areas in which young people socialise and form relationships, and to understand what defines these boundaries for young people. Firstly I asked young people to work in pairs to discuss the places they had socialised in recently. They wrote each one on a

separate post-it note. We then used these post-it notes as the focus of a discussion on locality and area.

- use of SNS for relationship formation: the purpose of this topic to find out what role SNS played in relationships amongst healthy young people. I adapted my approach to the characteristics of each group (i.e. I had a more structured activity for the younger participants, and more flexible approach for the older, more discursive participants).
- views on forming relationships: the purpose of this topic was to gauge the social norms within each group around sexual relationships, in order to place the findings on area and SNS in the context of how likely sexual risk behaviours would occur. I used case vignettes to elicit cultural norms from participants, so they would not have to share their own experiences around sexual activity or to have any relevant experience to express an opinion (Barter & Renold, 1999). Vignettes also provide a "common external reference point" to enable comparisons between groups (Kitzinger, 1994).

5.2.3.2. Developing the vignettes

I visited students attending the Kensington and Chelsea Further Education College Health and Social Care Course to test out ideas for the focus group, obtain ideas about how best to encourage participation and to develop the vignettes. After a general discussion about sexual health and research, the students took part in a role-play exercise where they wrote/acted out an instant messenger dialogue between two friends about starting a relationship, which I recorded. I created a composite vignette based on the students' role-plays. The resulting vignette was more credible to other focus group participants than anything I could have written.

5.2.3.3. Piloting

I conducted an initial pilot with members of my research group, which helped me to practice recording discussions, test the acceptability of the activities I had proposed and to clarify the language I used to introduce the group and each activity.

I also undertook a pilot amongst youth club members, which shaped the content, structure and my facilitation of later groups. As a result of this pilot, I reduced the amount of material I planned to cover in a group because their (and my) attention span was shorter than I expected. This group did not readily engage in reflective discussion, so I revised the first exercise to focus entirely on

recounting recent experience. In addition, as a result of the dynamic between the boys and girls and distractions from mobile phones in this pilot, I sought to facilitate single sex groups where possible and I introduced each group with a reminder to turn off mobile phones.

5.2.4. Data collection

I conducted each group with a co-facilitator. In the two youth groups, the facilitator was the youth group leader, in the educational groups it was Helen Barratt UCL (HB) and in the outreach groups it was Rupal Patel from Terrence Higgins Trust (RP). The co-facilitator in each group took field notes of key points during the discussion, non-verbal communications, seating arrangements and we met afterwards to discuss key points emerging from the discussion. I recorded each group and sent it for transcription.

5.2.5. Analysis

I have adopted a 'subtle realist' perspective to my analysis., as described by Ritchie and Lewis (2003). In common with a realist perspective, a subtle realist perspective acknowledges that there are real, knowable phenomena. It also recognises that these phenomena are only knowable through these people's representations of them. I selected this approach because I sought to elicit in the groups how young people use real geographical areas with recognised boundaries, and to obtain their experiences of using social networking sites to conduct their social (and sexual) lives. However, a central consideration was to explore how young people conceptualise boundaries, both geographical and in terms of the ways they form relationships. In addition, young people's interpretations of the information on social networking sites may well vary and is likely to be socially constructed.

I used the Framework approach to managing data as described by Ritchie and Lewis (2003), by conducting the analysis in the following stages:

5.2.5.1. Data preparation

I considered each focus group as one 'case' initially, though in certain instances, I have split the groups to highlight distinctions within them (i.e. by gender, or before/after having a baby). I annotated each transcript to highlight interaction between group members, non-verbal communication, levels of participation, evolution/formulation of views. I typed up post-it responses, grouped into 'local'

and ‘non-local’, annotated with a record of non-verbal interactions, reflections on comments from the discussion.

5.2.5.2. Organisation

I used *nvivo* qualitative data management software to code all transcripts. Initially, I used ‘free coding’ to label parts of the initial interviews relevant to any aspect of my three topics (Use and perceptions of local area, social norms around forming sexual relationships, use of Facebook). I used this coding, informed by my review of the literature to develop an initial index to code all transcripts. For the area topic, I adapted Cummins et al.’s (2007) conceptualisation of place as a framework for the index. My coding frameworks are in Appendix 5.

I then refined the index through coding subsequent interview transcripts and finally organised the coding in a hierarchical structure to highlight main and sub-themes. Using these coded transcripts, I constructed thematic charts, comprising summaries of the data in order to describe the range of perceptions/ views/ experiences in the data. Thematic charts for each theme can be found in Appendix 5.

Finally, I worked with Helen Crabbe (HPA) who had access to Geographical Information System software to construct maps based on participants’ post-it note destinations and residential postcodes in relation to local administrative boundaries.

5.2.5.3. Interpretation

I shared my initial descriptive analysis with co-facilitators (HB & RP) and supervisors to refine the emerging themes and identify abstract categories emerging from the data in three areas:

- I used the views expressed in the groups surrounding the formation of relationships to classify each group (and on two occasions two subgroups) according to how the social norms expressed would relate to their risk of contracting or transmitting chlamydia.
- I used the thematic charts to extract the ‘rules’ by which young people use Facebook to form relationships, highlighting instances where these were not observed or debated.
- To gain an insight into which local boundaries were relevant for young people in forming relationships, I compared the maps for each group with

their perceptions of what was local to them, their attitudes towards staying 'local' and their accounts of using their local areas to socialise and, where relevant, to form sexual relationships.

Finally, I sought to interpret the observance of Facebook 'rules' and variations in local boundaries/perceptions of 'local' in light of the sexual risk behavioural norms in each group (see thematic chart stage 2 in Appendix 5).

5.3. Results

5.3.1. Participants

Between August 2009 and May 2010, I conducted four single-sex and two mixed focus groups (Table 5-1).

Table 5-1. Focus group participant characteristics

Group	Age	Gender	Ethnicity
1. Youth Group Summer School **Gospel Oak (boys)**	15 years	4 male	3 white British, 1 white and black Caribbean
2. Youth Group Summer School **Gospel Oak (girls)**	15-18 years	8 female	6 white British, 2 white and black African
3. Health and Social Care **Diploma Students**, Kensington and Chelsea College of Further Education	17-19 years	2 male, 7 female	3 black Caribbean, 2 black British, 1 black African, Bangladeshi, mixed other British, black Colombian
4. 2nd year **Medical Students**, UCL	19-20 years	3 female, 2 male	3 white British, 1 Indian, 1 Pakistani
5. **'Straight Talking' parents** & peer educators, Barking	21-24 years	4 female	3 white British, 1 mixed Caribbean
6. School and Gap Year group, **North East London Friends (boys)**	17-20 years	5 male	5 white British

Under each theme illustrative quotes are given in boxes, with the group identified by number, and participants' gender (m, f) and age given. Where participants share the same age and gender, they are distinguished by a letter (a, b, c or d).

5.3.2. Analysis by theme

5.3.2.1. Views on forming relationships

The norms around forming relationships ranged widely, both within and between groups. The range of norms are summarised in Figure 5-2 along two key dimensions, also described in more detail below:

- whether sex would be expected to happen when two young people meet up
- the awareness and importance attached to risk in sexual encounters

In the Gospel Oak groups comprising the youngest participants, there was little apparent experience of sexual relationships, and a shared perception that sex at age 15 (their age) might be too young. Comments from the boys about what 'might happen' were vague (e.g. "she might get pregnant"), and amongst girls the idea of dates was "funny". Equally, there was little discussion of risks attached to sexual behaviour, although the boys expressed a fear of violence, in case a date was "a set-up, to get robbed or to get battered".

In group 4, the medical students, sex was also not necessarily expected to happen but they acknowledged there could be some sexual contact, perhaps a "fumble in the dark" or "first base". However, they thought sex was more likely because the female character had acknowledged sex was a possibility: "She's thinking of it, so it will go as he wants it to". There was an almost implicit acceptance that people would use condoms if they did have sex; this group felt it would be patronising to mention it to friend, who would have to be "especially stupid or very drunk" not to use them.

There were differences between men and women across all groups in the views expressed on social norms (see Figure 5-2). Women would be looking for certain characteristics in the man before they agreed to meet again. Men would seek to have sex with a girl, but would be more selective about whether she became their girlfriend. In group 3, the further education group, this difference was particularly stark (Table 5-2). However, the biggest concern for both men and women in this group was the risk of violence (rape or stabbing), from a set-up.

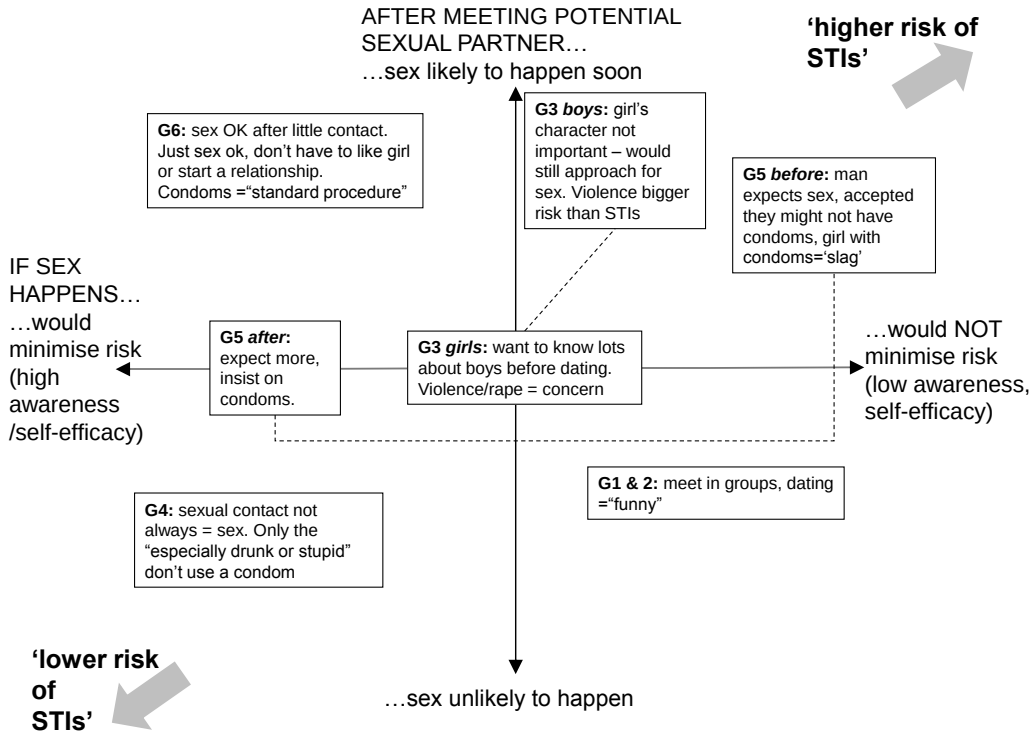
Table 5-2. Illustrative quotes: Who would you meet? Difference in male and female responses

Group 3:	**Diploma Students**
F,19y:	They need to have something of themself. Not just someone who sits at home all day on the street.
F, 18y:	He has to know about his life.
F,19y:	Even though he's not doing anything at least I want him to know what he wants to do in life. Then I know...
JS:	So he doesn't need to be doing anything at the moment but he needs to be going somewhere?
F,18y:	He needs to have his head screwed on.
M, 17y:	For boys it's different.
JS:	What do you want from a girl?
M, 18y:	I don't mind
M, 17y:	Just her love. [lots of laughing]
JS:	So it doesn't matter like ...so you're at college..you're going to ...you're thinking about university…doesn't matter if she's not in education at all?
M, 18y:	Yeah if want her to be my girlfriend then it matters.

The women in group 5 (the 'Straight Talking' parents) distinguished what would have happened before they had a baby to their response afterwards. Before they became parents, they were aware of risks, but acknowledged they were likely to have sex in order to confirm they were attractive. They would have accepted a man's decision not to carry a condom and would have been reluctant to carry one themselves for fear of being thought a "a slag". Now, most of the women felt they would be more assertive in their demands from a relationship e.g. "Like, for me personally, I'd say to a guy, look, don't be expecting sex." And if they did have sex, they would insist a man had condoms.

While the North East London friends group acknowledged that sex might well happen quite soon after meeting someone, often as something "casual" rather than in a relationship, they were unanimous in viewing condoms as "standard", describing it as "*the* contraception".

Figure 5-2. Groups norms about sex, relationships and risks



5.3.2.2. Facebook 'rules'

Because virtually all participants reported that they used Facebook as opposed to other SNS, this section focuses only on Facebook rather than SNS in general.

A set of clearly defined rules emerged from the groups surrounding Facebook usage in relationships. These rules were sometimes obvious and acknowledged openly by all, but more often tacit. Whilst the general rules held across most groups, observance differed between and within groups.

Excepting three participants, all had Facebook profiles and used the site daily (Table 5-3).

Table 5-3. Illustrative quotes: Facebook's role in young people's lives

Group 4: Medical Students	
F, 20y:	That's an achievement for me if I haven't been on Facebook that day.
F, 19y:	Like people who don't have it now sort of get excluded.
Group 6: North East London Friends (boys)	
M, 19y:	It's kind of weird if you don't have [a profile] nowadays.
M, 18y:	If someone's like, oh, have you got a picture of your girlfriend and they're like, no, they don't have Facebook, you're like, he's chatting rubbish, you've got to be joking.
M, 19y:	It's mainly a daily... You don't really realise it, like, but I've got it on my iPhone, but you don't actually think, oh I'm going to check my Facebook, you're just like, when you're sitting on the train, you just go on it and you just do things and check your messages and stuff. It becomes part of a daily thing, you don't even realise it.

Rule 1. You don't use Facebook to seek a new sexual partner…

In all the groups, participants agreed that Facebook should not be used to seek a sexual partner (Table 5-4).

Table 5-4. Illustrative quotes: Using Facebook to seek a sexual relationship

Group 4: Medical Students	
M, 19y:	You can't just start talking.
F, 20y:	You don't use it as a social networking site as in single and looking...
F, 19y:	…Facebook is not used like that.

Participants in all groups were all alert to the risks presented by interacting with strangers, and tended to class people (mainly men) who did seek partners this way as "paedophiles", "dodgy old men" or "weirdoes" and would ignore such requests. However, in group 3, a young man defended his routine practice of adding women he had not met before (when others in the group criticised this), noting that "loads of girls have done it to me".

In group 5, two participants reported meeting partners on Facebook, through friends of friends. In both cases, the participants had felt constrained from meeting men face to face, one physically (she had been experiencing domestic violence, and was unable to go out), the other through financial and safety concerns:

Table 5-5. Illustrative quotes: Reasons for using Facebook as opposed to face to face methods

Group 5: 'Straight Talking' parents	
F, 21y:	I know it sounds silly, but because, to go out and meet people in a club or a pub, you need money to go out in the first instance anyway. And then, like, it's risky because you're actually there. I mean, I think a lot of girls feel safer to go on Facebook because they're not physically there and putting themselves right at risk. It's just meeting someone.
F, 21y:	And you can always get away from him.

Rule 1b. BUT you CAN follow up a first/casual meeting on Facebook

Once they had met face to face, no matter how tenuously, it was perfectly acceptable to follow up contacts on Facebook. Boys in all the groups liked this approach because it was subtler than asking for a phone number and might be safer. However, in one group, boys were wary of adding a girl too early because it can accelerate a new relationship too quickly (Table 5-6).

Table 5-6. Illustrative quotes: Following up casual meetings on Facebook

Group 6: North East London Friends (boys)	
M, 18y:	Yeah, it's easier, isn't it. It's just easier to do because you don't have to actually, like, say, oh here's my number.
M, 18y:	And the numbers can be exchanged when you're not drunk as well. So it's probably a safer way to do it.
M, 19y:	...then all their mates start adding you and they're like, oh you seemed, like so and so, and then they're already involved before you've even like got somewhere with the person. Like, they're already one step ahead, like sort of, they're in on your relationship already before you've even done, like, met up with them a second time.

Rule 2. You should investigate potential sexual partners by viewing their profiles…

While all participants were against using Facebook to scan profiles in order to find a partner, participants agreed that it was perfectly acceptable to look at profiles of people they didn't know (described variously as "snooping" or "stalking")…as long as when they met those people they did not disclose having seen their profile (see Table 5-7).

Table 5-7. Illustrative quotes: The rules for 'stalking'

Group 4: Medical Students	
F, 19y:	There's a home page so if one of your friends put up photos from like home you can look at those photos even if it's no one you know. … if you bump into that person you definitely wouldn't say oh I've seen you on Facebook.

In fact, all the participants agreed that viewing the profiles of potential partners is now standard practice. In particular, participants would view profiles to find out who they are friends with, any ex or current partners, what they do. This information is used to form an opinion on their attitudes to and behaviour in relationships.

Participants in all the groups showed an awareness that information presented on a profile may not be a fair reflection of the person. They use other clues to form an opinion and to screen out obvious predators, e.g.: "secretly 50-year-old men who have a profile picture of some topless guy and then he has no mutual friends and all of his friends are just girls, I've seen that before on Facebook" (North East London friends, M17y).

However, the same information was interpreted differently, between and within groups. For example, Facebook prompts members to give a relationship status but gives the option to leave it blank. In one group men leaving their status blank were perceived as "players", and because of this they were "suspicious". While this suspicion was echoed by a boy in another group, girls defended their decision not to update their status when they started a new relationship, observing, "It's actually a big thing like when you decide to make it public on Facebook" (Medical Students, F19y), and described the etiquette of informing friends before they read it on Facebook. Their readiness to update their status was also connected to whether parents can view their profiles.

Moreover, men and women may act on the same information differently. In one group in particular, girls used information to make a decision about whether to see a guy. In contrast, boys used the information to inform their approach:

Table 5-8. Illustrative quotes: Men's response to a woman's Facebook profile

Group 3: Diploma Students	
M, 18y:	…know that [whether she sleeps around] and you know how to approach her. You can respect her or you can't.
JS:	Right. So how to approach her than whether to approach her?
M, 17y:	No, how to approach her, you've still got to approach her.

In group 5, all the participants reported that viewing current partners' profiles also played a destructive role in relationships. It sparked jealousy when participants were messaging other men (or their partners were writing on the walls of other girls). There was the potential for misunderstanding in a way that was not possible when they communicated face to face, so one participant reported she has chosen not to communicate with her partner on Facebook. Furthermore, and as arguments/problems between couples become public through Facebook, it could accelerate the end of a relationship when others became involved in the argument. For one participant, it led to harassment to the extent that she no longer uses Facebook.

Rule 3. You have to take steps to protect your privacy

Protecting privacy online emerged very strongly from some groups and participants within groups. Participants' concerns ranged from a general uneasiness about strangers looking at their private information, to instances of harassment and a serious incident resulting from malicious messages sent from an individual's Facebook account by a hacker.

Some participants described a wide range of strategies they employed to protect the privacy of their information. Several participants were careful to restrict the personal details on their profile, restricting access to pictures, 'de-tagging' photos, restricting event invites. There was some awareness that even these settings had limitations, leading one participant to deactivate her profile entirely.

For most participants, it was a priority to protect their privacy from parents and others in their generation. This was not universal – for example in group 5, for 1-2 individuals the whole family was on Facebook and there was no hesitation about communicating with parents. In the Medical Students group, there was more reluctance: one participant restricted access for her family ("the thinking is they can see like some ridiculous photos of me go up") but felt guilty about it so

still accepted their 'friend' requests. In contrast, all the participants of the North East London friends group agreed they had no qualms about prohibiting parents from accessing their profiles (see Table 5-9).

Table 5-9. Illustrative quotes: Parents are not allowed to be 'friends' on Facebook

Group 6: North East London Friends (boys)	
M, 19y:	My mum is on Facebook but I haven't added her.
Ma, 18y:	Yeah, same.
M, 17y:	I've forbidden my mum from having Facebook.
Mb, 18y:	I don't want to add my mum.

Rule 3b. But it's OK if someone you know hacks into your profile

Even the participants who were most meticulous in protecting their privacy (for example North East London friends) were generally relaxed about their profiles being altered by people they knew, considering it largely benign, often funny. Even when the amendments were considerable, participants were not always very concerned (Table 5-10).

Table 5-10. Illustrative quotes: 'Acceptable' breaches of Facebook privacy

Group 6: North East London Friends (boys)	
M, 18y:	One of my most favourite things in the world is 'frape'.
Facilitator:	What's that?
M, 18y:	It's Facebook rape. When you get one of your friend's accounts and mess it up.
M, 17y:	Like you put statuses saying, like, what they're not actually going to be doing, or just controversial...
M, 18y:	Or like changing their birthday. So that everybody starts saying 'happy birthday' on the...
M, 18y:	…I did that to xxx yesterday, it's his "birthday" today.
Group 5: 'Straight Talking' parents	
F, 21y:	It took me six months to notice, but I must have left my Facebook open or something. He [Her boyfriend] had gone through there and deleted loads of like males.

5.3.2.3. Local area: perceptions and boundaries

Figures 5-3, -4, -5,-6, -7 and -8 show maps for five of the six focus groups, with markers for where they lived and where they visited in the few days preceding each group. A map is not shown for 'Straight Talking' parents, who all reported being restricted from travelling much outside the home because of their babies/very young children.

For all groups, the boundaries are shown on maps with MSOA boundaries, with greater resolution maps shown at LSOA level for groups with more localised boundaries. It is important to note one limitation of these figures: there are data points which represent the locations that several participants reported they had visited. However, it is not possible to show the density of visits to locations on these maps.

In the Gospel Oak groups, participants showed very little mobility; with much of their daily lives contained within one borough and within that, mainly within two MSOAs (Figure 5-3). As shown in Figure 5-7, at least half of their regular activity could be captured within three LSOA areas too.

In contrast, the Diploma Students' social activities are dispersed over many MSOAs across nine London boroughs (Figure 5-4). This group reported travelling further on a daily basis than other groups, some taking 2-3 forms of transport just to attend college every day, and frequently sought leisure and social opportunities outside of what they defined as their local area (e.g. weekly football training in Cobham, Surrey).

As in the Gospel Oak groups, the Medical Students' activities were mainly concentrated within one borough. Most of their activity occurred within one MSOA and within two or three LSOA areas. However, one student lived with parents in outer London, and whilst his social life was still focused on university, he commuted 20km each way every day. For the other four participants who lived at a different address in term time, parents' homes (the address they referred to as 'home home') were still an important second base at weekends and holidays for socialising.

The North East London friends' activities were concentrated within a single MSOA in one borough. This MSOA largely captured their trips for socialising around school and each other's houses. However, they all reported visiting clubs where they met girls outside of this borough. For the one participant in full time employment, his social life extended towards inner London as a result of his new connections at work. In addition it is worth pointing out that the geographical size of MSOA areas for this group is larger because the population density in outer London and Essex (on which these areas are based) is less than in inner London, where the other groups took place.

Figure 5-3. Regular local travel mapped onto MSOA boundaries – Gospel Oak groups (boys and girls)

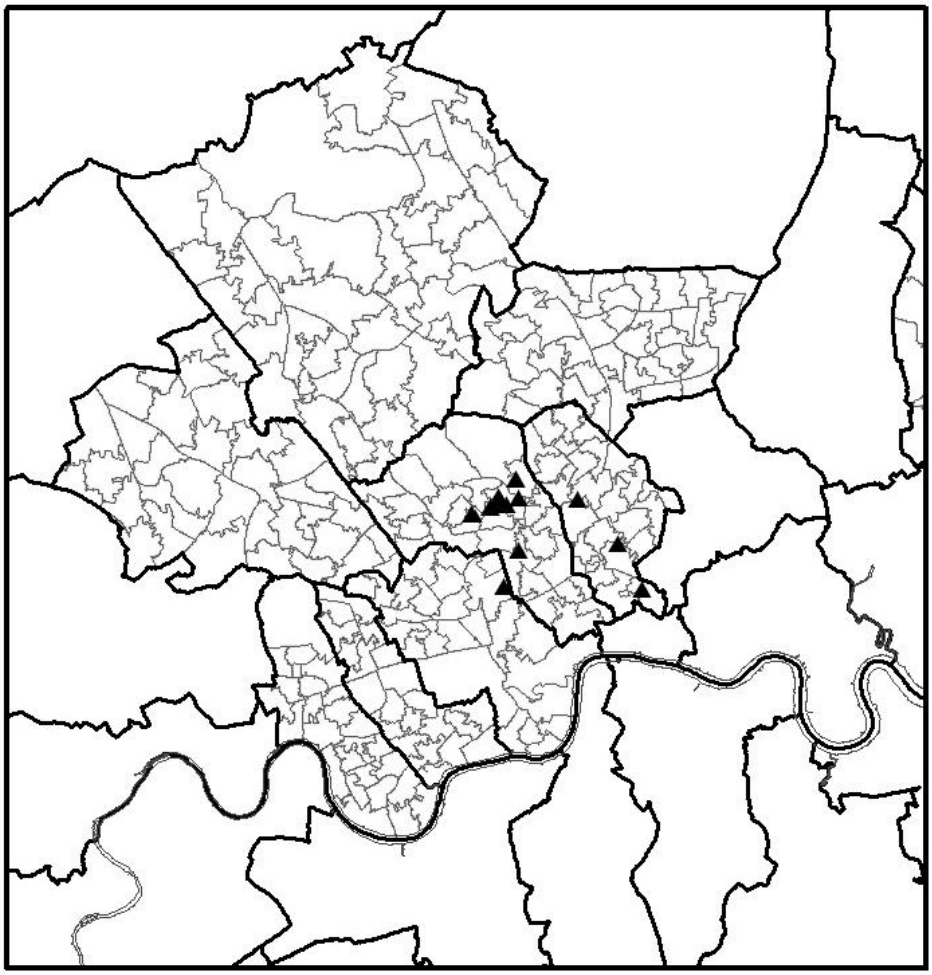


Figure 5-4. Regular local travel mapped onto MSOA boundaries - group 3: Diploma Students

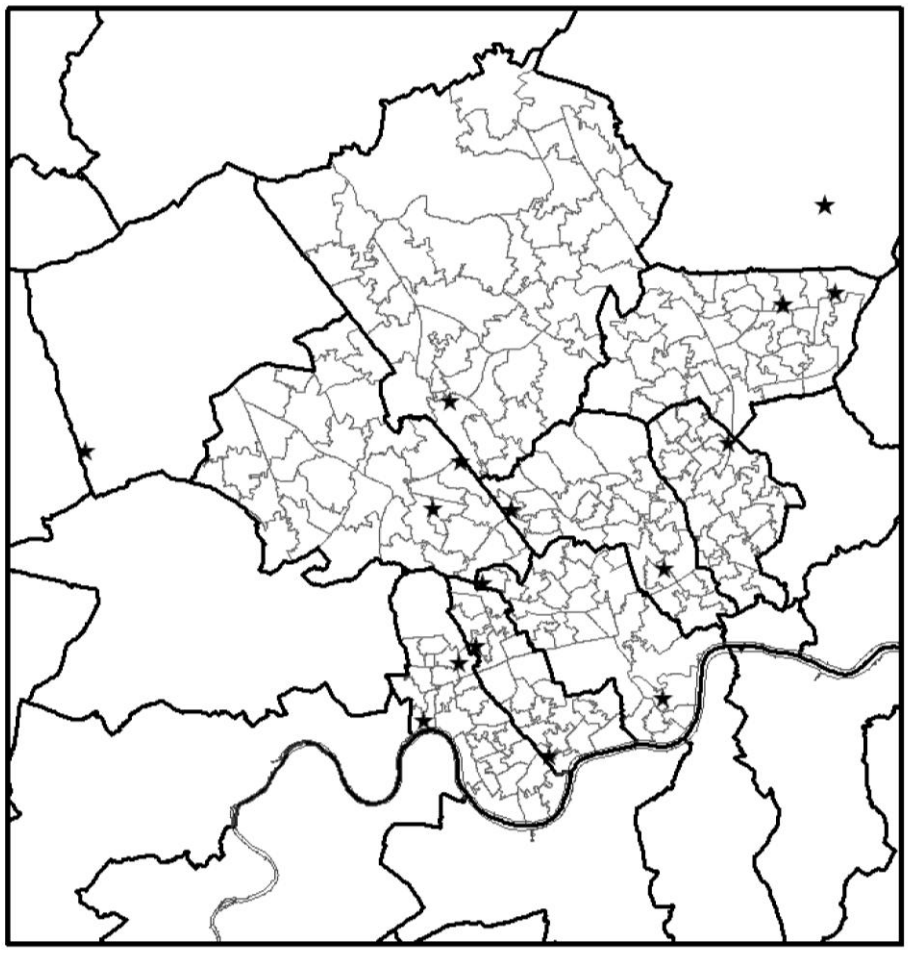


Figure 5-5.Regular local travel mapped onto MSOA boundaries – group 4: Medical Students (term-time)

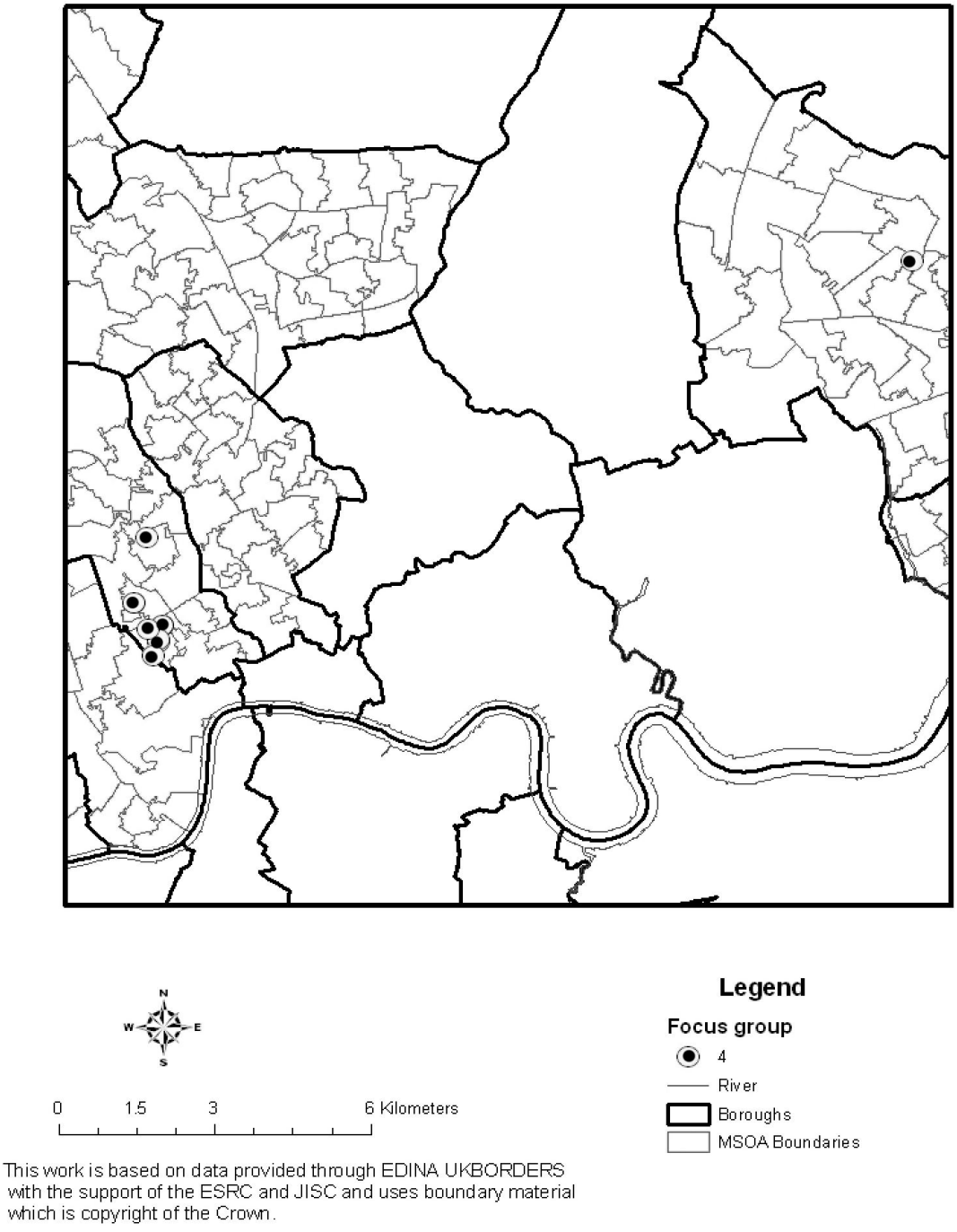


Figure 5-6.Regular local travel mapped onto MSOA boundaries - group 6: North East London friends (boys)

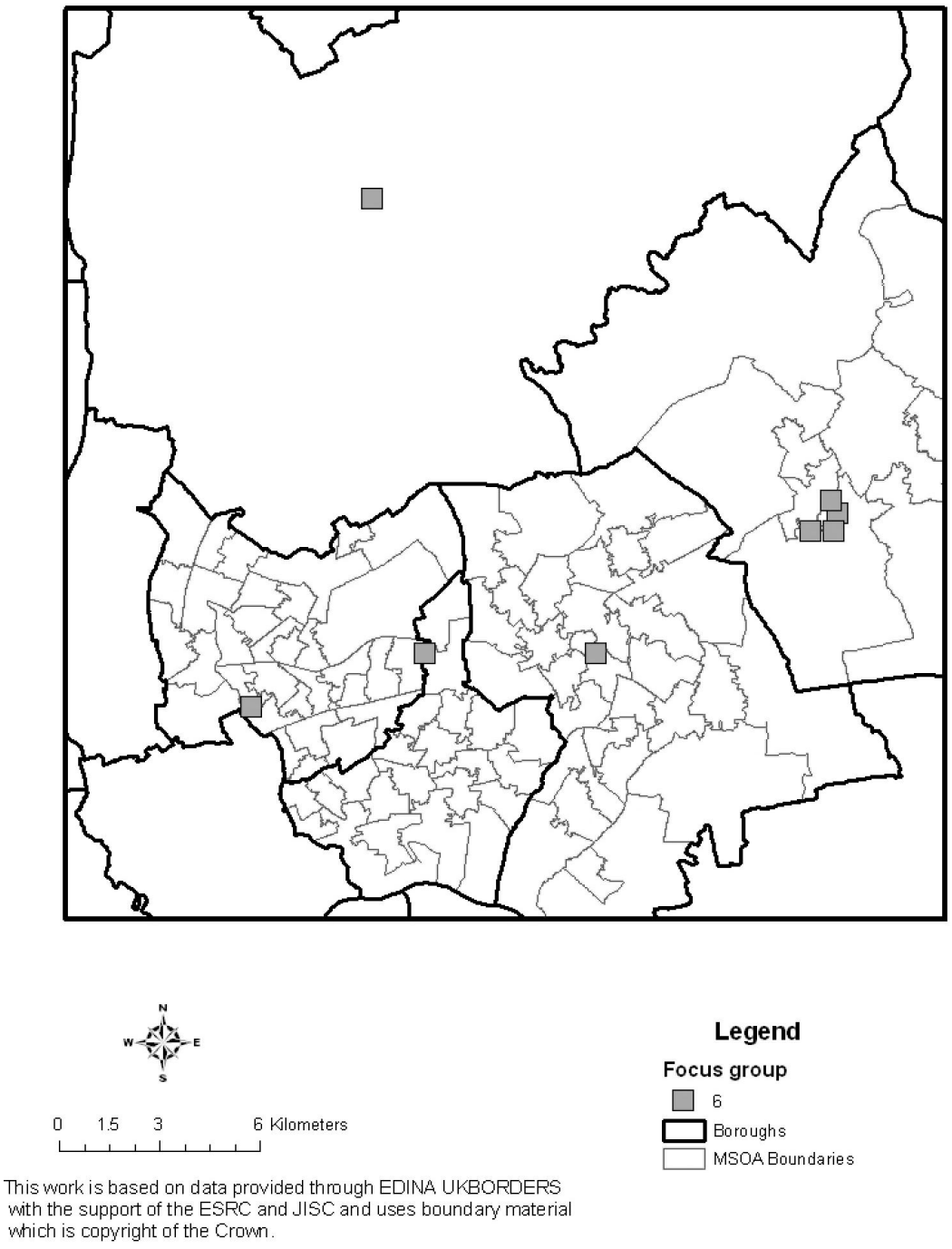


Figure 5-7. Regular local travel mapped onto LSOA boundaries – Gospel Oak groups 1 & 2

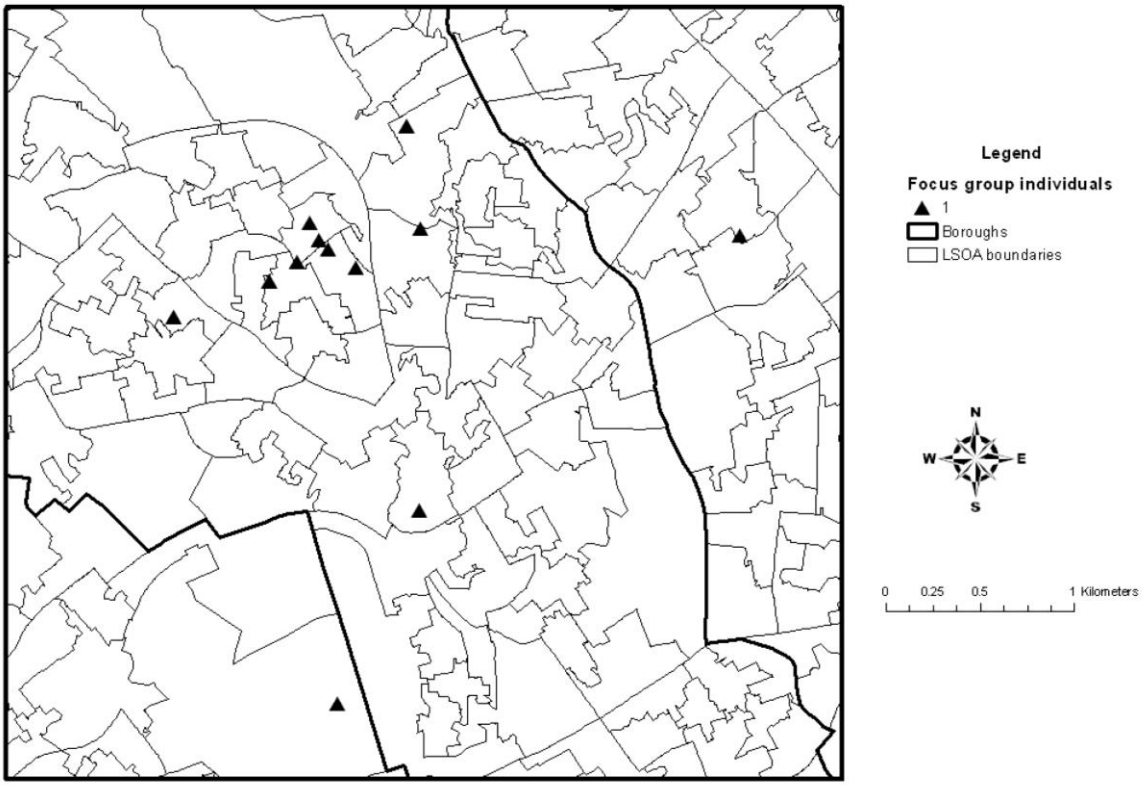
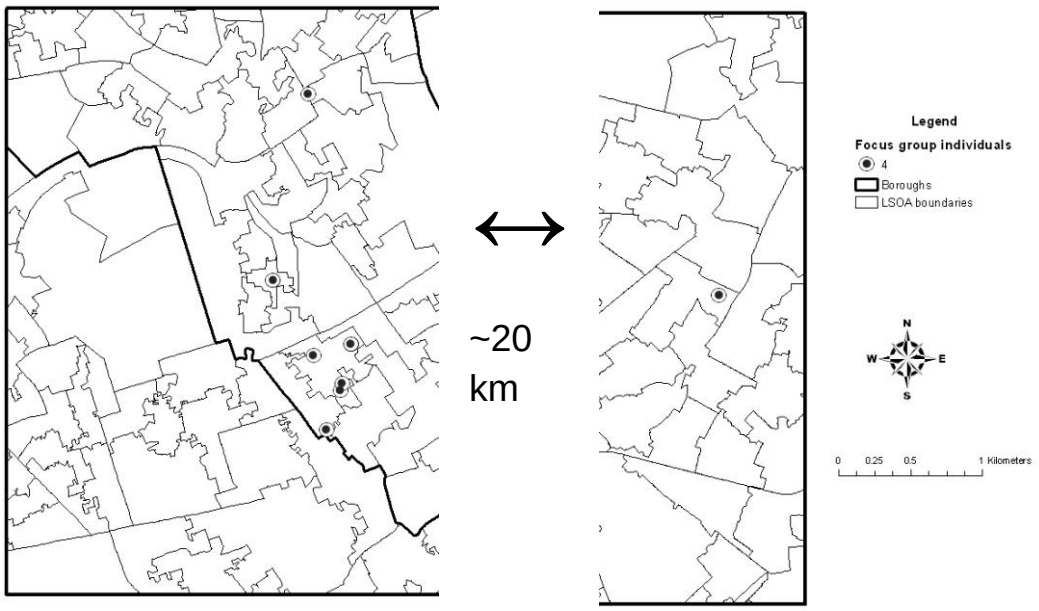


Figure 5-8. Regular local travel mapped onto LSOA boundaries - group 4: Medical Students

(term) **(home)**



There were also marked differences between groups in their perceptions of local areas and boundaries, their willingness to travel and their awareness of places outside of their local area:

- **Perceptions of boundaries between 'local' and 'not local'** (Table 5-11):Few considered area boundaries in terms of geographical distance (miles/kilometres). In all groups, the time taken to reach a place was more important and transport was a big factor – whether they had to take transport, whether a place required more than one bus or train journey. Group 1 considered distinctions of local primarily in terms of administrative boundaries – boroughs and cities. For the university students, 'not local' could sometimes be even the other side of the lecture theatre. However, in groups 2, 4 and 6, they were more likely to consider places as local when they visited them often, even when the geographical distance was further than a destination they considered 'not local'.
- **Awareness/familiarity beyond local**: groups 1 and 2 had sketchy perceptions of areas the considered 'not local'. The youth club organised trips throughout the summer. The week before the group the participants had been on a trip to Madame Tussauds and an activity centre near Staines (Table 5-12). In contrast, 4/5 members of group 4 were living away from parents to attend university and all described another 'local' area around their parents' home, where they spent significant amounts of time and still had social ties.

Table 5-11. Illustrative quotes: Perceptions of 'local'

Group 1:Gospel Oak (boys)	
Ma, 15y:	It is local, it's London.
Mb, 15y:	It's not in the borough of Camden.
Ma, 15y:	I say London's local.
Mb, 15y:	Local's like your borough.
JS:	And you put Hackney as our area?
Ma, 15y:	Not local, not local.
Mb, 15y:	No. Not local, neither is Angel.
Ma, 15y:	It's not that far though.
Mc, 15y:	It's not walking distance.
Mb, 15y:	That's not the point though
Group 4:Medical Students	
Fa, 19y:	And you'll find that if you introduced to somebody new they're defined by what side of the lecture theatre they're on. [laughs]
JS:	Really?
Fb, 20y:	Yeah. Like this is like so and so oh you might not know him because he sits on the other side of the lecture theatre.
Group 6:North East London friends (boys)	
Ma, 18y:	Just whether I count it as a long time to get there or not. But I suppose what a long time is again sort of something that's a grey area, isn't it.
Facilitator 2:	Would you count if it costs more money to get there as local or not local?
M, 17y:	For me, yeah.
Ma, 18y:	I'd sort of say walking distance or a short car distance, that's the way I think of it, and Romford is a reasonable amount of car distance.
Mb, 18y:	I have walked to Romford, therefore I count that.
JS:	Golf club local?
M, 19y:	Yeah, that's me, yeah. I would call that local because like the drive is only about ten, fifteen minutes in a car, and I do it so regularly. Like, if I was going on a train, it's become just routine, so you just sort of don't think about it being a long journey. So to me, it is local really.
Ma, 18y:	I suppose if you go somewhere quite regularly it seems local.

Table 5-12. Illustrative quotes: Awareness of area in groups 1 and 2

Group 1:Gospel Oak (boys)	
Ma, 15y:	Where's Heathrow? Where abouts?
Mb, 15y:	West. South West
Ma, 15y:	I went out of London when we went...thing
JS:	Did you?
Mc, 15y:	It was, like, just past Heathrow.
Md, 15y:	Just say Heathrow.
Mc, 15y:	We went on a trip. Where is it, xxx?
Md, 15y::	That'd be Middlesex, isn't it?

Group 2: Gospel Oak (girls)	
Fa, 15y:	Where's Madame Tussaud's?
Fb, 15y:	Where is Madame Tussaud's?
Fa, 15y:	Marylebone.
Fb, 15y:	Let's just write that.
Fa, 15y:	It's that way, it's all down the same way.
F, 16y:	West.
Fa, 15y:	All I know we got a bus there.

- **Willingness to travel:** Although groups 1 and 2 both tended to remain in their local area there was a marked difference in their willingness to travel. At weekends the boys travelled outside their area to “explore”, meet their girlfriends or possibly to meet other girls. In contrast, girls were much more reluctant to go any further than they had to, describing a visit to a friends as “we have to trek”, or a fear that parents might “drag you far out into the countryside”. While boys did not recognize any constraints on their capacity to travel outside of school hours, girls found having no money was a barrier, partly because they wanted to travel to go shopping. These attitudes are reflected in their views on using their area to form relationships (Table 5-13).

Table 5-13. Illustrative quotes: Willingness to travel - Where would you go to meet a boy?

Group 2: Gospel Oak (girls)	
F, 18y:	Sometimes, you have to travel to go on a date.
F, 15y:	Date?
F, 18y:	Yeah.
F, 15y:	They can't come to pick you up?

Fa, 16y:	No. It has to be, sort of, within the middle of the tube network.
JS:	Middle of the tube network.
Fa, 16y:	Can't be too far out.
Facilitator 2:	What if they lived in Brighton?
Fb, 16y:	See you later!
	[laughter]
Fb, 16y:	What's the point of going to see someone if they live in Brighton?
Fc, 16y:	Well they're coming down to you every time they're seeing you...
Fd, 16y:	Exactly. As long as you're not paying the money to keep coming down there, it's all right.

Nodes (social hubs): for the younger groups friends' houses, local estates and the youth club comprised their major social hubs. In groups 3 and 6, most participants regularly went clubbing, and talked of meeting potential partners in clubs. In contrast, in Group 4, who spent their first year of university living in halls, they described meeting people (friends and partners) in this venue rather than clubs (Table 5-14).

Table 5-14. Illustrative quotes: Views on meeting places – clubs vs. other

Clubs are good for meeting girls IF you look the part	
Group 3: Diploma Students	
M18y:	There's two boys yeah in a club. Two boys in a club yeah. Before you've got inside the club you see one in his 59 plate, 59 license plate, and that means that his car was made in 2009 ...the boy that walked to the rave he got the bus. [laugh or a push bike!] And they came and ask a girls number in a club the girl wouldn't give it to him ...
JS:	Why not?
M18y:	No, okay wait, I'll come to that - but if the boy that had the car that was made in 2009 came to the girl, the majority, he would get the number.
Clubs are not good – only casual sex, you can't get to know someone	
Group 4: Medical Students	
F, 20y:	I don't really think a club is the best place. In fresher's week we didn't go to any of the club nights. Everyone's like it's a social life but I didn't see how you could meet people because the music is so loud and people are so drunk that they're never going to remember that they... it depends where it is but I think most of the friends that I know are from our halls."

In contrast to the younger groups, meeting at home was less acceptable for the oldest group, Group 5, who lived away from parents. Meeting at home signified they were expecting to have sex ("it's a bit obvious"), and that a man had not made much effort ("No way, you can take me out").

No go areas (Table 5-15):all groups identified places that they would not go to socialise or meet partners. Familiar buildings/social venues were often identified as 'no go areas' and heavily disparaged. However, through discussion they actually emerged as social hubs but were no longer considered fashionable. In contrast, geographical areas outside their local area tended to prompt less discussion and often related to a genuine fear of violence/attack, particularly in groups 1 and 3 for boys, but this was also mentioned by girls. In contrast to the familiar places, there was no contradiction within the group or sense of fondness in the discussion of these places.

Table 5-15. Illustrative quotes: 'No go' areas

a) Well used, but no longer fashionable

Group 2: Gospel Oak (girls)

F, 18y:	When I was younger there was... It was called Bacton. [general laughter]
JS:	What's that?
F, 18y:	It's a block of flats, like an estate, and...
F, 16y:	What, when you was younger where you would go?
F, 18y:	Yeah, but like, this is when I was like in year 9, year 10, and we used to just, you could just go and like, between like after school times from about five til about eleven and you could just go and you'd know there'd be people sitting there just talking, just there. So that was like where we'd go in the freezing cold, the rain. And sit, watching the boys smoke.
JS:	Anyone else go to, is it Bacton?
Fa, 15y:	Yeah, we go Bacton.
Fb, 15y:	Bacton, Wendoline, Lismore [other local estates]
Fa, 15y:	Yeah, you're not allowed there.
Fb, 15y:	Yeah, we got banned. We got ASBOed.

Group 4: Medical Students

Ma, 19y:	Huntley Street – there's no atmosphere…
Mb, 19y:	Yeah
Ma, 19y:	…it's sort of like it's like there's been a funeral recently…
F, 20y:	…it's dubbed the medics union even though all of UCL can use it but only medics go there and then there's only certain times when medics actually go there. It somehow it just doesn't work.
Ma, 19y:	With it being the medics union it alienates like 90% of the UCL population immediately. The medics don't go there cos there's no one there.
JS:	…so the Huntley street union is really not a place you go to?
Fa, 19y:	Monday nights
F, 20y:	Well no it is cos like Monday nights and stuff. It's... like a standard like student night out you go really... then go to Mooney's afterwards which is awful [laughs]

b) Outside the local area – associated with physical danger

Group 3: Diploma Students

M, 18y:	Because if a girl said come and meet me in Brixton…
M, 17y:	or Peckham
M, 18y:	… I wouldn't go.
JS:	You wouldn't go.
M, 18y:	No because didn't you hear about that girl? She had two boys that liked her. She liked one and then she told the other one come and meet me and the other boys killed him.

F, 19y:	Because you know what? Sometimes certain areas scare you. I'm not saying I'm scared of nothing but if he said like a notorious area like East [London]. I wouldn't want to go out with him.
M, 17y	You don't want to say South [London]

Table 5-15. (continued). 'No go' areas associated with physical danger

Group 1: Gospel Oak (boys)

Mb, 15y:	I wouldn't really like going not local that often.
JS:	Right, why's that?
Mb, 15y:	It's not your area, is it?
Md, 15y:	Yeah people might stab you.
Mc, 15y:	I wouldn't give a shit.
Md, 15y:	People might shoot you in the head because there are more people carrying guns and knives these days.

5.4. Discussion

5.4.1. Main findings

These focus groups indicated that although Facebook was the SNS of choice for these young people and integral to their social lives, it was not an acceptable place to meet sexual partners that were not encountered offline first. These groups reinforced the importance of local areas for young people in forming relationships but they illustrated the heterogeneity in the size and shape of young people's day-to-day socialising and their perceptions of local boundaries. The groups also suggested that where young people chose to meet partners was linked to social norms around sexual behaviour and their living circumstances.

5.4.2. Methodological challenges

Failure to recruit groups covering the entire target population: The groups do not reflect the experiences of men aged 20-24 years who were not in education. When I was able to negotiate access to young people and met them face to face, I persuaded most individuals to consider taking part, and the young men who participated in the focus groups took an active and lively part in discussions. The most significant obstacle was negotiating access to this population even to invite participation, because I do not normally encounter many 20-24 year olds not in formal education. Access through third parties – workplaces and snowball sampling – was problematic for the following reasons:

- Workplaces: in organisations focused on health and social care, raising awareness of sexual health was a strong selling point for the study (we capitalised on this by bringing chlamydia testing kits, condoms and sexual health promotion giveaways to the groups for those that wanted to take

them). However, for workplaces with no connection to health, this did not facilitate access and a perceived link to sex was sometimes a drawback to participation. In addition, maintaining confidentiality was a more sensitive issue for employees/employers than it was for other organisations.

- snowball sampling: I did identify young men who were in principle happy to take part but finding a mutually convenient date, time and venue to meet when they had no prior social ties and different work schedules was extremely difficult. My gender, age and social background may have posed additional barriers to recruiting individuals outside of education. For example, when the male peer education worker recruited men from his social circle, he selected friends he thought would be the most 'well-mannered' and therefore excluded his football contacts and work colleagues.

It is possible that I would have achieved higher participation by targeting sporting and leisure facilities to access young men early in the process (e.g. pool clubs, football clubs).

*Uneven coverage of topics across groups:*It was not possible to cover all the topics to the same depth in each group. This limited the extent to which I could draw comparisons between groups or generalise across the sample. This manifested in two ways:

- in the opening discussion in the young parents group it was clear that these women were not leaving the house very much at all. A detailed exploration of their use of their local area would have been unproductive and may have alienated participants from contributing to other discussions.
- Lack of depth in the younger groups: in the first pilot group with 15-16 year olds I found it very difficult to stimulate reflective discussion, which was partly because their attention span was short. In the real focus groups with these participants, I built in a break after 30 minutes, broke the tasks up, started discussions with more direct questions. In comparison to the pilots, these focus groups were more productive but still it was difficult to stimulate much discussion, partly because this group's experience of relationships was limited.

Validity/credibility of responses: My profile – being female and older than participants - clearly had an impact on what participants were willing to share and who they shared it. This study was intending to capture social norms, rather

than individuals' sexual behavioural patterns so my concern regarding the credibility and validity of the information was about less whether participants were 'telling the truth' and more what they choose to share in the group.
There were instances where overriding cultural differences shaped the level of participation. This was very obvious in one group, where two participants spoke very little. Their religious and ethnic backgrounds were different to the rest of the group (e.g. Bangladeshi Muslim vs. Caribbean and South American) and their experiences were markedly different from the rest of the group. For example, they tended to socialise with family and at others' houses, while the rest of the group talked of parties in warehouses and their anecdotes indicated they were sexually active.

I chose to use vignettes so that participants did not need to share information about their own sexual behaviour but could still productively contribute to discussions. There is a risk that the way I used the vignette method (i.e. asking participants to offer advice to the character) may not have captured actual social norms, but instead reflected what participants felt 'should' happen. However, there were several instances where individuals contrasted the advice they gave (i.e. what 'should' happen) with what actually happened in their own or friends' situations.

5.4.3. Comparisons with other research

5.4.3.1. Facebook: rules promote protective sexual behaviours?

My study indicated that young people, to varying extents, have developed their own sets of rules and behaviours for using Facebook to negotiate sexual relationships. These rules were recognised across the groups although applied in various different ways. In contrast to the fears expressed in the media that technologies such as Facebook make young people vulnerable to sexual predators (e.g. newspaper coverage "Failed by Police. Failed by Facebook. A family torn apart by the cunning of an online predator". *Daily Mail*, 2010), there is evidence that application of their rules may reduce the risks of sexual contact that young people face when meeting through other means. This is consonant with findings Rice et al.'s study in 2010 from the US on high risk young people which found a protective influence of SNS on sexual behaviours.

The role of Web 2.0 technologies such as SNS in enabling people to find sex partners online has been described in relation to particular risk groups such as MSM and in it the Internet is generally characterised as a 'risk environment' (Rietmeijer & McFarlane, 2009). However, although it has been acknowledged that SNS are integral to young people's social lives, Subrahmanyam & Greenfield (2008) observe that are not generally used by adolescents as dating sites. Our focus groups provided some support for this: Facebook was largely disparaged by participants as a place to start relationships. However, in one group, half of the members had met partners through Facebook. As indicated in the discussions around sexual behaviour, these young women engaged in high risk sexual behaviours in the past and described instances where they had unprotected sex even when they did not want to do so because of concerns for their reputation if they carried a condom and because they recognised that they had needed to have sex to support their self-esteem (see Section 5.3.2.1). It is possible therefore that the minority of people that do meet partners through Facebook are already at higher risk because of other factors.

Subrahmanyam & Greenfield (2008) suggest that SNS could be protective because they enable people to screen potential dates before meeting them. This follows research by Padgett et al. from 2007 which found this strategy was used by women using online dating sites. Consonant with this suggestion, there was consistent evidence from the groups that all Facebook users view profiles to form opinions about potential sexual partners. Female participants in my focus groups routinely cited this method as useful in deciding whether to meet someone. However, for male participants, viewing profiles was not used for screening, but instead it just informed how they would approach women or what they would expect from an encounter.

Several studies (for example, Moreno et al., 2009) have proposed that sites such as Facebook put young people at risk by encouraging potentially damaging self-disclosure of personal information. In my groups, several participants were acutely aware of the need to protect their privacy and in general were highly skilled in using the technology to do so. However, some participants were clearly less aware of the limitations of Facebook in protecting their privacy and may unwittingly share more information than they intended. Moreover, even highly sophisticated users were relatively relaxed about perceptions of breaches to their privacy when friends and partners were responsible.

5.4.3.2. Local area

From these focus groups, there was evidence that young people still conduct lots of the social lives within their local area but the size and nature of their areas varied significantly. Some groups spent most of their time within extremely localized areas that could be captured within just 2-3 MSOA boundaries. While the university student group (group 4) was the most concentrated within one MSOA area, they also had strong links beyond their local area. My groups were mainly conducted within inner and outer North London and it is not clear how the use of areas or perceptions of boundaries would vary for young people living outside of these areas. However, the variations in travel patterns and perceptions of travel that I found have similar themes to those found in Hull, Walsall and Wolverhampton (Green & White, 2007). Green and White describe young people 'trapped by space', both in terms of their physical travel and their horizons; this was evidence in group 2, where the 15-16 year old girls attending the youth summer school, travelled little and expressed very little interest in travelling beyond their local area. They also describe young people who have to break out of their local area in order to obtain opportunities for employment and education; participants in focus groups 3 and 6 travelled further afield in order to seek opportunities for work and training not available locally. Young men also sought opportunities to meet women outside of their local area, but in two groups, there was the perception they faced greater threats to their safety when they travelled outside of their locality to certain areas.

In common with the relational conceptualisation of area, (Cummins et al., 2007) for these young people, places for meeting potential partners were not culturally neutral; different individuals and groups perceive and experience the same contextual features variably. There was no consensus on what constitutes a 'safe' or 'suitable' meeting place but young people's choice of where they sought to meet partners bore some relationship to their social norms around sexual behaviours. For example, the Medical Student group, characterised by low risk social norms around sexual behaviour, agreed that clubs were not suitable places for meeting potential partners. In contrast, in the Diploma Student group, where some participants were seeking high numbers of sexual partnerships, discussions of meeting partners focused on experiences in clubs. Although in a different setting with different population groups, the themes arising are consonant with Akers et al.'s study where areas with few safe spaces for meeting people led to more opportunities for sexual risk taking amongst

disadvantaged individuals. In addition, living circumstances also appeared to influence young people's perceptions about where was safe to meet partners. College students had the opportunity and the inclination to meet partners through their halls of residence. While home was a place of safety for younger individuals living with parents, it was perceived as offering an invitation to have sex in older groups and particularly amongst those living alone.

5.5.Implications for Chapter 6

My focus groups reinforced the importance of local areas for young people in forming relationships. Although Facebook was the SNS of choice for these young people and integral to their social lives, in this age group, it was not perceived as an acceptable place to meet sexual partners not encountered offline first.

Given the heterogeneity in the size and shape of young people's area use and what they considered within their local area, there will be no single, ideal boundary to capture the scope of social/sexual networks in all young people. However, in general, young people routinely spent time in areas larger than that covered by an LSOA, suggesting this level would not adequately capture social/sexual networks in the majority of young people. In contrast, there was greater evidence to support using an MSOA boundary level for use in my study examining area SEC and chlamydia positivity.

Two factors also emerged from the groups that may explain or mediate the relationship between SEC and chlamydia:

- place of meeting last sexual partner: social norms around sexual behaviours appeared to be linked to young people's choice of where they sought to meet partners. In addition whilst young people did not seek to meet partners through Facebook, those that do meet partners in this way, may be at high risk.
- household living circumstances: As discussed in chapter 1, living circumstances may also be an important factor in how individuals experience education and there may be an interrelationship between individual SEC and household living circumstances in the association with sexual health.

These factors are included in the working model at the start of Chapter 6.

6. Cross-sectional study: comparison of socio-economic variations in chlamydia testing and positivity between geographical areas and service models

6.1. Introduction

Chapter 4 (NCSP data analysis) prompted the following questions about the delivery of chlamydia testing:

- Are groups with low coverage in the NCSP in 2008 (i.e. individuals living in the least deprived areas, men aged 20-24 years) tested for chlamydia in service models other than NCSP to a greater extent?
- Are area-level associations with access and chlamydia positivity explained by individual socio-economic characteristics, i.e. does screening reach disadvantaged individuals living in these areas? To what extent do area-level associations with chlamydia remain after individual SEC is taken into account?
- How does positivity in young people vary within local areas?

Chapter 5 (focus group study) reinforced the importance of local areas for young people in forming social networks. It illustrated how the shape and size of the areas in which they formed their networks varied. It also suggested two factors that may explain/mediate the relationship between SEC and chlamydia:

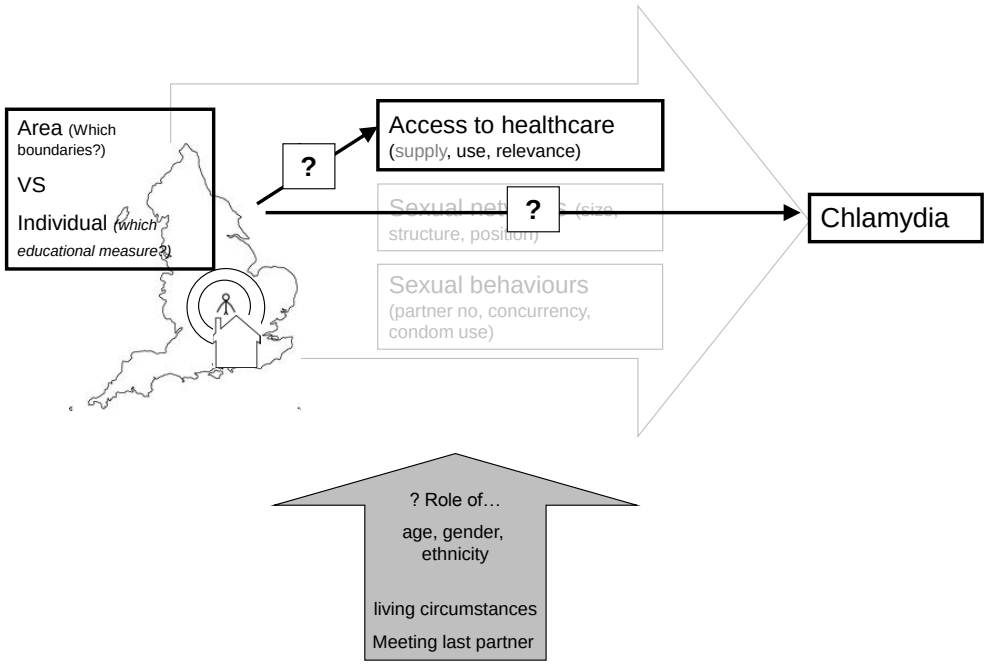
- Place of meeting last partner
- Household living circumstances (i.e. whether young people were currently living with other people and their relationship to these people and in what type of residence)

To address these questions, I conducted a cross-sectional study across different service models where individual-level SEC data and data on living circumstances and place of meeting their last partner were collected.

6.1.1. Hypotheses and working models

The study sought to test three hypotheses relating to SEC, service use and chlamydia positivity (Figure 6-1).

Figure 6-1. Working model to be tested in Chapter 6



Hypothesis 1. SEC and demographic patterns of chlamydia testing coverage will vary by service model

To address whether testing is reaching deprived individuals in deprived areas, I will also examine the extent to which service use reflects local educational profiles and the distribution of coverage amongst university attenders and those leaving education early.

Hypothesis 2: Young people with lower educational participation are more likely to have chlamydia than those with higher levels of participation

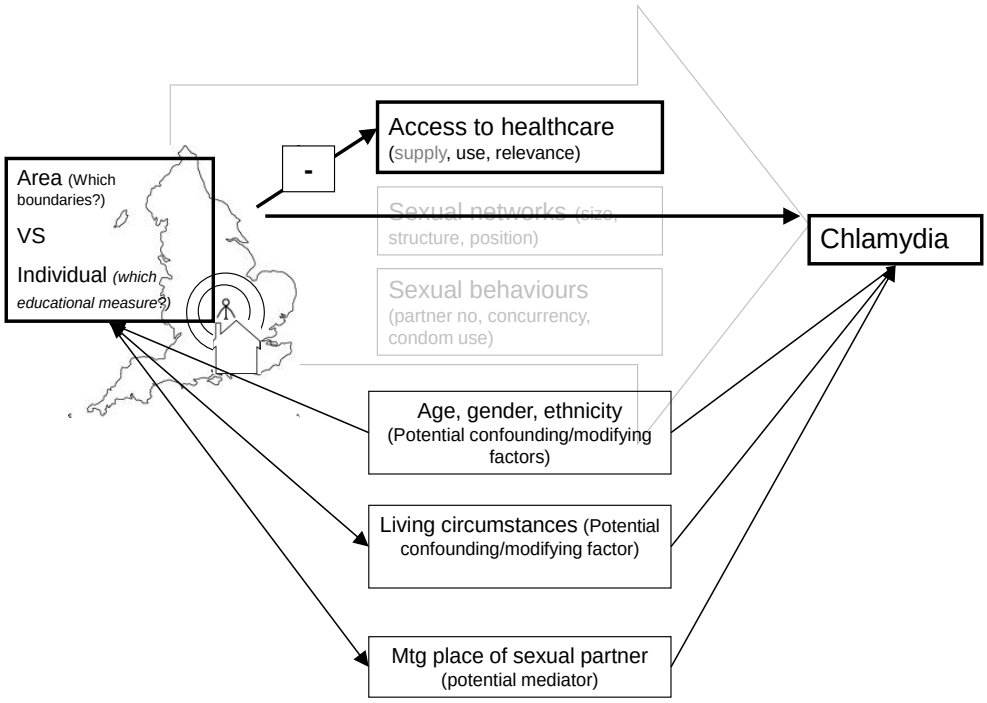
In relation to this hypothesis, I will also examine the extent to which any observed individual SEC variations are explained by other factors (e.g. age, gender, ethnicity, living circumstances and meeting partners).

Hypothesis 3: Young people living in more disadvantaged areas are more likely to test positive for chlamydia than those in less disadvantaged areas over and above their individual SEC

I will construct a multilevel model to examine area-level socio-economic associations with chlamydia over and above the associations with individual SEC and other individual-level factors significantly associated with chlamydia.

Figure 6-2 shows the model with further details included. Given this is a cross sectional study, it is not possible to distinguish between mediation and confounding or to examine temporal associations, so I am only seeking to examine how the relationship between SEC and chlamydia varies when these variables are taken into account.

Figure 6-2. Working model – conceptual basis for testing living circumstances and meeting partner



6.2. Methods

6.2.1. Sampling frame

I sought to obtain survey responses from all individuals aged 16-24 years tested for chlamydia in three selected locations, described in section 6.2.2.

6.2.2. Recruitment of participating locations

Initially I approached the NCSP at a national level and a range of NCSP local programme areas to recruit sites to take part in this study. I was seeking highly performing screening areas in terms of volume of screening or data quality. This was to ensure participating locations could achieve the sample size required whilst meeting their NHS service delivery requirements. I also sought areas with a range

of socio-economic and cultural diversity and educational participation. To address questions about how testing and positivity varied between service models providing chlamydia testing, I widened my scope to include GUM services and non-GUM, non-NCSP services (e.g. sexual health centres).

I recruited sites in three locations. They were in relatively deprived parts of England overall but had diverse population characteristics, educational profiles and provided chlamydia testing for young people under different service models (Table 6-1).

Doncaster, Bassetlaw, Rotherham and Barnsley (DBRB): the four local authority areas of Doncaster, Bassetlaw, Rotherham and Barnsley span South Yorkshire and northern East Midlands. It is an area of high deprivation overall and in respect to education, with no higher education establishments in the area at all. The population is mainly white British (95%). Terrence Higgins Trust (THT) was contracted by the four primary care trusts serving the area to provide a chlamydia screening office, which trains local services in providing screening, monitors coverage figures and collates the data across all sites for reporting to the NCSP. Chlamydia screening was provided by over 100 sites in the area registered with the NCSP. THT also provided approximately 50% of screening in the area using peer outreach workers.

Southampton: Southampton is characterised as a university town; with over 25,000 of the 30,000 18-22 year olds attending either University of Southampton or Solent University as undergraduates (Southampton City Council, 2005; Office for National Statistics, 2001). Chlamydia screening is provided by a specialist outpatient NHS GUM clinic with spokes in three primary care centres (Southampton GUM), and the Southampton Chlamydia Screening Programme (Southampton CSP). The Chlamydia Screening Office (CSO) for Southampton CSP provides a small volume of outreach screening directly; and lots of testing – both healthcare and non-healthcare – is provided through educational settings i.e. GPs working in university health centres and outreach events in university.

Camberwell Sexual Health Centre: Camberwell, crossing the border of Lambeth and Southwark Local Authority areas in South London, comprises an ethnically diverse population where approximately 50% are not White British. The area is highly economically deprived, though a relatively high proportion of residents have gained education, skills or training (see Table 6-1). Camberwell sexual health centre provides chlamydia testing amongst other sexual health services under the 'non-GUM non-NCSP' service model. Approximately 75% of young people attending the centre live in Lambeth and Southwark.

Table 6-1. Area characteristics of participating locations

		Ethnicity(1)	Age (1)	IMD 2010 characteristics			
				Average Score	Rank of Average Score (2)		
Site	Local authority	%White British	% population aged 16-24 years	IMD	IMD	Education	Employment
DBRB	Barnsley District	95.9%	9.9%	28.6	47	9	27
	Doncaster District	94.0%		29.8	39	11	21
	Rotherham District	93.4%		28.1	53	23	36
	Bassetlaw District	95.2%		25.0	82	35	128
Southampton	City of Southampton	82.7%	18.8%	25.0	81	61	70
Clinic postcode (Royal South Hants Hospital)				*39.3*			
Camberwell	Lambeth	55.6%	13.1%	31.2	29	223	23
	Southwark	52.6%		29.7	41	252	33
Clinic postcode (Camberwell Sexual Health centre)				*29.5*			
	England	83.6%	10.9%	n/a			

(1)Source: ONS 2007
(2) Ranked out of 294 local authorities, with 1 being most deprived

6.2.3. Survey instrument development

I developed a survey to collect the data necessary to explore the hypotheses proposed and to test the feasibility of obtaining data on educational participation in a service setting. To ensure that administration of the survey would take up the minimum amount of time in a consultation/screening offer, I restricted the questions on the survey to just three, focused on educational participation, household living circumstances and where people met their last partner.

I sought information on education as opposed to other SEC measures because in chapters 2, 3 and 4 education emerged as the most sensitive SEC measure to variations in the risk of chlamydia in young people. As chapter 1 described, educational measures may capture a range of interrelated, but distinct, mechanisms which could drive inequalities in young people's risk of chlamydia. While measures of achievement (e.g. highest qualification attained) may provide a stronger indication of cognitive abilities and health literacy, measures of participation (e.g. level of education undertaken, leaving age) may provide a measure of students' commitment to education and in turn their aspirations and opportunities.

I selected a measure of participation because the teenage pregnancy literature indicates that engagement with education is more important than cognitive abilities in young women's risk of pregnancy (Harden et al., 2009). Vuylsteke et al. (1999) also hypothesised that the nature of young people's educational participation may determine the social networks and in turn the sexual networks to which they belong.

I sought information on household living circumstances and where people met their last partner because they emerged as potentially relevant in focus groups. Living circumstances also emerged from the SEC literature (see chapter 1) as an influence on young people's experience of higher education. These two questions have been asked of participants under 25 years in established national surveys such as Natsal-2000 and the Longitudinal Survey of Young People in England (National Centre for Social Research, 2011). I based the wording of my instrument as closely as possible on the questions asked in these surveys, but with responses to the question on meeting partners informed by the venues that featured most prominently in discussions of forming relationships in my focus groups.

6.2.4. Survey pilot

I consulted a group of peer outreach workers (most were in the target age range for chlamydia screening) in Doncaster on the survey instrument and participant information sheet. The group gave feedback on the options available for each item, the clarity and user-friendliness of the wording and the layout of the instrument. I also shadowed the outreach workers offering screening in pubs and clubs in Doncaster to understand how the survey would be administered in practice. As a result of the consultation, I simplified the wording of the introductory text, aligned the survey's format to the screening worker's routine data collection forms and changed the order of survey responses.

Screening workers observed that young people in pubs and clubs rarely want to take away health promotion literature, which often ends up discarded on the floors of venues. In response to this observation, I produced a laminated participant information sheet in addition to the paper copies, so screening workers could still share necessary details of the study, without participants having to take away any paperwork. I also developed an information sheet to support screening workers or clinicians to complete the survey with young people with a Q&A section developed from their questions and comments (see Appendix 6 for the survey tool and information sheets).

In other sites, I visited the clinics in which the survey would be used and consulted clinical and administrative staff on how the survey should be administered and what adaptations would be needed to make the tool suitable for use in their setting.

6.2.5. Routine data collection and data transfer

In all participating locations, the following demographic and service information was also routinely recorded for each chlamydia test:

- Chlamydia test result
- Age
- Gender
- Ethnicity
- Residential area
- Service setting and type (i.e. Contraceptive and Sexual Health service (CASH), GP, outreach)

Each site sent routinely recorded data and survey responses to Ali Talebi (AT) (HPA), who assigned an LSOA code based on postcode to each record and anonymised the dataset to remove date of birth, postcode and NHS number.

6.2.6. Study duration and data collection processes

Before the study started, I agreed with participating services an aspiration for 70% of those tested to complete surveys, and planned for at least 50% completion.

DBRB collected data from October 1 2010 to March 31 2011. Surveys were attached to forms used by screening workers to collect the information routinely required by the NCSP. I provided a Q&A session for outreach workers one week before the study started and they used the forms with surveys attached as soon as R&D approval was granted. Other NCSP providers in the area (e.g. GPs, CASH, youth services) received information about the study through THT (by email or face to face through training). THT did not distribute the NCSP forms to other providers until their current stock of forms had run out. I provided monthly updates on interim findings and completion rates to DBRB CSO, who disseminated the updates to outreach screening workers.

In Southampton GUM, data were collected from October 1 2010 to February 28 2011. Receptionists gave eligible patients presenting to the clinic the survey and information sheet as part of a set of routine paperwork to complete before their consultation took place. In Southampton CSP, data were collected from October 1

2010 to January 31 2011. As in DBRB, for the duration of the data collection period, surveys were attached to the routine screening forms. These were used as soon as data collection began by the Chlamydia Screening Office. However, there was a delay in adoption by other sites in CSP Southampton since forms plus surveys were only distributed to other provider settings when their current stock of forms ran out. Due to database problems in the Chlamydia Screening Office (described in Section 6.2.8.1), it was not possible to receive data from the CSP until the data collection period was almost over.

In Camberwell, data were collected from November 15 2010 to April 21 2011. Posters to raise awareness of the survey were displayed at the entrance to the clinic for the duration of the data collection period (copy in Appendix 6). The survey was produced as an A5 insert to patients' notes with the information sheet. When individuals aged 16-24 registered at the clinic, an alert appeared for receptionists to attach the survey to eligible patients' notes. Clinicians then asked the patient the survey questions during the consultation or gave it to patients to complete whilst they processed their test samples. The Centre's Information Manager, Zac Gleisner (ZG), collated the routine data and survey responses for the HPA. The first submission of data during the data collection phase indicated completion rates less than 20%. I raised this directly with the site. In response, I met with all clinicians at their weekly academic health slot and Camberwell provided dedicated help from a research assistant, Birgit Engler, (BE) working onsite. From February 2011, ZG, BE and I monitored survey completion weekly, BE visited the clinic daily and put up a poster-sized 'thermometer' which she updated each week to show responses obtained in the site. These initiatives raised awareness of the study amongst clinicians and receptionists and significantly improved completion rates from under 20% to over 65%.

6.2.7. Sample size calculation

I used analysis of the NCSP from 2008 (Chapter 4) to inform the sample size and study duration period required. In 2008, the overall risk of testing positive for chlamydia was 8% and the unadjusted odds of chlamydia positivity was 42% higher in women and 38% higher in men in the most deprived quintile compared with the least deprived. Approximately 4,000 responses would be required for 80% power to detect differences in positivity of the same magnitude as found in NCSP in 2008 stratified by gender, taking into account clustering by area. Assuming a 50% response rate, approximately 8,000 records would be required.

6.2.8. Ethics

Multisite research ethics approval for the study was obtained from the Outer West London Research Ethics Committee (ref: 10/H0709/054). Research Governance approval was obtained for each of the six participating NHS Trust areas.

6.2.9. Data cleaning and analysis

I cleaned and analysed the anonymised data using Stata10 (2007).

6.2.9.1. Cleaning and linkage

Linking survey and routine data: each participating location provided AT with two datasets: survey responses and tested population. In all sites except Southampton CSP, each dataset had a unique patient identifier so AT could match the records to create one dataset, which he sent to me. In Southampton CSP, there was no unique identifier available to link survey data to those tested. AT sent me this data directly and I used an alternative system to match date of attendance and date of birth across both datasets. Initially, for 185/733 records, the date of attendance and date of birth in the survey dataset was not found in the testing dataset and there were also ambiguities in the matching for 113 records (i.e. when more than one record had the same date of birth and the same date of attendance). I worked with Southampton CSP over several occasions to resolve these ambiguities and mismatches. CSO staff checked each record individually to resolve data input errors in either date of birth or date of attendance. This exercise was time consuming for all parties but improved Southampton CSP's completion rate by over 25% (from 14% to 21%).

Exclusions: I excluded the following records:

- data from patients under 16 years or over 24 years
- records collected from young people in correctional facilities on the grounds that whilst incarcerated, engagement with their local area is likely to be extremely limited
- duplicates (records with the same patient identification number and test date)
- chlamydia test result inconclusive (e.g. insufficient sample)
- CSP providers within DBRB and Southampton CSP where the survey was not in active use for most of the study period (i.e. where fewer than 10 surveys were completed during the study duration)

- records without a valid LSOA within England (so could not be assigned an IMD2010 score).

In addition, I restricted the sample to just one test for each individual. Where more than one test was carried out on the same individual during the study period, initially, I selected the first test performed during the study period. Because individuals tested more than once may have tested negative on their first visit but positive on a subsequent visit, I also repeated the analysis by selecting the first test where an individual tested positive.

I restricted analysis of positivity to just those that responded to the survey. However, where there was a partial response (i.e. 1 or more questions missing) I retained these in the dataset to examine whether missing data were more common in those testing positive compared with those testing negative for chlamydia.

Linking area code: I linked patients' residential area LSOA code to the Index of Multiple Deprivation 2010 (IMD2010) and the Indices of Deprivation educational domain (ID2010_education). I generated quartiles of deprivation by LSOA within the each participating location. For MSOA areas, I generated average IMD2010 and ID2010_education scores weighted for the population in each LSOA.

Imputing missing data: where individuals attended more than once and completed the survey on at least one visit, I used last observation carried forward to impute the answer to the education question. I checked the validity of this method on data from individuals in one site attending more than once who completed the survey on both occasions; their responses to the education question were the same in 71/72 cases.

Generating new variables/categorical variables: I generated new variables for young people who had tested more than once during the study's duration and those who left education aged 16 or younger. I grouped test settings into five categories (sexual health, general health, outreach, education and other).

I grouped ethnicity information into four categories - White (British, Irish, other), Black (mixed, African, Caribbean, British, other), Other and missing - in DBRB and in Southampton, where over 80% of the sample were white. In Camberwell, where less than 50% of the sample was white and there was greater ethnic diversity, I first examined the frequencies of ethnicity responses across the whole sample. I examined positivity across 8 categories, each with at least 5% of the sample in each group but this resulted in small subgroups with wide confidence intervals around

estimates of positivity so little could be inferred about differences between groups (see appendix 6). So, I also collapsed these categories to just 4 groups as in other sites. I retained records with missing ethnicity information in the dataset partly because Southampton CSP did not collect this information at all, and partly to examine whether the risk of chlamydia was higher in those that chose not to give ethnicity data.

6.2.9.2. Bias and sample characteristics

To assess the acceptability of obtaining information on educational participation in a service setting, I examined the proportion of the eligible population completing the survey in each location.

To ascertain whether there was bias in which population groups completed the survey, I compared the characteristics of the populations eligible to complete the survey with respondents in terms of their socio-demographics, risk of chlamydia, test setting and residential area IMD score.

6.2.9.3. Access

6.2.9.3.1. Service use

To examine the extent to which the SEC of those tested was representative of the resident population, I compared the educational profile of survey respondents with data on the resident population.

I used an indicator of the percentage of young people not staying in education post 16, available for local areas in the IMD 2007. In this indicator, the proportion not staying in education is calculated using child benefit data, because families with children aged over 16 were only entitled to child benefit if the child is still in fulltime education. For the denominator population, the resident population of 13-15 year olds in 2004 was used and the numerator was those aged 17-19 years in 2007 where the families are still claiming child benefit data. Figures are available within each local authority at LSOA level. Because LSOA areas have different (although similar) population sizes, I linked the data to Office for National Statistics (2007) small area population size estimates by LSOA. I constructed a weight proportional to the population size of each LSOA area first. I then applied these weights using STATA to generate a weighted median for each local authority area.

Those tested in services ranged from 16-24 years but to be comparable with the IMD2007 population (i.e. aged 17-19 years), I included just those less than 20 years in this analysis.

6.2.9.3.2. Population coverage of chlamydia testing

I generated figures for the population testing coverage (numbers tested/1000 target population) as described in section 4.2.3. I calculated coverage separately by service model, so data for Southampton are split into CSP and GUM. To generate the target denominator population I used 2007 estimates of 16-24 year olds obtained from the Office for National Statistics by LSOA (Small Area Population Estimates, 2007). I restricted the analysis to those tested in the services that were living in the local authority areas in which services were located because it was not possible to assign a denominator population to those living outside of these areas.

I examined the distribution of coverage by:

- area socio-economic quartile measured by IMD2010: For each numerator population, I matched respondent characteristics to the appropriate denominator population eg where the numerator was respondents living in the least deprived quartle, I used a denominator population of all 16-24 year olds living within the least deprived quartile of the relevant area.

- population group: by gender and age. For each numerator group, I matched respondent characteristics to the appropriate denominator population eg where the numerator was male respondents aged 16-19 years, I used a denominator population of all 16-19 year old men living within the relevant area.

- educational group within each socio-economic quartile, focusing on respondents currently in university or respondents who left education by 16 years. Where the numerator was those currently in university, I used a denominator population of 18-22 year olds in the relevant areas. Where the numerator was respondents who left by 16 years, I used the total population estimates.

6.2.9.4. Chlamydia positivity

Single level analysis: I conducted the analysis of the chlamydia positivity (number of positive tests/∑ positive + negative tests) separately by participating location amongst those who completed the survey.

I examined positivity in a bivariate analysis separately for men and women by individuals' demographic and service characteristics, educational participation and by their survey responses.

I tested whether socio-economic associations (measured by IMD, educational setting, or leaving education early) were the same for men and women or for those tested in sexual health vs. other settings. Where sample sizes were smaller e.g. in Camberwell, I collapsed education and IMD to dichotomous variables. Where there was significant interaction by gender, I analysed data separately.

Multilevel analysis: Multilevel modelling describes a series of regression analysis techniques that enable social epidemiologists to quantify how much health differences are attributable to variations in the context in which individuals live, over and above variations in their individual characteristics. Context is often measured as geographical area, but can be also applied to other groups such as schools, hospitals, services. (Centre for Multilevel Modelling, accessed 2011).

I sought to use multilevel modelling techniques for two reasons:

1. to control for clustering within areas: It is highly likely that the areas in which individuals are living may influence their health status. As a result, it is not possible to assume data from individuals within an area are truly independent observations – we need to consider them as 'clustered', which reduces the effective sample size of the study population (Centre for Multilevel Modelling, accessed 2011). Failure to take account of this clustering leads to underestimates of the standard errors of parameters such as odds ratios, and therefore there is a risk of concluding a statistically significant association exists where it does not.

2. to quantify the amount of variation in chlamydia positivity that can be attributed to variations in area deprivation characteristics compared with individual circumstances. It is possible to control for clustering using techniques (eg applying a 'design effect' related to the intraclass correlation) other than multilevel modelling. However, as Merlo et al. (2005 p443) argue "clustering of individual health within neighbourhoods is not a statistical nuisance that only needs to be considered for obtaining correct statistical estimations, but a key concept in social epidemiology that yields important information by itself".

In multilevel modelling, variance is first estimated when there are no explanatory variables in the analysis at all, to give an indication of how much variation there is

between areas. When individual-level variables are added to the model, the overall variance changes. A key parameter, the Variance Partition Coefficient (VPC); is a measure of the proportion of variance not explained by individual-level characteristics. Where all relevant individual-level characteristics are added to the model, this VPC represents the variance attributed to variation at area- level.

To identify which individual-level variables should be included in the multilevel models, I entered all the factors significantly associated with chlamydia in the bivariate analysis into a stepwise logistic regression. Informed by the results of the stepwise analyses, I also examined interactions by SEC for living circumstances and education.

I generated the following multilevel models to examine:

- the extent of variation in chlamydia positivity between areas (Model 1 – null model with no covariates)
- non-random distribution of demographic and service (i.e. non socio-economic) characteristics significantly associated with chlamydia (Model 2)
- individual educational participation: current participation in school/FE or university compared with not being in education (hypothesis 2 - Model 3)
- area deprivation: whether deprived quartiles of participating locations (measured by IMD2010 at MSOA level) were associated with increased chlamydia positivity over and above individual factors (hypothesis 3 – Model 4).

I conducted a sensitivity analysis to examine the extent to which results varied when different SEC variables were used: in relation to education, I generated a model using leaving education by 16 years instead of current education (Option A). In relation to area, I generated a model using the educational domain of IMD (ID2010_education – Option B) and another using LSOA as the boundary size (Option C). Finally, I generated a model using IMD2010 at MSOA level using data when tests selected for repeat visitors included any positive tests instead of first tests only (Option D).

I first sought to develop one multilevel model for all three areas. However, the single level regression models indicated different relationships between chlamydia positivity and individual level characteristics in each area. Combining the data from all three areas into one model masked these differences, partly because the sample

size from DBRB was so much larger than the other areas. As a result, I constructed separate models for each area.

6.3. Results

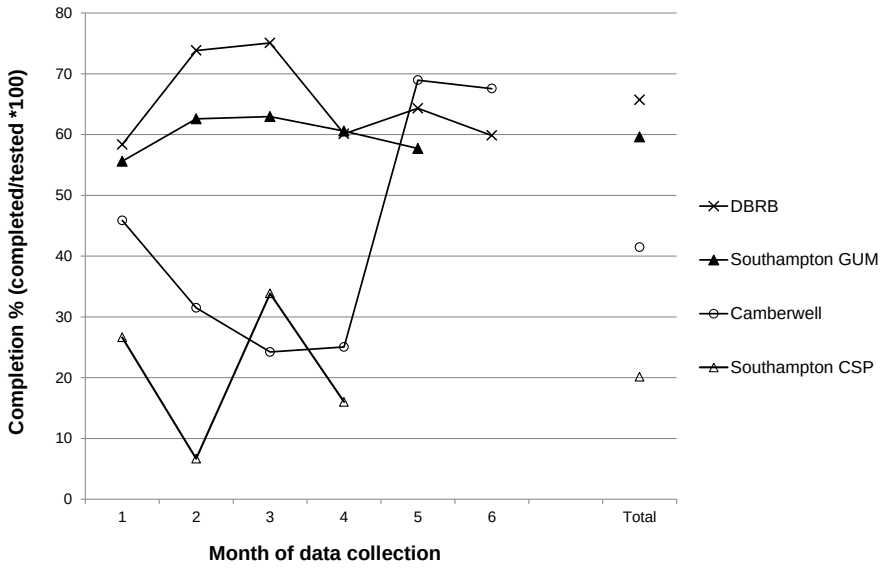
6.3.1. Data completion and population characteristics

6.3.1.1. Data completeness during the study and across sites

After records meeting exclusion criteria were removed (see Appendix 6), 16,404 tests for chlamydia were performed across all three participating locations on 14,784 individuals. In total 7,983 (54%) eligible individuals completed or partially completed the survey.

As shown in Figure 6-3, completion rates ranged from 67% in DBRB to just 21% in Southampton CSP and varied during the study's duration. In DBRB it peaked in January at 74% but fell slightly after PCTs announced the cancellation of THT's contract for outreach services (to take effect April 2011). In Camberwell, completion improved markedly from month 4 onwards following the assignment of an onsite research assistant to support the study and the instigation of weekly monitoring and feed back to clinic staff on completion rates.

Figure 6-3. Completion rates by month and location



6.3.1.2. Population characteristics: sample vs. respondents

As shown in Table 6-2, the populations tested varied significantly between locations. In DBRB, the sample was youngest and comprised a higher proportion of men than in Camberwell or Southampton. In Camberwell just 31% were from any white ethnicities whilst in DBRB 95% of those answering ethnicity questions were white British. Positivity was lowest in the CSP settings (4%) and highest in specialist sexual health settings (12% in Southampton GUM; 13% in Camberwell).

In Southampton GUM and Camberwell there were no significant differences in positivity between those responding to the survey and the population eligible to complete it. In DBRB, there was little indication of response bias across most characteristics although there was a higher proportion of men in those responding than in the tested population as a whole. The gender bias is due to higher proportions of women than men tested in sexual health service settings (which had lower completion rates overall than outreach and educational settings). In Southampton CSP, however, there was some indication of response bias. Responders were significantly more likely to be younger than those tested and there was a higher proportion of women amongst responders than the sample as a whole (although this difference was not significant). In addition, it was not possible ascertain bias in completion by ethnicity because these data were not collected (Table 6-2).

Table 6-2. Characteristics of tests and respondents by location

		DBRB	Ston GUM	Ston CSP	Camberwell
n	All	7,288	2,633	2,414	2,449
	Responders	4,888	1,631	499	965
Gender					
%male	All	55.3 [54.1;56.4]	39.2 [37.4;41.1]	42.5 [40.6;44.5]	35.2 [33.3;37.1]
[95%CI]	Responders	64.0 [62.6;65.3]	39.5 [37.1;41.9]	48.7 [44.3;53.1]	33.4 [30.4;36.3]
Age*					
Mean	All	18.8 [18.8;18.9]	20.6 [20.6;20.7]	19.7 [19.6;19.8]	21.0 16-24
[95%CI]	Responders	18.8 [18.8;18.9]	20.6 [20.5;20.7]	19.2 [19;19.4]	21.0 16-24
Ethnicity					
%White	All	97.3 [96.8;97.7]	89.6 [88.4;90.7]	no ethnicity	31.0 [29.1;32.8]
[95%CI]	Responders	97.5 [97;98]	90.3 [88.9;91.8]	information collected	30.6 [27.7;33.5]
Chlamydia test result					
%positive	All	5.1 [4.6;5.6]	11.9 [10.7;13.2]	4.4 [3.6;5.3]	11.5 [10.2;12.7]
[95%CI]	Responders	4.2 [3.7;4.8]	10.9 [9.3;12.4]	4.4 [2.6;6.2]	13.0 [10.8;15.1]
Area characteristics					
Mean	All	32.8 [32.4;33.2]	21.4 [20.9;21.9]	23.8 [23.3;24.3]	31.4 [31.1;31.8]
[95%CI]	Responders	32.3 [31.8;32.8]	20.9 [20.3;21.5]	25.0 [23.9;26]	31.5 [31;32.1]

* for Camberwell only, median age (range) is given due to significant skew in the distribution of ages
= significant differences ($p<0.05$) between sample population and responders

6.3.1.3. Sample characteristics: survey responses

The sample's educational participation varied significantly between locations (Table 6-3). In Southampton, 50% of young people were in university compared with just 5% in DBRB.

In DBRB, 29% had left education at 16 years old or earlier. In contrast, in Southampton this comprised just 11% and Camberwell 8% of the sample. It was not possible to derive a measure of leaving education by 16 years for 20% of the sample. This missing data was partly because some individuals did not enter an age of leaving education (9.7%, described as 'missing') but it was also those aged 16 who are still in school do not fit into any category (11%, described as 'non applicable').

Table 6-3. Survey responses by location

	DBRB		Southampton		Camberwell		ALL	
	n	%	n	%	n	%	n	%
Education:								
Current participation								
No	2,454	*50.2*	714	*33.5*	497	*51.7*	3,665	*45.9*
School/FE	2,214	*45.3*	357	*16.8*	233	*24.2*	2,804	*35.1*
University	220	*4.5*	1,059	*49.7*	231	*24.0*	1,510	*18.9*
Leaving age								
Left 16y or under	1,404	*28.7*	225	*10.6*	83	*8.6*	1,712	*21.5*
In education 17y+	2,212	*45.3*	1,704	*80.0*	696	*72.4*	4,612	*57.8*
Missing	514	*10.5*	117	*5.5*	146	*15.2*	777	*9.7*
Not applicable	758	*15.5*	84	*3.9*	36	*3.7*	878	*11.0*
Living circumstances								
Alone	431	*8.8*	142	*6.7*	155	*16.1*	728	*9.1*
Friends	131	*2.7*	731	*34.3*	206	*21.4*	1,068	*13.4*
Halls	86	*1.8*	290	*13.6*	40	*4.2*	416	*5.2*
Other (see A)	48	*0.9*	34	*1.6*	73	*7.6*	155	*1.9*
Parents	3,964	*81.1*	832	*39.1*	349	*36.2*	5,145	*64.5*
Partner	139	*2.8*	84	*3.9*	52	*5.4*	275	*3.4*
Missing	89	*1.8*	17	*0.8*	88	*9.1*	194	*2.4*
Where met last sexual partner								
Club	387	*7.9*	326	*15.3*	99	*10.3*	812	*10.2*
Education	1,325	*27.1*	813	*38.2*	242	*25.1*	2,380	*29.8*
Facebook	220	*4.5*	86	*4.0*	15	*1.6*	321	*4.0*
Other (see B)	1,241	*25.4*	187	*8.8*	352	*36.6*	1,780	*22.3*
Pub/bar	1,185	*24.2*	326	*15.3*	64	*6.6*	1,575	*19.7*
Work	275	*5.6*	366	*17.2*	89	*9.2*	730	*9.1*
Missing	255	*5.2*	26	*1.2*	100	*10.4*	381	*4.8*

A Living Circumstances (Other)

Living circumstances (other)	DBRB		Camberwell	
	n	%	n	%
Other family members	26	61.9	36	49.3
Own child/children	2	4.8	16	21.9
Homeless/hostel	4	9.5	9	12.3
Care system	6	14.3	5	6.8
Other (eg au pair, army)	4	9.5	7	9.6
Total	42	100.0	73	100.0

Note: In Southampton 'other' detail not recorded

B Meeting Partners (Other)

Where met last partner (other)	DBRB		Southampton		Camberwell	
	n	%	n	%	n	%
Friend/family	539	43.4	99	52.7	148	41.9
Public place	237	19.1	13	6.9	74	21.1
Private party	148	11.9	19	10.3	36	10.3
House	129	10.4	5	2.7	30	8.6
Holiday/abroad	65	5.2	17	9.3	7	2
Hobby/pastime	52	4.2	10	5.2	29	8.1
Internet	5	0.4	7	3.9	10	2.7
Other	67	5.4	17	9	19	5.3
Total	**1241**	**100**	**187**	**100**	**353**	**100**

In all sites, living with parents was most commonly reported but respondents' circumstances varied across locations. In DBRB, most respondents (81%) lived with parents. In Southampton, 40% lived with parents with a sizable minority of respondents living with friends (34%) or in halls (14%). In Camberwell, a greater proportion than in other locations lived alone (16%). In this site there was also higher proportions (9% vs. <2% in other locations) with missing data and living in 'other' circumstances (8% vs. <2% in other locations). In Camberwell, as shown in Figure 6-4, those living in other circumstances were most commonly in alternative family structures (e.g. with grandparents, siblings 50%) or raising their own children (22%), and a significant proportion were in hostels (12%) or in care (7%). These responses suggest that the 'other' category captured a group of young people in vulnerable living circumstances. It is possible that some of those who left this question blank would also fall into this group, if their living circumstances were also 'other' (i.e. not adequately captured by the options given on the survey).

Respondents most commonly reported meeting their last sexual partner in educational venues (30%) but 22% reported meeting in a range of 'other' places. As shown in Table 6-3b, in all locations respondents most commonly reported having met through friends (43% - including family, neighbours and ex-partners); or in public places (23% - including in parks, fields, on the street). Less than 5% reported meeting a partner through Facebook (Table 6-3) and as shown in Table 6-3b, use of other internet resources to meet partners was also low across all sites (<1%).

6.3.2. Access

6.3.2.1. Service use by educational profile

The proportion of those leaving education by age 16 amongst the resident population and amongst survey respondents is shown in Table 6-4. In DBRB, the profiles of the resident population and those tested were fairly similar, at least for men. It was not possible to obtain figures for the local populations staying in education by gender, but national statistics indicates that women are more likely to remain in education beyond 16 years,(Department for Education, 2011a) so DBRB may have reached a population that reflects its own resident population.

In Southampton, the profiles of those tested were very different in CSP from GUM; far fewer men and women had left education early in CSP than GUM. However, for both services the proportion leaving early was much lower than the average for Southampton.

In Camberwell, a smaller proportion of those tested had left education early than the average for Lambeth or Southwark. As the column on the far right shows, when those aged 18-19 who could be at university are excluded, the profile of those tested in the service is more similar to the resident population. The sample size is too small to make any firm conclusions, but it suggests that still fewer men and women in the tested population left education early than in the resident population.

Table 6-4. Educational profile: respondents vs. source population

Service	Local authority	Tested population	Not staying in education post 16 (%) Local population(1) Weighted median % (range)	Not staying in education post 16 (%) Survey respondents excl missing or n/a (2) % [95%CI]
DBRB	Barnsley	men	39.1 (0 - 70)	37.3 [32.1;42.5]
		women		28.4 [21.1;35.7]
	Bassetlaw	men	29.4 (0 - 72.7)	32.4 [24.6;40.2]
		women		10.9 [5.3;16.6]
	Doncaster	men	36 (0 - 81.2)	31.4 [27.3;35.4]
		women		20.8 [16.3;25.4]
	Rotherham	men	35 (0 - 73.3)	34.7 [30.7;38.6]
		women		23.7 [19.2;28.2]
Southampton CSP	Southampton	men	33.3 (0 - 69.6)	3.3 [0.1;6.4]
		women		3 [-0.4;6.4]
Southampton GUM		men		14.7 [8;21.4]
		women		13.1 [8.8;17.5]
Camberwell SHC	Lambeth	men	25 (0 - 75)	8 [-2.9;18.9]
		women		18 [7.2;28.8]
	Southwark	men	26.7 (0 - 100)	13.5 [2.3;24.7]
		women		6.5 [1.4;11.6]

Notes:

(1) Figures aggregated from IMD2007 data at lsoa, weighted for population size

(2) All respondents living in participating local authority areas. Exclusions: Missing = left education but did not give an age; N/a = 16y and still in education

6.3.2.2. Coverage of chlamydia testing

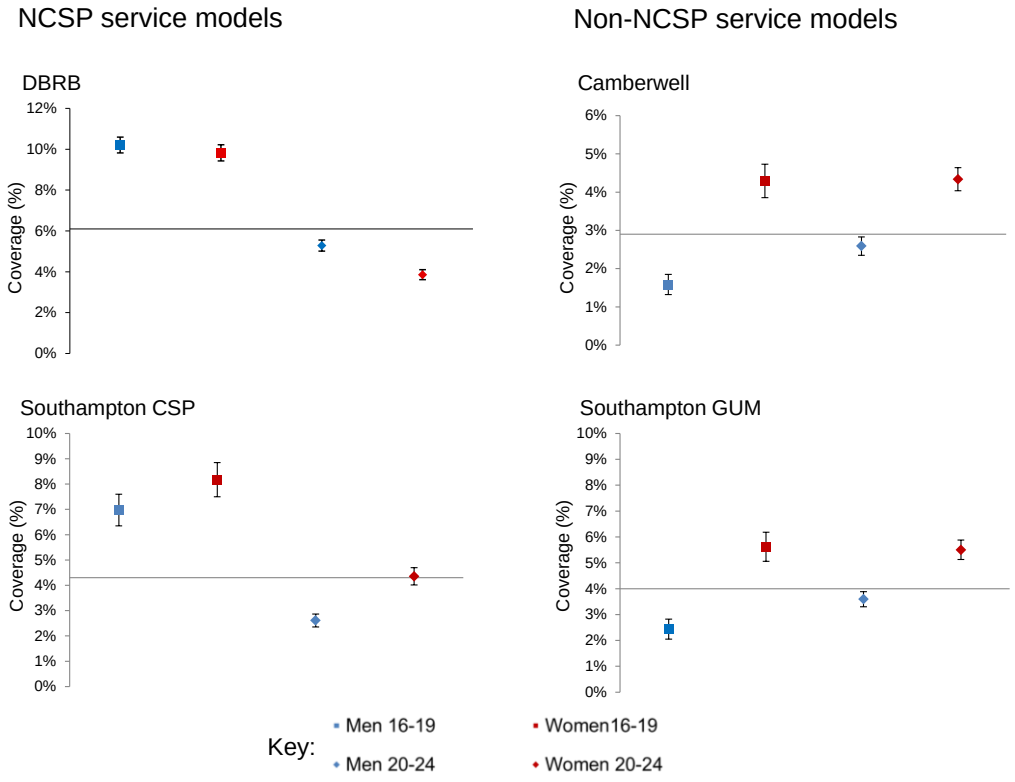
Table 6-5 shows the coverage of chlamydia testing in each area, calculated as the numbers tested per 1000 population within each IMD quartile. As shown in Table 6-5 coverage in DBRB was highest in the most deprived quartile (7.6%) and lowest in the least deprived areas (5.14% and 5.6% in the second least and least deprived quartiles). Across Southampton as a whole, coverage in CSP and GUM showed a similar distribution, both peaking in the third quartile (the second most deprived area), where the GUM clinic was also located. However, there was a slight variation between quartiles, with GUM accounting for more tests than in the least deprived areas (48%) than the most deprived (41%). In Camberwell (non-NCSP non-GUM) coverage was lowest in the least deprived quartile. It was highest in the most deprived quartile but the difference between quartiles 2-4 was not statistically significant.

Table 6-5. Variations in coverage between NCSP and non-NCSP models across SEC quartiles

	Coverage (%) [95% CI]			
	NCSP outreach	NCSP NHS	nonNCSP	nonNCSP
IMD2010	DBRB	Southampton CSP	Southampton GUI	Camberwell
1 (least deprived)	5.61 [5.34;5.91]	4.43 [4.15;4.74]	4.62[.33;4.92]	2.13 .67;2.72]
2	5.14 [4.88;5.4]	4.01 [3.71;4.33]	5.77[.42;6.15]	3.02[.74;3.33]
3	5.77 [5.52;6.04]	5.84 [5.37;6.36]	6.3[.81;6.84]	2.79 [2.59;3]
4 (most deprived)	7.57 [7.29;7.86]	3.34 [2.89;3.85]	4.69[.16;5.29]	3.11[.89;3.35]
n (screened)	7,098	1,993	2,106	1,836
n (population)	116,240	49,590	48,394	62,876

In Figure 6-4, coverage in men and women, over and under 20 years is plotted for each service model. The horizontal axis represents the total population coverage in the each service model. The scales of each graph are different, reflecting the different overall volumes of testing activity in each location, but the figure shows how coverage varies between men and women of different ages in each service model.

Figure 6-4. Variations in coverage between NCSP and non-NCSP models by age and gender



In the NCSP service models (DBRB, Southampton CSP), coverage was higher amongst those aged 16-19 (men and women) than those aged 20-24 years. Coverage was lower in both men and women aged 20-24 in DBRB than people

aged 20-24 years and it was particularly low in men aged 20-24 years in Southampton CSP.

In the non-NCSP service models, coverage was lower in all ages in men than women. However, in both these services coverage was higher in men 20-24 years than men aged 16-19 years.

Table 6-6. Coverage by deprivation quartile and educational profile.

	Coverage (%) [95% CI]			
	DBRB		Southampton	
IMD2010	Left education by 16y	Attending university	Left education by 16y	Attending university
1 (least deprived)	0.78 [0.69;0.	0.52 [0.42;0.65]	0.30 [0.24;0.39]	3.66 [3.33;4.02]
2	1.01 [0.9;1.1	0.31 [0.22;0.42]	0.32 [0.24;0.42]	3.05 [2.72;3.41]
3	1.21 [1.08;1.	0.30 [0.21;0.42]	0.70 [0.55;0.9]	4.20 [3.68;4.78]
4 (most deprived)	1.58 [1.45;1.	0.38 [0.3;0.49]	0.60 [0.43;0.83]	0.82 [0.56;1.21]
n (screened)	1,331	211	207	945
n (population)	116,240	54,678	49,765	29,034

In Table 6-6, coverage by IMD quartile is shown for respondents attending university and those reporting leaving education early. I have not shown analysis for the Camberwell population because there were less than 100 respondents leaving education early in total and in two quartiles there were 10 or fewer respondents.

In DBRB, coverage amongst those that left education by 16 years or younger was highest in the most deprived quartiles. In contrast, coverage amongst those in university was low overall, but there was no indication they were concentrated in the most deprived parts of the boroughs.

In Southampton, coverage was also highest in the most deprived quartiles amongst those leaving education by 16 years. Amongst those currently in university in Southampton, coverage was lowest in the most deprived quartile and higher overall in the least deprived quartiles, again suggesting that the coverage in the most deprived areas was not due to a student population. However, the patterns suggest also that the location of the GUM service may be a key determinant of access for students living nearby: coverage peaked in the 2nd most deprived quartile, which matches both the profile of the GUM clinic and several of Solent University halls of residence.

6.3.3. Chlamydia positivity

6.3.3.1. DBRB

The results of a bivariate analysis of positivity in DBRB are shown in Table 6-7 and Table 6-8. Overall, unadjusted positivity was lower in men (3.5% - Table 6-7) than women (5.4% - Table 6-8). The odds of testing positive were over seven times higher for men tested in sexual health settings than those tested in other venues, but there were wide confidence intervals due to small numbers of men tested in sexual health service settings. Men aged 23-24 years were seven times more likely to test positive compared with men aged 16-17 years. In contrast, there were no significant variations in women. There were no significant variations in positivity by ethnicity in men or women.

Men and women who were currently in school/FE (or university) were less likely to test positive for chlamydia than those were not currently in education but respondents who had left education early were not at significantly greater risk than those remaining in education beyond 17 years. While men's risk of chlamydia positivity was higher amongst men who met partners in clubs and in pubs than those meeting through education, women's risk did not vary significantly by where they met their last partner. In both men and women, there were no variations in positivity by area SEC. There was no significant interaction by gender for the relationship between chlamydia and any SEC variable ($p>0.1$), so adjusted analyses are reported for both men and women together.

When all variables were entered stepwise into a logistic regression model with educational participation or area deprivation, gender, service type and age remained significantly associated with chlamydia (see Appendix 6). Ethnicity, living circumstances and meeting place were not significant so were not included in the multilevel models.

Table 6-7. Bivariate analysis of chlamydia positivity in men in DBRB

Variable			Positivity			
		n	(%) [95% CI]	Odds ratio	[95% CI]	p
Overall		3,127	3.54 [2.89;4.19]			
	nonSHS	3,067	3.2 [2.57;3.82]	1		
Service type	SHS	60	20 [9.79;30.21]	7.57	[3.9;14.71]	<0.01
	16-17y	902	0.89 [0.27;1.5]	1		
	18-19y	1,051	4.95 [3.64;6.26]	5.82	[2.75;12.31]	<0.01
	20-22y	878	3.53 [2.31;4.75]	4.09	[1.87;8.95]	<0.01
Age group	23-24y	296	6.42 [3.62;9.22]	7.67	[3.32;17.7]	<0.01
Ethnicity	White	2,355	3.82 [3.05;4.6]	1		
	Other	39	0 › positive cases			
	Black	29	3.45 [-3.31;10.21]	0.9	[0.12;6.68]	0.92
	missing	704	2.7 [1.5;3.9]	0.7	[0.42;1.15]	0.16
Education:						
Current participation	no	1,741	4.88 [3.87;5.9]	1		
	school/FE	1,258	1.91 [1.15;2.66]	0.38	[0.24;0.6]	<0.01
	uni	128	0.78 [-0.75;2.31]	0.15	[0.02;1.11]	0.06
Leaving age	left16	1,022	4.5 [3.23;5.77]	1		
	stayed17	1,334	3.15 [2.21;4.09]	0.69	[0.45;1.06]	0.09
	leaving age missing	353	6.23 [3.71;8.76]	1.41	[0.84;2.38]	0.2
	notappl	418	›ositive cases			
Living circum-stances	Alone	254	4.33 [4.33;1.82]	0.83	[0.26;2.67]	0.75
	Friends	77	5.19 [5.19;0.2]	1		
	Halls	53	1.92 [1.92;-1.85]	0.36	[0.04;3.3]	0.36
	Other	24	3.85 [3.85;-3.7]	0.73	[0.08;6.84]	0.78
	Parents	2,589	3.44 [3.44;2.74]	0.65	[0.23;1.82]	0.41
	Partner	77	3.9 [3.9;-0.46]	0.74	[0.16;3.42]	0.7
	Missing	53	1.92 [1.92;-1.85]	0.36	[0.04;3.3]	0.36
Where met last partner	Club	314	5.1 [5.1;2.66]	2.61	[1.29;5.29]	0.02
	Education	794	2.02 [2.02;1.04]	1		
	Facebook	163	4.29 [4.29;1.17]	2.18	[0.88;5.39]	0.09
	Other	685	3.65 [3.65;2.24]	1.84	[0.98;3.48]	0.06
	Pub	834	4.56 [4.56;3.14]	2.32	[1.28;4.2]	0.01
	Work	170	4.12 [4.12;1.12]	2.09	[0.85;5.16]	0.11
	Missing	167	0.6 [0.6;-0.58]	0.29	[0.04;2.22]	0.24
Area circumstances:						
IMD2010	1(least deprived)	740	3.78 [3.78;2.41]	1		
	2	855	3.86 [3.86;2.57]	1.02	[0.61;1.71]	0.94
	3	718	2.79 [2.79;1.58]	0.73	[0.41;1.31]	0.29
MSOA	4 (most deprived)	814	3.56 [3.56;2.29]	0.94	[0.55;1.59]	0.82

Key: p<0.05

Table 6-8. Bivariate analysis of chlamydia positivity in women in DBRB

Variable		Positivity					
		n	(%)	[95% CI]	Odds ratio	[95% CI]	p
Overall		1,761	5.44	[4.38;6.51]			
	nonSHS	1,581	5.25	[4.15;6.35]	1		
Service type	SHS	180	7.78	[3.85;11.7]	1.52	[0.84;2.74]	0.16
	16-17y	672	4.46	[2.9;6.03]	1		
	18-19y	611	5.56	[3.74;7.39]	1.26	[0.76;2.09]	0.37
	20-22y	364	7.14	[4.49;9.79]	1.65	[0.96;2.83]	0.07
Age group	23-24y	114	6.14	[1.71;10.57]	1.4	[0.6;3.27]	0.44
Ethnicity	White	1,265	5.3	[4.06;6.53]	1		
	Other	15	0	no positive cases			
	Black	11	0	no positive cases			
	missing	470	6.38	[4.17;8.6]	1.22	[0.78;1.9]	0.38
Education:							
Current participation	no	713	6.87	[5.01;8.73]	1		
	school/FE	956	4.6	[3.27;5.93]	0.65	[0.43;0.99]	0.05
	uni	92	4.35	[0.15;8.54]	0.62	[0.22;1.75]	0.36
Leaving age	left16	382	6.28	[3.84;8.72]	1		
	stayed17	878	5.58	[4.06;7.1]	0.88	[0.53;1.46]	0.62
	leaving age missing	161	6.83	[2.92;10.74]	1.09	[0.52;2.29]	0.81
	notappl	340	3.82	[1.78;5.87]	0.59	[0.3;1.18]	0.14
Living circum-stances	Alone	177	7.91	[3.92;11.9]	1.07	[0.34;3.41]	0.9
	Friends	55	7.41	[0.35;14.46]	1		
	Halls	34	11.76	[0.76;22.76]	1.67	[0.39;7.16]	0.49
	Other	21	9.09	[-3.21;21.39]	1.25	[0.21;7.37]	0.81
	Parents	1,375	5.24	[4.06;6.42]	0.69	[0.24;1.97]	0.49
	Partner	62	0	no positive cases			
	Missing	37	2.7	[-2.6;8]	0.35	[0.04;3.24]	0.35
Where met last partner	Club	73	6.85	[1.01;12.69]	1.49	[0.55;4.02]	0.43
	Education	531	4.71	[2.9;6.51]	1		
	Facebook	57	3.51	[-1.31;8.33]	0.74	[0.17;3.19]	0.68
	Other	556	5.04	[3.22;6.86]	1.07	[0.62;1.87]	0.8
	Pub	351	6.84	[4.19;9.48]	1.49	[0.83;2.65]	0.18
	Work	105	7.62	[2.52;12.72]	1.67	[0.73;3.81]	0.22
	Missing	88	5.68	[0.81;10.55]	1.22	[0.45;3.27]	0.69
Area circumstances:							
IMD2010	1(least deprived)	431	6.03	[3.78;8.28]	1		
	2	485	4.54	[2.68;6.39]	0.74	[0.41;1.33]	0.31
	3	411	5.84	[3.57;8.11]	0.97	[0.55;1.71]	0.91
MSOA	4 (most deprived)	434	5.76	[3.56;7.96]	0.95	[0.54;1.68]	0.87

Key: p<0.05

The multilevel models of positivity at MSOA level are shown in Table 6-9. A sensitivity analysis showing multilevel models with a range of alternative variables is shown in Table 6-10. As the empty model (Model 1) shows, there was no significant variations in positivity between areas (p=0.29). In Model 2, when the non-socio-economic variables associated with chlamydia are added to the model, there are still no significant variations in positivity between areas. The associations between these variables and positivity found in the bivariate analysis remain.

Hypothesis 1: association between individual educational participation and chlamydia

As shown in Model 3, the association between being in education and testing positive for chlamydia remains significant (p=0.04) when clustering and other social factors associated with chlamydia are taken into account. Compared with those not in education, young people currently in school (OR=0.68 [0.46;0.99]) and in university (OR=0.40 [0.16;0.99]) were less likely to test positive for chlamydia. As shown in Table 6-10 (Option A), when leaving age was included in the model instead of current participation, there was no significant association with chlamydia.

Hypothesis 2: association between area SEC and chlamydia

There was no association between living in a deprived area and positivity in DBRB over and above individual social factors (Model 4). When area deprivation was added to the model, the remaining (non-significant) variation between areas disappeared completely.

As shown in Table 6-10, there was no difference to the findings when alternative area level measures were used; there was still no association with chlamydia when the educational domain of IMD was used alone (Option B)and still no area level variation when LSOA boundaries were used instead of MSOA (Option C).

Table 6-9. Multilevel models at MSOA level showing individual and area-level associations with chlamydia positivity in DBRB

			Model 1 (empty model)	Model 2 (plus age & service type)	Model 3 (plus current education)	Model 4 (plus area deprivation (IMD)
N (individuals)			4,785	4,785	4,785	4,785
n (MSOA areas)			192	192	192	192
				OR [95% CI]	**OR [95% CI]**	**OR [95% CI]**
Individual-level variables	AGE	16-17		1.00	1.00	1.00
		18-19		2.34 [1.59;3.47]	2.00 [1.28;3.13]	1.99 [1.27;3.11]
		20-22		2.09 [1.37;3.18]	1.72 [1.03;2.87]	1.71 [1.02;2.87]
		23-24		2.96 [1.77;4.95]	2.31 [1.26;4.21]	2.31 [1.26;4.21]
	SERVICE	Non-sexual health		1.00	1.00	1.00
		Sexual health		3.38 [2.18;5.24]	3.40 [2.11;5.46]	3.43 [2.13;5.52]
	EDUCATION	Not in education			1.00	1.00
		In school/FE			0.68 [0.46;0.99]	0.67 [0.46;0.98]
		In university			0.40 [0.16;0.99]	0.39 [0.16;0.97]
Area-level variables	IMD 2010 QUARTILE	Least deprived				1.00
		q2				1.00 [0.67;1.48]
		q3				0.95 [0.64;1.42]
		Most deprived				0.83 [0.55;1.25]
Level 2 variance	(SE)		0.01 (0.14)	0.11 (0.14)	0.07 (0.15)	0.00 (0)
	p		0.450	0.19	0.31	1.00
Variance Partition Coefficient (%)			0.3%	3.3%	2.0%	0.0%

Key: p<0.05

Table 6-10. Sensitivity analysis: DBRB multilevel models with alternative individual and area SEC variables

			A: MSOA + IMD + **Individual education var=leaving age**		B: MSOA + education + **Area-level var=ID2010 education domain**		C: Education+ IMD + **Area level=LSOA**	
N (individuals)			3,616		4,785		4,785	
n (MSOA areas)			185		192		669	
			OR	**[95% CI]**	**OR**	**[95% CI]**	**OR**	**[95% CI]**
Individual-level variables	AGE	16-17	1.00		1.00		1.00	
		18-19	1.65	[1.03;2.65]	2.01	[1.28;3.14]	1.99	[1.27;3.11]
		20-22	1.52	[0.9;2.56]	1.71	[1.02;2.87]	1.71	[1.02;2.87]
		23-24	2.21	[1.18;4.14]	2.30	[1.26;4.21]	2.31	[1.26;4.21]
	SERVICE	CSP	1.00		1.00		1.00	
		GUM	4.71	[2.83;7.83]	3.35	[2.08;5.39]	3.43	[2.13;5.52]
	EDUCATION	notin ed			1.00		1.00	
		school			0.67	[0.46;0.98]	0.67	[0.46;0.98]
		university			0.39	[0.16;0.97]	0.39	[0.16;0.97]
		stayed in education	1.00					
		left education by 16 yrs	1.21	[0.86;1.69]				
Area-level variables	DEPRIVATION QUARTILE	least	1.00		1.00		1.00	
		q2	1.00	[0.64;1.57]	0.80	[0.53;1.21]	1.00	[0.67;1.48]
		q3	0.89	[0.56;1.4]	0.90	[0.6;1.34]	0.95	[0.64;1.42]
		most	0.90	[0.56;1.44]	0.95	[0.64;1.42]	0.83	[0.55;1.25]
Level 2 variance		(SE)	0.02	(0.1)	0.00	(0)	0.00	(0)
		p	0.43		1.00		1.00	
Variance Partition Coefficient (%)			0.5%				0.0%	

Key: p<0.05

6.3.3.2. Southampton

Overall positivity was similar in men (10**%**)(see Table 6-11) and women (10%)(see Table 6-12). The odds of testing positive in the GUM service was higher for both men (OR=3.2) and women (OR=2.2) compared with those tested in CSP. In line with national figures, women aged 18-19 years were most likely to test positive and men over 20 years were more at risk than those aged 16-17 years. However, in contrast to national patterns, positivity was lowest in women aged 16-17 years (3.4%) and men aged 23-24 years (5.2%). There were no significant associations with ethnicity, except for a lower positivity in those missing data. Individuals with no ethnicity data were significantly less likely to test positive for chlamydia but this is likely to be due to the lower positivity in CSP respondents (where no ethnicity data were collected). Service type and age remained significantly associated with chlamydia when entered into the stepwise logistic regression model with education, so were included in the multilevel model (Appendix 6)

Both men and women currently in education were less likely to test positive for chlamydia than those not currently in education but the odds ratios were not statistically significant ($p>0.05$). There was little difference in positivity between those staying in education and those that left early.

While in the bivariate analysis, living circumstances were not significantly associated with chlamydia, in analyses adjusted for age, gender and service type, individuals living in halls and with parents were at higher risk of testing positive than the reference group (living with friends) so this variable was retained in the multilevel model. In contrast, while in the bivariate analysis there were associations between meeting partners and chlamydia e.g. women meeting through pubs were more at risk compared with those meeting through education (OR=2.4), when adjusted for other factors these associations were attenuated and became non-significant.

There were no significant differences in associations by gender so a single multilevel model is presented for both men and women.

Table 6-11. Bivariate analysis of chlamydia positivity in men in Southampton

Variable		n	Positivity (%) [95% CI]	Odds ratio [95% CI]	p
Overall		887	9.02 [7.13;10.91]		
Service type	CSP	243	3.7 [1.32;6.09]	ref	
	GUM	644	11.02 [8.6;13.45]	3.22 [1.58;6.55]	<0.01
Age group	16-17y	101	4.95 [0.69;9.21]	ref	
	18-19y	204	9.80 [5.71;13.9]	2.09 [0.76;5.73]	0.15
	20-22y	430	10.93 [7.97;13.89]	2.36 [0.91;6.08]	0.08
	23-24y	152	5.26 [1.7;8.83]	1.07 [0.34;3.36]	0.91
Ethnicity	White	572	10.31 [7.82;12.81]	ref	
	Other	35	20 [6.54;33.46]	2.17 [0.91;5.19]	0.08
	Black	30	13.33 [0.94;25.72]	1.34 [0.45;3.97]	0.6
	missing	250	4 [1.56;6.44]	0.36 [0.18;0.72]	<0.01
Education:					
Current participation	no	282	9.93 [6.43;13.43]	ref	
	school/FE	157	6.37 [2.53;10.21]	0.62 [0.29;1.31]	0.21
	uni	448	9.38 [6.67;12.08]	0.94 [0.57;1.55]	0.8
Leaving age	left16	102	9.8 [4;15.61]	ref	
	stayed17	706	9.49 [7.32;11.66]	0.96 [0.48;1.94]	0.92
	missing	49	4.08 [-1.52;9.69]	0.39 [0.08;1.86]	0.24
	n/a	30	3.33 [-3.21;9.88]	0.32 [0.04;2.58]	0.28
Living circum-stances	Alone	38	7.89 [-0.81;16.6]	1.01 [0.29;3.55]	0.98
	Friends	295	7.8 [4.73;10.87]	ref	
	Halls	136	11.03 [5.74;16.32]	1.47 [0.74;2.91]	0.27
	Other	15	20 [-0.98;40.98]	2.96 [0.78;11.23]	0.11
	Parents	357	9.24 [6.23;12.26]	1.2 [0.69;2.1]	0.51
	Partner	38	7.89 [-0.81;16.6]	1.01 [0.29;3.55]	0.98
	Missing	8	0	no positive cases	
Where met last partner	Club	166	10.84 [6.09;15.59]	0.92 [0.51;1.66]	0.78
	Education	334	11.68 [8.22;15.13]	ref	
	Facebook	43	6.98 [-0.74;14.69]	0.57 [0.17;1.92]	0.36
	Other	80	8.75 [2.51;14.99]	0.73 [0.31;1.69]	0.46
	Pub	138	4.35 [0.93;7.77]	0.34 [0.14;0.83]	0.02
	Work	115	6.09 [1.69;10.48]	0.49 [0.21;1.13]	0.09
	Missing	11	0	no positive cases	
Residential area characteristics:					
IMD2010	1(least deprived)	250	9.58 [5.85;13.32]	ref	
	2	153	7.81 [4.51;11.11]	0.8 [0.43;1.5]	0.48
	3	269	8.05 [3.99;12.1]	0.83 [0.41;1.65]	0.59
LSOA	4 (most deprived)	215	10.6 [6.49;14.71]	1.12 [0.61;2.06]	0.72

Key: p<0.05

Table 6-12. Bivariate analysis of chlamydia positivity in women in Southampton

Variable		n	Positivity (%) [95% CI]	Odds ratio [95% CI]	p
Overall		1,243	9.57 [7.94;11.21]		
Service type	CSP	256	5.08 [2.38;7.78]	ref	
	GUM	987	10.74 [8.81;12.67]	2.25 [1.24;4.07]	0.01
Age group	16-17y	133	3.76 [0.51;7.01]	ref	
	18-19y	330	11.82 [8.33;15.31]	3.43 [1.32;8.91]	0.01
	20-22y	583	10.46 [7.97;12.95]	2.99 [1.18;7.6]	0.02
	23-24y	197	7.11 [3.51;10.71]	1.96 [0.69;5.57]	0.21
Ethnicity	White	893	10.64 [8.61;12.66]	ref	
	Other	58	13.79 [4.83;22.75]	1.34 [0.62;2.92]	0.46
	Black	34	8.82 [-0.86;18.51]	0.81 [0.24;2.71]	0.74
	missing	258	5.04 [2.36;7.72]	0.45 [0.25;0.81]	0.01
Education:					
Current participation	no	432	11.57 [8.55;14.6]	ref	
	school/FE	200	8 [4.23;11.77]	0.66 [0.37;1.2]	0.17
	uni	611	8.67 [6.44;10.91]	0.73 [0.48;1.09]	0.12
Leaving age	left16	123	9.76 [4.49;15.03]	ref	
	stayed17	998	9.72 [7.88;11.56]	1 [0.53;1.87]	0.99
	missing	68	8.82 [2.03;15.62]	0.9 [0.32;2.5]	0.83
	n/a	54	7.41 [0.35;14.46]	0.74 [0.23;2.41]	0.62
Living circum-stances	Alone	104	10.58 [4.63;16.52]	1.31 [0.64;2.68]	0.45
	Friends	436	8.26 [5.67;10.85]	ref	
	Halls	154	11.69 [6.59;16.78]	1.47 [0.81;2.68]	0.21
	Other	19	10.53 [-3.66;24.72]	1.31 [0.29;5.88]	0.73
	Parents	475	10.53 [7.76;13.29]	1.31 [0.83;2.05]	0.24
	Partner	46	no positive cases		
	Missing	9	22.22 [-6.61;51.06]	3.17 [0.64;15.85]	0.16
Where met last partner	Club	160	15 [9.44;20.56]	2.39 [1.36;4.17]	<0.01
	Education	479	6.89 [4.62;9.16]	ref	
	Facebook	43	6.98 [-0.74;14.69]	1.01 [0.3;3.45]	0.98
	Other	107	10.28 [4.49;16.07]	1.55 [0.76;3.17]	0.23
	Pub	188	9.57 [5.35;13.8]	1.43 [0.78;2.61]	0.24
	Work	251	10.76 [6.91;14.6]	1.63 [0.96;2.78]	0.07
	Missing	15	20 [-0.97;40.97]	3.38 [0.91;12.57]	0.07
Residential area characteristics:					
IMD2010	1(least deprived)	349	9.97 [6.73;13.21]	ref	
	2	292	6.47 [3.85;9.09]	0.62 [0.36;1.1]	0.1
	3	311	10.7 [7.19;14.22]	1.08 [0.65;1.81]	0.76
LSOA	4 (most deprived)	291	11.72 [7.9;15.55]	1.2 [0.72;2.01]	0.49
Key:	p<0.05				

Table 6-13 shows the multilevel models of positivity at MSOA level. In Model 1, the empty model, there was highly significant variation in positivity between

areas (p>0.001). In Model 2, when the distribution of non-socio-economic variables associated with chlamydia is taken into account, the variation in areas remains, with 10% still unexplained by the model.

Hypothesis 1: association between educational participation and chlamydia

As shown in Model 3, there was no statistically significant association between current educational participation and chlamydia positivity. As the sensitivity analysis shows (Table 6-14, Option A), leaving education early was similarly not a significant risk factor for testing positive.

When living circumstances are added to the model, the risk of chlamydia was still higher for individuals living in halls and living with parents compared with living with friends (Model 3b). The variation between areas is reduced slightly but remains significant (p=0.01).

Hypothesis 2: association between area SEC and chlamydia

Whilst the unexplained variation between areas fell from 8.5% to 7.5% when IMD was added to the model, it did not explain most of the variation between areas (Model 4). Contrary to the hypothesis proposed, young people living in the most deprived quartiles were not at higher risk of chlamydia than those living in the least deprived areas.

As shown in the sensitivity analysis (Table 6-14), there was some difference in the results when the educational domain of IMD was used instead of the composite index (Option B). There was significant variation between areas but still only a minority of variation between areas was explained by the addition of this variable into the model. As shown in Option C in Table 6-14, the larger MSOA geographical level appeared to be more sensitive to picking up variations between areas than the LSOA level, where there was no detectable variation between areas.

Table 6-13. Multilevel models at MSOA level showing individual and area level odds ratios for chlamydia positivity in Southampton

			Model 1	Model 2		Model 3a		Model 3b		Model 4	
			Empty	M1 plus nonSE covariates		M2 plus ed. participation		M3a plus living circumstances		M3 plus IMD	
N (individuals)			2,130	2,130		2,130		2,130		2,130	
n (MSOA areas)			155	155		155		155		155	
				OR	**[95% CI]**	**OR**	**[95% CI]**	**OR**	**[95% CI]**	**OR**	**[95% CI]**
Individual-level variables	AGE	16-17		1.00		1.00		1.00		1.00	
		18-19		2.16	[1.04;4.46]	2.53	[1.15;5.56]	2.62	[1.18;5.78]	2.64	[1.06;5.81]
		20-22		2.03	[1;4.12]	2.46	[1.09;5.58]	2.80	[1.23;6.38]	2.84	[1.25;6.46]
		23-24		1.06	[0.48;2.37]	1.27	[0.51;3.12]	1.49	[0.6;3.72]	1.51	[0.61;3.77]
	SERVICE	CSP		1.00		1.00		1.00		1.00	
		GUM		2.51	[1.56;4.06]	2.58	[1.57;4.22]	3.04	[1.82;5.06]	3.02	[1.81;5.04]
	EDUCATION	not in education				1.00		1.00		1.00	
		school				1.22	[0.67;2.2]	1.27	[0.69;2.32]	1.26	[0.69;2.3]
		university				0.87	[0.59;1.27]	0.95	[0.59;1.54]	0.94	[0.58;1.52]
	LIVING CIRC-UMSTANCES	Alone						1.35	[0.66;2.77]	1.33	[0.65;2.73]
		Friends						1.00		1.00	
		Halls						1.81	[1.03;3.17]	1.75	[0.99;3.07]
		Other						1.98	[0.67;5.81]	1.88	[0.64;5.53]
		Parents						1.66	[1;2.76]	1.63	[0.98;2.73]
		Partner						0.43	[0.12;1.49]	0.44	[0.13;1.52]
		missing						1.40	[0.28;7.02]	1.37	[0.28;6.8]
Area-level variable	DEPRIVATION QUARTILE	least								1.00	
		q2								0.82	[0.5;1.35]
		q3								1.14	[0.69;1.87]
		most								1.16	[0.69;1.94]
Level 2 variance	(SE)		0.34	0.36	(0.2)	0.34	(0.19)	0.31	(0.19)	0.27	(0.19)
p			0.00	0.00		0.00		0.01		0.02	
Variance Partition Coefficient (%)			9.3%	10.0%		9.3%		8.5%		7.5%	

Key: p<0.05

Table 6-14. Sensitivity analysis: Multilevel models with alternative individual and area-level SEC variables

			A: MSOA + IMD + **Individual education variable=leaving age**		B: MSOA + education + **Area level variable=ID2010 education domain**		C: Education+ IMD + **Area level=LSOA**		D: MSOA + education+ IMD+ **First visit selected where test result=positive**	
N (individuals)			2,130		2,130		2,180		2,130	
n (M or LSOA areas)			155		155		385		155	
			OR	**[95% CI]**	**OR**	**[95% CI]**	**OR**	**[95% CI]**	**OR**	**[95% CI]**
Individual-level variables	AGE	16-17	1.00		1.00		1.00		1.000	
		18-19	2.87	[1.08;7.61]	2.62	[1.19;5.8]	2.61	[1.2;5.65]	2.71	[1.24;5.94]
		20-22	3.02	[1.16;7.88]	2.80	[1.23;6.41]	2.79	[1.25;6.22]	2.79	[1.24;6.28]
		23-24	1.58	[0.56;4.46]	1.46	[0.58;3.66]	1.50	[0.61;3.67]	1.37	[0.55;3.4]
	SERVICE	CSP	1.00		1.00		1.00		1.00	
		GUM	2.75	[1.65;4.59]	3.01	[1.81;5.02]	2.96	[1.79;4.88]	3.19	[1.92;5.3]
		twice								
	EDUCATION	not in education			1.00		1.00		1.00	
		school			1.24	[0.67;2.27]	1.22	[0.68;2.2]	1.12	[0.62;2.03]
		university			0.99	[0.61;1.61]	0.93	[0.58;1.49]	0.90	[0.56;1.44]
		stayed in education	1.00							
		left education by 16 yrs	1.25	[0.79;2]						
	LIVING CIRC-UMSTANCES	Alone	1.60	[0.81;3.16]	1.33	[0.65;2.74]	1.33	[0.66;2.67]	1.36	[0.68;2.73]
		Friends	1.00		1.00		1.00		1.00	
		Halls	1.64	[0.93;2.87]	1.71	[0.97;3.04]	1.85	[1.12;3.06]	1.70	[0.98;2.95]
		Other	2.13	[0.74;6.15]	1.99	[0.68;5.87]	1.86	[0.65;5.3]	1.73	[0.59;5.06]
		Parents	1.80	[1.14;2.83]	1.65	[0.99;2.76]	1.63	[1;2.65]	1.68	[1.02;2.76]
		Partner	0.49	[0.14;1.65]	0.45	[0.13;1.55]	0.47	[0.14;1.59]	0.42	[0.12;1.45]
		missing	0.72	[0.09;6.02]	1.32	[0.26;6.6]	1.49	[0.31;7.07]	1.33	[0.27;6.55]
Area-level variables	DEPRIVATION QUARTILE	least	1.00		1.00		1.00		1.00	
		q2	0.827	[0.5;1.38]	1.64	[1.01;2.65]	0.85	[0.55;1.32]	0.81	[0.5;1.32]
		q3	1.148	[0.69;1.92]	1.15	[0.69;1.91]	1.23	[0.8;1.89]	1.10	[0.68;1.79]
		most	1.24	[0.73;2.13]	1.88	[1.09;3.23]	1.31	[0.87;1.98]	1.26	[0.77;2.07]
Level 2 variance	(standard error)		0.33	(0.22)	0.31	(0.2)	0.00	(0)	0.22	(0.17)
	p			0.01		0.01		1.00		0.03
Variance Partition Coefficient (%)			9.1%		8.6%		0.0%		6.3%	

Key: p<0.05

6.3.3.3. Camberwell

Overall positivity in men (16%) (Table 6-15) was substantially higher than positivity in women (9%) (Table 6-16). Variations in chlamydia positivity were also different for men and women. In men, in contrast to national patterns, positivity was not higher in men over 20 than those under 20 years. However, age variations in women were in line with national figures; women under 20 years were more likely to test positive than those over 20 years. In both men and women there was a significant association with ethnicity with those of white ethnicity having a lower positivity than other groups.

As shown in Table 6-15**,** men in education were less likely to test positive for chlamydia than those not currently in education. However, women in education were not significantly less likely to test positive than those not currently in education (Table 6-16). This may be driven by the very high positivity in men not in education (22%) compared with women not in education (10%). In contrast, the risk of chlamydia in school/FE was similarly high across men and women (18.6% and 17% respectively). A test for interaction was not significant for leaving education early or for current participation.

Age and ethnicity remained significantly associated with chlamydia when entered into the stepwise logistic regression model with education, so were all included in the multilevel model (see Appendix 6 for stepwise logistic regression results).

The interaction by gender was significant for IMD (p=0.03), so I report multiply adjusted analysis separately by gender.

Table 6-15. Bivariate analyses of chlamydia positivity in men in Camberwell

Variable		n	Positivity (%) [95% CI]	Odds ratio [95% CI]	p
	Overall	322	15.87 [13.43;18.32]		
Age group	16-17y	23	26.09 [7.67;44.51]	1	
	18-19y	64	23.44 [12.94;33.94]	0.87 [0.87;0.29]	0.8
	20-22y	128	19.53 [12.61;26.45]	0.69 [0.69;0.25]	0.48
	23-24y	107	11.21 [5.19;17.24]	0.36 [0.36;0.12]	0.07
Ethnicity	White	83	6.02 [0.85;11.19]	1	
	Other	39	12.82 [2.15;23.49]	2.29 [2.29;0.62]	0.21
	Black	181	24.86 [18.52;31.2]	5.16 [5.16;1.97]	<0.01
	missing	19	15.79 [-1.12;32.7]	2.92 [2.92;0.63]	0.17
Education: Current part-icipation	No	192	21.35 [15.52;27.19]	1	
	School/FE	70	17.14 [8.22;26.07]	0.76 [0.76;0.37]	0.45
	University	60	8.33 [1.25;15.41]	0.33 [0.33;0.13]	0.03
Leaving age	Left 16y or under	30	26.67 [10.51;42.82]	1	
	In education 17y+	224	15.18 [10.45;19.91]	0.49 [0.49;0.2]	0.12
	Missing	63	22.22 [11.83;32.61]	0.79 [0.79;0.29]	0.64
	Not applicable	3	33.33 [-32.25;98.91]	1.38 [1.38;0.11]	0.81
Living circumsta nces	Alone	51	21.57 [10.13;33.01]	3.99 [3.99;1.19]	0.03
	Friends	62	6.45 [0.26;12.64]	1	
	Halls	12	0 [0;0]	no cases	
	Other	14	21.43 [-0.96;43.82]	3.95 [3.95;0.77]	0.1
	Parents	147	21.09 [14.45;27.73]	3.87 [3.87;1.31]	0.01
	Partner	11	27.27 [-0.44;54.98]	5.44 [5.44;1.02]	0.05
	Missing	25	24 [6.85;41.15]	4.58 [4.58;1.17]	0.03
Where met last partner	Club	52	17.31 [6.89;27.73]	1.12 [1.12;0.45]	0.81
	Education	89	15.73 [8.09;23.37]	1	
	Facebook	9	33.33 [0.54;66.12]	2.68 [2.68;0.6]	0.2
	Other	93	17.2 [9.46;24.95]	1.11 [1.11;0.51]	0.79
	Pub	20	15 [-1.12;31.12]	0.95 [0.95;0.24]	0.94
	Work	30	20 [5.39;34.61]	1.34 [1.34;0.46]	0.59
	Missing	29	24.14 [8.23;40.05]	1.7 [1.7;0.61]	0.31
Area circumstances: IMD2010 (LSOA)	1(least deprived)	84	8.33 [2.36;14.3]	1	
	2	71	18.31 [9.22;27.4]	2.47 [2.47;0.93]	0.07
	3	77	22.08 [12.72;31.44]	3.12 [3.12;1.21]	0.02
	4 (most deprived)	90	23.33 [14.51;32.15]	3.35 [3.35;1.34]	0.01

Key: p<0.05

Table 6-16. Bivariate analyses of positivity in women in Camberwell

Variable		n	Positivity (%) [95% CI]	Odds ratio [95% CI]	p
	Overall	643	9.08 [7.66;10.49]		
Age group	16-17y	81	18.52 [9.99;27.05]	1	
	18-19y	129	15.5 [9.22;21.79]	0.81 [0.39;1.69]	0.79
	20-22y	252	8.33 [4.91;11.76]	0.4 [0.2;0.82]	0.04
	23-24y	181	6.08 [2.58;9.57]	0.28 [0.12;0.65]	<0.01
Ethnicity	White	212	5.66 [2.54;8.78]	1	
	Other	107	13.08 [6.65;19.52]	2.51 [1.12;5.64]	0.06
	Black	277	13 [9.02;16.97]	2.49 [1.26;4.91]	0.01
	missing	47	10.64 [1.71;19.57]	1.98 [0.66;5.93]	0.16
Education: Current part-icipation	No	307	10.42 [6.99;13.85]	1	
	School/FE	164	15.85 [10.24;21.47]	1.62 [0.93;2.82]	0.09
	University	172	5.23 [1.89;8.58]	0.47 [0.22;1.02]	0.08
Leaving age	Left 16y or under	53	9.43 [1.47;17.39]	1	
	In education 17y+	472	9.11 [6.51;11.71]	0.96 [0.36;2.55]	0.79
	Missing	83	13.25 [5.9;20.61]	1.47 [0.48;4.49]	0.62
	Not applicable	33	24.24 [9.37;39.12]	3.07 [0.91;10.38]	0.12
Living circumstances	Alone	105	8.57 [3.18;13.96]	1.39 [0.53;3.62]	0.63
	Friends	142	6.34 [2.31;10.37]	1	
	Halls	29	6.9 [-2.51;16.3]	1.09 [0.22;5.35]	0.99
	Other	58	17.24 [7.42;27.07]	3.08 [1.18;8.03]	0.02
	Parents	202	9.9 [5.76;14.04]	1.62 [0.72;3.68]	0.23
	Partner	42	9.52 [0.52;18.53]	1.56 [0.45;5.33]	0.59
	Missing	65	20 [10.18;29.82]	3.69 [1.49;9.16]	<0.01
Where met last partner	Club	48	10.42 [1.67;19.17]	2.12 [0.66;6.82]	0.19
	Education	154	5.19 [1.67;8.72]	1	
	Facebook	5	40 [-8.1;88.1]	12.17 [1.77;83.45]	0.02
	Other	260	11.54 [7.64;15.44]	2.38 [1.06;5.33]	0.07
	Pub	44	9.09 [0.48;17.7]	1.82 [0.52;6.37]	0.54
	Work	59	6.78 [0.3;13.26]	1.33 [0.38;4.58]	0.92
	Missing	73	19.18 [10.07;28.29]	4.33 [1.73;10.86]	<0.01
Area circumstances: IMD2010 (LSOA)	1(least deprived)	158	10.76 [5.9;15.62]	1	
	2	166	12.65 [7.57;17.73]	1.2 [0.61;2.37]	0.40
	3	170	7.65 [3.63;11.66]	0.69 [0.32;1.46]	0.69
	4 (most deprived)	149	10.74 [5.74;15.74]	1 [0.48;2.06]	0.72

Key: p<0.05

In contrast to other locations, women living with partners were no less likely to have chlamydia than other groups, and in fact, men living with partners were at higher risk than those living with friends (Table 6-15). In women, the risk of testing positive was over three times higher in the ‘other’ group.

There is suggestive evidence that being in education may be protective for those living in vulnerable household circumstances. As shown in Table 6-17, those in education in “other” circumstances were no more likely to test positive for

chlamydia than the baseline, while those not in education had over 4 times the odds of testing positive for chlamydia compared with respondents living with friends. However, a test for interaction between being in education and living in "other" circumstances was not significant (p=0.48).

Table 6-17. Interaction between living circumstances and education in the risk of chlamydia

	Not in education			In education		
	OR	[95% CI]	p	OR	[95% CI]	p
Alone	1.75	[0.71,4.31]	0.23	1.4	[0.42,4.65]	0.58
Friends	1			1		
Halls	0.58	[0.11,3.05]	0.52	0.58	[0.11,3.05]	0.52
Other	4.17	[1.53,11.34]	0.01	1.04	[0.24,4.54]	0.96
Parents	1.49	[0.65,3.42]	0.34	1.56	[0.59,4.13]	0.37
Partner	2.61	[0.84,8.11]	0.1	1.08	[0.12,9.74]	0.95
Missing	3.29	[1.22,8.85]	0.02	3.85	[1.28,11.56]	0.02

Key: p<0.05

In the logistic regression, living circumstances remained significant for men, but not for women, so it is included in the multilevel analysis for men. There were no associations between where young men met partners and their risk of chlamydia. Women meeting through education were less likely to test positive than those meeting in other venues. This association remained in the logistic regression so it included in the multilevel model for women.

Table 6-18 shows the multilevel models for men and Table 6-19 for women. In men, the variance between areas was not significant in the empty multilevel model (p=0.41 see Table 6-18, Model 1). As shown in Model 2, adjusting for age and ethnicity reduced the variation between areas still further. In women there was no variation between areas at all at the MSOA level (Table 6-19).

Hypothesis 1: association between individual educational participation and chlamydia

When education was added (Model 3), men's odds of testing positive for chlamydia were lower in those currently in school/FE (OR= 0.35 (95% CI [0.15;0.84]) or university (OR= 0.33 (95% CI[0.13;0. 85]) compared with men that had left education (Table 6-18). When living circumstances were added to the model, the association with education remained. In addition, although the confidence intervals are wide, men's odds of testing positive were substantially

higher for those living with partners (OR=8.64 (95% CI[1.36;54.95]) than with those living with friends.

As shown in Table 6-19, women in school/FE were not at lower risk of chlamydia than those not currently in education but both groups were at higher risk than those in university. When meeting partners in education was added to the model (Model 3b), the association with university was attenuated slightly (from 0.48 to 0.56) and was no longer significant at the 5% level.

As shown in the sensitivity analysis (Table 6-20), men leaving school early (Option A) had over twice the odds of testing positive than those staying on at 17 years but this association was not statistically significant (p>0.05). This may be because the sample size was smaller (9% of those responding were excluded because they did not give a leaving age or they were 16 years old and still in school). In women, there was no significant association between chlamydia and leaving education early (Table 6-21).

HYPOTHESIS 2: associations between living in deprived parts of participating locations and chlamydia

When deprivation was added to the model (Model 4), the odds of chlamydia amongst men living in quartiles of highest deprivation were three times higher than those in the least deprived areas (OR=3.21 95% CI[1.25;8.27]). However, the addition of IMD did not attenuate the association with education and the level 2 variance disappeared altogether. This suggests that there are other factors significantly associated with chlamydia affecting this association that are not included in the model.

As shown in Model 4, there was no gradient in positivity between areas in women. As shown in the sensitivity analyses, the associations did not change significantly in either men or women when area deprivation was measured by the educational domain of IMD2010 (Option B), or at LSOA level (Option C), although at this level there was even less variation between areas.

Table 6-18. Multilevel models of positivity at MSOA level in Camberwell: men

			Model 1 Empty		Model 2 M1 plus age & ethnicity		Model 3a M2 plus ed participation		Model 3b M3a plus living circumstances		Model 4 M3b plus IMD quartiles	
N (individuals)			322		322		322		322			
n (MSOA areas)			116		116		116		116			
					OR	[95% CI]	OR	[95% CI]	OR	[95% CI]	OR	
Individual-level variables	AGE	16-17			1.00		1.00		1.00		1.0	
		18-19			0.82	[0.25;2.66]	0.64	[0.2;2.04]	0.83	[0.25;2.69]	0.8	
		20-22			0.48	[0.14;1.61]	0.42	[0.13;1.35]	0.50	[0.15;1.68]	0.5	[illegible]
		23-24			0.29	[0.08;1.04]	0.25	[0.07;0.9]	0.28	[0.08;1.05]	0.27	[0.07;1.05]
	ETHNICITY	White			1.00		1.00		1.00		1.00	
		Black			5.15	[1.89;14.02]	5.81	[2.14;15.76]	4.64	[1.54;13.97]	4.29	[1.41;13.05]
		Other			2.38	[0.63;9.03]	2.41	[0.64;9.13]	2.19	[0.53;9.05]	1.84	[0.43;7.82]
		Missing			3.46	[0.72;16.7]	3.57	[0.74;17.25]	3.36	[0.64;17.83]	3.19	[0.59;17.3]
	EDUCATION	No			1.00		1.00		1.00		1.00	
		School/FE			0.35	[0.15;0.85]	0.35	[0.15;0.84]	0.35	[0.15;0.85]	0.34	[0.14;0.84]
		University			0.28	[0.1;0.77]	0.33	[0.13;0.85]	0.33	[0.12;0.91]	0.29	[0.1;0.84]
	LIVING CIRC-UMSTANCES	Alone							2.41	[0.67;8.75]	2.24	[0.61;8.27]
		Friends							1.00		1.00	
		Halls							no cases		no cases	
		Other							3.34	[0.61;18.46]	2.81	[0.49;16.24]
		Parents							2.10	[0.64;6.86]	2.13	[0.64;7.13]
		Partner							6.84	[1.11;42]	7.84	[1.18;52.2]
		missing							2.53	[0.59;10.81]	2.69	[0.62;11.69]
Area-level variable	IMD 2010 QUARTILE	Q1 (least deprived)									1.00	
		Q2									2.47	[0.87;7]
		Q3									3.57	[1.29;9.89]
		Q4 (most deprived)									3.29	[1.24;8.68]
Level 2 variance		(SE)	0.00	0.00	0.00	(0)	0.00	(0)	0.00	(0)	0.00	(0)
		p	1.00		1.00		1.00		1.00		1.00	
Variance Partition Coefficient (%)			0.0%		0.0%		0.0%		0.0%		0.00	

Key: p<0.05

Table 6-19. Multilevel models of positivity at MSOA level in Camberwell: women

			Model 1 Empty		Model 2 M1 plus age & ethnicity		Model 3a M2 plus ed participation		Model 3b M3a plus met partner in ed		Model 4 M3b plus IMD quartile	
N (individuals)			643		643		643		643		643	
n (MSOA areas)			179		179		179		179		179	
					OR	**[95% CI]**	**OR**	**[95% CI]**	**OR**	**[95% CI]**	**OR**	**[95% CI]**
Individual-level variables	AGE	16-17			1.00		1.00		1.00		1.00	
		18-19			0.85	[0.4;1.79]	0.95	[0.43;2.09]	0.91	[0.41;2.03]	0.96	[0.44;2.13]
		20-22			0.47	[0.22;0.98]	0.58	[0.24;1.4]	0.51	[0.21;1.26]	0.53	[0.22;1.28]
		23-24			0.32	[0.14;0.75]	0.33	[0.12;0.86]	0.30	[0.11;0.78]	0.31	[0.12;0.8]
	ETHNICITY	White			1.00		1.00		1.00		1.00	
		black			2.08	[1.03;4.2]	1.94	[0.94;3.97]	1.97	[0.95;4.05]	2.20	[1.06;4.54]
		other			2.21	[0.97;5.03]	2.05	[0.89;4.7]	2.20	[0.95;5.07]	2.33	[1.01;5.4]
		missing			2.08	[0.68;6.37]	1.88	[0.61;5.8]	1.91	[0.62;5.95]	2.00	[0.65;6.16]
	EDUCATION	No					1.00		1.00		1.00	
		School/FE					0.91	[0.46;1.82]	0.96	[0.48;1.93]	0.94	[0.47;1.89]
		University					0.44	[0.2;0.98]	0.52	[0.23;1.16]	0.47	[0.21;1.06]
	MET PARTNER IN EDUCATION?	Yes							0.36	[0.16;0.78]	0.35	[0.16;0.77]
		No							1.00		1.00	
Area-level variable	DEPRIVATION QUARTILE	Q1 (least deprived)									1.00	
		Q2									0.86	[0.42;1.75]
		Q3									0.47	[0.21;1.05]
		Q4 (most deprived)									0.67	[0.31;1.43]
Level 2 variance	(SE)		0.00	(0)	0.02	(0.2)	0.00	(0)	0.00	(0.21)	0.00	(0)
p			1.00		0.46		0.50		1.00		1.00	
Variance Partition Coefficient (%)									49.0%			

Key: p<0.05

Table 6-20. Sensitivity analysis: Multilevel models with alternative individual and area-level

			A: MSOA + IMD + **Individual education variable=leaving age**		B: MSOA + education + **Area level variable=ID2010**		C: EMPTY MODEL **Area level =LSOA**		D: MSOA + education+ IMD+ **First visit selected where test result=positive**	
N (individuals)			254		322		322		322	
n (M or LSOA areas)			102		116		207		116	
			OR	**[95% CI]**	**OR**	**[95% CI]**			**OR**	**[95% CI]**
Individual-level variables	AGE	16-17	1.00		1.00				1.00	
		18-19	0.79	[0.25;4.54]	0.96	[0.29;3.23]			0.70	[0.21;2.31]
		20-22	1.00	[0.25;3.95]	0.63	[0.18;2.25]			0.43	[0.12;1.47]
		23-24	0.36	[0.08;1.72]	0.28	[0.07;1.09]			0.23	[0.06;0.87]
	ETHNICITY	White	1.00		1.00				1.00	
		black	3.89	[0.88;17.28]	3.84	[1.25;11.82]			5.78	[1.86;18.01]
		other	1.99	[0.34;11.74]	1.70	[0.4;7.25]			2.20	[0.51;9.55]
		missing	1.26	[0.08;18.72]	2.94	[0.54;16.13]			3.86	[0.7;21.34]
	EDUCATION	notin ed			1.00				1.00	
		school			0.38	[0.15;0.95]			0.32	[0.13;0.8]
		university			0.32	[0.11;0.92]			0.33	[0.12;0.88]
		stayed in education	1.00							
		left education by 16 yr	2.37	[0.81;6.96]						
	LIVING CIRC-UMSTANCES	Alone	5.91	[1.04;33.64]	2.61	[0.69;9.85]			1.67	[0.49;5.71]
		Friends	1.00		1.00				1.00	
		Halls	no cases		no cases				no cases	
		Other	8.23	[0.93;72.91]	2.81	[0.49;16.23]			2.19	[0.39;12.16]
		Parents	3.79	[0.71;20.16]	2.48	[0.73;8.48]			1.64	[0.53;5.03]
		Partner	136.39	[7.77;2393.06]	7.89	[1.21;51.33]			10.91	[1.64;72.78]
		missing	5.02	[0.65;38.86]	3.36	[0.75;15.02]			3.31	[0.86;12.7]
Area-level variables	DEPRIVATION QUARTILE	least	1.00		1.00				1.00	
		q2	5.47	[1.03;28.97]	4.16	[1.33;13.05]			2.19	[0.79;6.06]
		q3	8.79	[1.75;44.18]	1.93	[0.59;6.29]			3.81	[1.42;10.21]
		most	9.09	[1.81;45.61]	4.50	[1.52;13.36]			3.21	[1.25;8.27]
Level 2 variance	(standard error)		0.18	(0.54)	0.00	(0)	0.14	(0.42)	0.00	(0)
	p		0.36		1.00		0.36		1.00	
Variance Partition Coefficient (%)			0.0%		0.0%		0.00		0.0%	

Key: p<0.05

Table 6-21. Sensitivity analysis: Multilevel models with alternative individual and area-level SEC variables: Women

			A: MSOA + IMD + **Individual education var=leaving age**		B: MSOA + education + **Area level variable=ID2010 education domain**		C: EMPTY MODEL **Area level=LSOA**		D: MSOA + education+ IMD+ **First visit selected where test result=positive**	
N (individuals)			525		643		643		643	
n (M or LSOA areas)			154		179		339		179	
			OR	**[95% CI]**	**OR**	**[95% CI]**	**OR**	**[95% CI]**	**OR**	**[95% CI]**
Individual-level variables	AGE	16-17	1.00		1.00				1.00	
		18-19	1.16	[0.43;3.09]	0.87	[0.39;1.94]			1.09	[0.5;2.36]
		20-22	0.54	[0.2;1.46]	0.48	[0.2;1.18]			0.66	[0.28;1.56]
		23-24	0.39	[0.13;1.17]	0.27	[0.1;0.73]			0.35	[0.14;0.89]
	ETHNICITY	White	1.00		1.00				1.00	
		black	2.86	[1.25;6.55]	2.26	[1.08;4.69]			2.07	[1.05;4.08]
		other	2.16	[0.78;5.96]	2.34	[1.01;5.43]			1.92	[0.86;4.31]
		missing	2.03	[0.51;8.15]	2.07	[0.67;6.4]			2.06	[0.73;5.84]
	EDUCATION	not in education			1.00				1.00	
		school			0.93	[0.46;1.86]			1.00	[0.51;1.95]
		university			0.51	[0.23;1.14]			0.53	[0.25;1.11]
		stayed in education	1.00							
		left education by 16	1.08	[0.39;3]						
	MET PARTNER IN EDUCATION?	Yes	3.52	[0.76;16.37]	0.35	[0.16;0.77]			0.42	[0.2;0.85]
		No	1.00		1.00				1.00	
Area-level variables	DEPRIVATION QUARTILE	least	1.00		1.00				1.00	
		q2	0.67	[0.3;1.49]	0.76	[0.37;1.57]			0.99	[0.49;2]
		q3	0.36	[0.14;0.91]	0.53	[0.24;1.14]			0.62	[0.29;1.32]
		most	0.61	[0.26;1.46]	0.66	[0.32;1.37]			0.80	[0.38;1.69]
Level 2 variance		(SE)	0.00	(0)	0.00	(0)	0.00	(0)	0.00	(0)
	p		1.00		1.00		1.00		1.00	
Variance Partition Coefficient (%)			0.0%		0.0%		0.0%		0.0%	

Key: p<0.05

6.4. Discussion

6.4.1. Main findings

In relation to my three hypotheses, this study in three relatively deprived locations indicated:

Hypothesis 1. Service use: Young people faced no major socio-economic barriers to access across any service model in terms of area deprivation. However, all service models except the NCSP outreach-led service in DBRB tested individuals with higher levels of education than their local population. There was some variation in access between service models by age and gender, with non-NCSP service models reaching higher coverage amongst men aged 20-24 years better than the NCSP. However, in these service models men aged 16-19 years were at higher risk of testing positive than men aged 20-24 years.

Hypothesis 2. Education and positivity: Chlamydia positivity was associated with education in Camberwell and DBRB but the relationship varied by the measure of participation used, gender and location. A measure of current participation appeared to be more sensitive to variations in positivity than leaving education early. In DBRB, both men and women who were not currently in education were at greater risk than those in education; in Camberwell, men not currently in education were at greater risk than those in school, FE or university, but there was no significant association for women. In Southampton there was no difference in positivity for young people by educational participation.

Hypothesis 3. Area deprivation and positivity: The findings from DBRB and Southampton provide no support for the hypothesis that area deprivation (within local areas) is associated with chlamydia over and above individual SEC. Moreover, in Southampton there was substantial area-level variation that was not explained by SEC. However, in Camberwell, men living in the most deprived areas were at substantially higher risk than men in the least deprived areas even after controlling for individual socio-demographic variables including education.

6.4.2. Methodological considerations

6.4.2.1. Strengths

The study provides information on how social variations in testing and positivity vary across diverse service models. It had sufficient power to examine these associations and adds to secondary data studies by providing analysis at both area

and individual levels. The availability of anonymised but unique identifiers in my dataset meant I was also able to overcome a limitation of the secondary data analysis, i.e. to identify and exclude repeat tests from the same individuals.

The study also demonstrates that it is feasible to collect information on educational participation in a service setting. The design minimised the burden on participants by making full use of routinely collected data which also enabled detailed examination of response rates. When the survey was administered by all staff (for example outreach workers in DBRB) response rates were high (>80%). It also provided useful information on how to maximise data collection in a service setting; for example, it led to changes in the conduct of other studies in Camberwell Sexual Health Centre.

6.4.2.2 *Weaknesses*

Lack of comparability and socio-economic diversity between study locations: The three participating locations in this study are diverse in terms of geography, ethnicity, demography and educational participation but they are all from deprived parts of the country, so this limits its generalizability to all areas of England. I approached a range of local programmes from affluent as well as deprived areas (e.g. Cambridgeshire, South East) to take part in the study. However, there were two major factors that affected recruitment. Firstly, at this time (April - October 2010), Government reforms (Department of Health, 2010a) led to instability in the NHS in general and following severe criticism of the programme (see The Comptroller and Auditor General, 2009), there was also particular instability in the NCSP.. Secondly, all NCSP areas were focused on meeting stringent chlamydia screening coverage targets. As data from the National Chlamydia Screening Programme (2009b) show, programme areas in the most affluent parts of England were struggling most to meet these targets.

An alternative approach would have been to use the NIHR Portfolio more pro-actively to recruit sites. As soon as my study appeared in the portfolio (December 2010), I was contacted by CLRNs offering further sites to take part in the study. However, a five-month delay from receiving confirmation of Portfolio eligibility to formal adoption onto the Portfolio on the NIHR website meant it was too late to recruit these sites.

Variable and low response rates to the survey: The variability in completion rates may have biased the results obtained. The very low implementation of the survey in

primary care and CASH also limits the generalizability of the survey to these providers. However, in areas except Southampton CSP, the routinely collected demographic information indicated that when the survey was administered, there was little bias in which young people completed the survey by gender, age, risk of chlamydia, residential area.

In chlamydia screening programme areas, the survey was implemented with variable success. The problems we experienced mirrored closely the problems local programmes commonly experience in implementing service change across their area. In both DBRB and Southampton CSP there were over 50 venues registered to deliver screening but some venues perform just 1-2 tests/month and as a result have minimal contact with the screening office. In DBRB, THT directly provided 50% of tests through outreach workers, where study completion rates were over 80% for the whole period. Where screening was not directly provided by the CSO, it was more challenging to persuade services to use the survey partly due to longstanding problems in the relationship between THT and NHS services, particularly contraceptive and sexual health services (CASH). Relationships between screening venues and Southampton CSP were not as difficult, but it was still extremely challenging for the CSO to influence data collection in providers.

For even simple studies such as this one, therefore, a dedicated person onsite is required to monitor data collection and maintain awareness of the study amongst clinicians. This should be built into applications for service support costs in all sites to support onsite study implementation.

Unmeasured risk factors and residual confounding: There are important risk factors for chlamydia not captured by this study around sexual behaviour. For example, it would have been useful to examine whether social variations in factors such as condom use and partner numbers known to affect STI transmission could account for variations in positivity between different population groups. I did not seek to collect information on sexual behaviour partly because I thought information on partner numbers would be collected in all the sites, given that it would be standard data required in a consultation in a sexual health service and given that the NCSP data collection form includes a question on whether individuals have had more than two sexual partners in the last year. However, I was not able to use information from NCSP sites because completion was very low in DBRB (<25%) and not collected at all in Southampton CSP. I did not prioritise collection of sexual behaviour information in the participating NCSP sites because could well have reduced

engagement from the staff completing the surveys. In Camberwell, I have since worked with the site to append data on partner numbers and condom use to the dataset, so it will be possible to examine this association in the future.

In addition, this information does not adequately capture risk behaviour (i.e. does not provide any information on condom use, concurrency, and absolute numbers of partners in a defined time period).

6.4.3. Comparisons with other research and possible explanations for the findings

6.4.3.1. Service use

Coverage across all service models in the most disadvantaged areas was at least as high as in areas of low deprivation. Whilst in Southampton, the GUM and CSP services provide most of the chlamydia screening for the local population, in South London, there are several other services providing chlamydia screening to the local population in addition to Camberwell so it is possible in this area that testing in other services could delivery to more affluent neighbourhoods. The absence of conclusive socio-economic associations at an area level may indicate that, as Kaufman observes, socio-economic inequalities in healthcare are not present in every situation,(Kaufman, 2010) and our expectation of finding them is simply “social epidemiological hypochondria”.

However, the educational profiles of respondents compared with the local populations varied by service model. All models except DBRB appeared to reach a population that stayed in education longer than the general population. The data used to generate local educational profiles are now 5 years old and the proportion staying in education has increased over the last five years (Department for Education, 2011b). This may explain why the profiles of those using services appear in general more educationally advantaged but would not explain the variation between service models. In Southampton the CSP reached a more educated population than the GUM service, but in contrast, in DBRB, the other NCSP service, the profiles of respondents were relatively similar to the local population. Therefore, this provides little support for Dixon-Woods theory that socio-economically disadvantaged seek care only when symptomatic, whilst advantaged are tested when asymptomatic. Instead, it provides suggestive support for THT workers’

perceptions that their outreach service model was successful in reaching marginalised communities.

CSP staff proposed that testing asymptomatic young people through the NCSP also serves to normalise testing and overcome the range of barriers that prevent young people accessing sexual health services (Formby et al., 2010). As a result, young people tested through the NCSP are not only more aware of when testing is required, but they are also more ready to visit services when they do need care. The higher coverage of younger populations in Southampton CSP than in the GUM service may indicate that indeed, CSP models are successful in reaching younger men and women, whilst the older population are now equipped to seek care in GUM.

6.4.3.2. Positivity

6.4.3.2.1. Education

This study indicated that chlamydia positivity was associated with educational participation in some areas and populations only. Individuals outside of education were not at higher risk in Southampton nor were women in Camberwell.

Individuals' current educational participation was more sensitive than the duration of participation to detecting variations in chlamydia positivity amongst young people. This may indicate the impact of education on the risk of chlamydia is less to do with how it affects opportunities and aspirations and more about how it channels social and sexual networks. An alternative explanation for the stronger associations with current participation compared with leaving age is that the missing information for younger participants in particular reduced the power to detect significant differences if they existed.

6.4.3.2.2. Area SEC

The finding that area deprivation was not associated with chlamydia in DBRB, Southampton and Camberwell women is consistent with other research in England e.g. Macleod et al.'s 2005 study of a postal screening invitation also found no association with area-level deprivation and chlamydia positivity in men or women. However, the findings are counter to my analysis at national level.

It is possible that I did not find area-level socio-economic variations in these locations was because there was not sufficient socio-economic diversity for any socio-economic variations to become apparent. The lack of area-level variation in chlamydia positivity found in DBRB and Camberwell may also be due to methodological limitations in my multilevel analysis. For example, I used MSOA and LSOA as proxies for local area boundaries but MSOA may adequately capture the areas young people use in Southampton but may not be an appropriate area boundary for analysis in DBRB and Camberwell. This is consonant with my focus group findings, where the size and shape of young people's 'local' areas varied considerably between groups. It is also possible that accounting for the distribution of unmeasured or uncontrolled variables (e.g. sexual behaviour at individual or area level), testing in other services in the area would explain these findings.

However, there were socio-economic variations in chlamydia positivity amongst men at area level in Camberwell. The association between area deprivation and chlamydia in men in South London has been found in previous analysis of chlamydia and gonorrhoea diagnoses in Lambeth, Southwark and Lewisham (Low, 2002). Low et al.'s research (2001) proposed that assortative mixing amongst black ethnic groups with high risk of STIs may explain these findings. In our study both men and women from black ethnic groups also were more likely to test positive for chlamydia than those from white ethnic groups. However, associations with living in deprived areas in our study remained after controlling for ethnicity. In addition, this explanation does not account for why women in deprived areas – also at high risk of gonorrhoea in Low's study - were also not at greater risk in my study.

In addition, there were substantial variations in between areas in Southampton that was not explained by IMD, suggesting that geographical characteristics other than social deprivation may play a greater role in influencing behaviours and population factors that determine chlamydia acquisition and transmission amongst young people. Studies from the USA indicate that exposure to social disorder may place individuals at higher risk of STIs. For example, Cohen et al. (2000) found gonorrhoea was more strongly associated with neighbourhood disorder than poverty. They hypothesized that a poorly maintained neighbourhood indicates 'no-one cares', which in turn may lead to increased rates of casual sex within sexual networks characterized by high risk behaviours and reduced motivation to seek treatment for symptoms, resulting in a higher prevalence of STIs. There was some support from my focus groups for a link between social networks and social

disorder, where a fear of violence/crime deterred some men from travelling to certain areas to seek sexual partners.

6.4.3.3. Gender

It is not clear why men but not women in Camberwell who were not in education and living in disadvantaged areas were at higher risk of chlamydia positivity. The existence of gender variations in SEC associations is consonant with international population-based studies (Goulet et al., 2010, Stein et al., 2008), which reported gender variations in the relationship between chlamydia prevalence and education.

It is possible that living in the disadvantaged areas of South London may drive a high prevalence of risk behaviours (multiple partners, limited use of condoms) amongst men but less so in women living in these same circumstances. There is some support for this from Gerressu et al.'s qualitative research in London(2009) and from my focus groups, where I saw substantial differences in sexual attitudes and behaviours between men and women in the same group. However, the finding that positivity varies in different ways amongst men and women using the same clinic is still surprising, if one assumes that these men and women are members of the same sexual networks. This may not necessarily be the case.

Alternatively, the gender difference in SEC variations may be linked to differences in the profiles of those tested in the clinic for opportunistic screening purposes and those tested for diagnostic purposes. Clinic staff at Camberwell observed that women presenting with any indication of having had unprotected sex (i.e. seeking contraception, advice on pregnancy or for advice/testing of an STI) are tested for chlamydia opportunistically. In contrast, they find that men may only present when they experience symptoms of an STI or who have some other pressing need to seek treatment. I have obtained a minor amendment to the study protocol for Camberwell to link the study data with more detailed information collected in the clinic to examine socio-demographic associations with the reason for testing and a range of reported sexual behaviours.

6.4.3.4. Variations between locations

The variations between these three locations suggest it may not be possible to make generalised conclusions about the link between SEC and chlamydia but instead, that to explain the variation in SEC associations other contextual factors need to be considered. For example, to explain why there was an association with education in DBRB and Camberwell but not in Southampton, we may need to

consider the role of local employment. The areas served by Camberwell and DBRB services are characterised by greater employment deprivation than the city of Southampton (see Table 6-1). This is also supported by the survey data, where 15% of Southampton respondents met partners through work, whereas in DBRB this was just 5%. Therefore, in Southampton a higher proportion of participants not in education may be or have been working compared with DBRB or Camberwell. Compared with those that are currently in education, these individuals may not be socio-economically disadvantaged, i.e. they may have already benefited from the effects of education on health literacy self-esteem and health behaviours.

6.4.3.5. Role of household/living circumstances

The findings in Southampton and Camberwell provide some insight into how living circumstances, education and the risk of chlamydia may be interrelated.
In Southampton, a higher proportion of students lived in halls of residence (21%) compared with Camberwell (9.5%) and DBRB (<1%), where there was also a higher risk of chlamydia. As Annang et al. (2010) comment in relation to the risk of STIs in general, “the research on young adults often presumes education is a protective factor against risk outcomes”. However, attending college “may also provide a social environment where young adults engage in risky health behaviors” (p111). Therefore, in Southampton, living in halls of residence may offer a freedom from intergenerational surveillance, and a concentration of other young people that facilitates the spread of infection and/or these particular halls acted as reservoirs for chlamydia infection.

In Camberwell, there was a relatively large group of young people, particularly young women (9%) living in vulnerable circumstances compared with other sites (<2%). Individuals living in these circumstances had a higher risk of chlamydia, and when stratified by education, the association with living circumstances disappeared for those in education, while those not in education had over four times the odds of testing positive. The interaction was not significant possibly due to the sample size, but it provides suggestive evidence that education may have a particularly protective effect in those in particularly vulnerable living environments. Our findings that those in vulnerable living circumstances are at greater risk of chlamydia is in line with sexual behaviour research and research on teenage pregnancy in the UK(Bonell et al., 2005). However, given the complexity in the relationship between family structure, processes and sexual health illustrated by longitudinal studies such as Wight et al.’s (2006), further research in this area is needed.

6.5. Implications and avenues for further research

My findings support the conclusions of Chapter 4, i.e. that area deprivation did not present a barrier to young people's access of chlamydia testing across any service model. However, there are gender differences in access to different service models. In Camberwell, different reasons for being tested for chlamydia may explain the differences in patterns of positivity between men and women. In an extension of this study, I am working with staff in Camberwell to examine the range of factors associated with presentation at the clinic amongst study participants.

My findings indicate that there is not consistent evidence for socio-economic variations in chlamydia positivity. In addition, other exposures need to be taken into account to understand how educational participation may influence young people's risk of testing positive for chlamydia. In particular, examining the link between individual and population level sexual behaviours (condom use and number of recent sexual partnerships), education and chlamydia positivity would help to elucidate possible causal pathways linking variations in educational experience to chlamydia positivity.

The role of geographical conditions other than SEC should be explored to explain area-level variations in young people's risk of chlamydia. Building on the literature from the USA, the link between area indicators of social disorder and crime with chlamydia could be investigated.

The study provides little support for further exploration of meeting places as a potential mediating factor in the relationship between SEC and chlamydia. However, the completion of this question was problematic in the survey, which suggests the question used did not adequately capture this dimension. For further research to examine this factor in suitable depth, a different study design, which enables some discussion with study participants, would be required.

6.5.1. Implications for service delivery

Past reports (e.g. The Committee of Public Accounts, 2010 p3) have urged the Department of Health to make the NCSP "a national response to a national problem", by adopting national or regional commissioning arrangements. While this may be appropriate to some extent, the diversity in these findings indicate that local areas also need to consider their own variations in positivity and tailor/adapt

national guidance/service models to meet the needs of their local population. For the locations included in this study, the findings suggest:

- The DBRB outreach model was successful in reaching disadvantaged young people who are representative of those living in the area. However, positivity was relatively low. The four PCTs have now de-commissioned outreach, to focus on primary care and sexual health services, as recommended by national guidance. These four PCTs should continue to monitor the socio-economic profile of those tested under this new service model to ensure that it remains representative of the local population.

- In Southampton, there may be large numbers of young people who are not in education and who are at risk of chlamydia but are not accessing testing to the same degree as those in education. However, young people at university living in halls are also at high risk of testing positive. While NCSP national guidance recommends a focus on primary care and sexual health services, in Southampton it may still be appropriate to target some testing to university locations if positivity in halls of residence continues to be high.

- In Camberwell, young men tested at the clinic who are not in education, living in disadvantaged areas and from black ethnicities appeared at particularly high risk. Our ongoing analysis of the factors underlying their presentation at the clinic is intended to help us understand why these groups are at particularly high risk and to inform the development of local strategies to reduce this risk. Depending on the findings of this local study, analysis could be widened to the other major sexual health service providers across Lambeth and Southwark to understand the implications for service delivery for the whole local population.

6.5.2. Implications for Chapter 7

In common with many of the studies commissioned to support the implementation of the NCSP, this study focused on service delivery of chlamydia testing. However, in order to interpret these findings in relation to young people's sexual health we need to understand whether/how testing asymptomatic young people for chlamydia can benefit population health.

PART IV. THE RATIONALE FOR CHLAMYDIA SCREENING IN ENGLAND

Chapter 7. Chlamydia screening in England: a qualitative study of the narrative behind the policy

7. Chlamydia screening in England: a qualitative study of the narrative behind the policy

7.1. Introduction

The findings from Chapter 6 indicate chlamydia testing services reach different sectors of the population. Within the areas studied, an outreach model, whereby other young people offered chlamydia screening in diverse venues such as pubs, clubs and reached a more representative sample of the population than models delivered through health services. However, Chapter 6 did not consider how chlamydia screening was provided or consider which type of service had the greatest potential to improve sexual health in young people.

7.1.1. Is there evidence for the public health benefit of chlamydia screening?

When chlamydia screening was proposed in 1998 by an Advisory Group of the Chief Medical Officer, it was expected to "produce considerable health gains" and "reduce health costs" by preventing reproductive ill health (e.g. ectopic pregnancy and tubal factor subfertility) thought to be caused by chlamydia infection (Department of Health, 1998). However, there has been growing controversy over chlamydia screening in general and the NCSP in particular, culminating in the National Audit Office's report (The Comptroller and Auditor General, 2009), which questioned whether it was worth investing "so much public money" to tackle chlamydia when the evidence base for screening was "subject to debate". While this and other reports (e.g. Low2007b) have criticised the NCSP, there has been little objective analysis of the broader factors driving the Programme's establishment or exploration of decisions underlying its implementation. Such analysis is needed to inform decisions about the NCSP's future. It is important at this time when extensive healthcare reforms underway across the English National Health Service (Department of Health, 2010a) will challenge the NCSP's management and direction.

The NCSP is not unique amongst public health programmes in attracting controversy or in being established on the basis of limited evidence: for example, historical analysis of the cervical screening programme illustrates a similarly optimistic initial response, despite scant evidence, and later concerns about a lack of evidence of benefit (Bryder, 2008). Indeed, new interventions are

often informed by plausible intuition rather than evidence-based pathways describing anticipated outcomes (Parkhurst et al., 2010). In some instances, such approaches are grounded in theory but in many cases they are based on implicit assumptions. It is helpful to distinguish between these approaches in order to fully understand the motivations for the establishment of new interventions and to explain the effectiveness of widespread adoption and dissemination of the intervention.

*Contributions of others to this study***:** The text in this chapter is largely based on a paper submitted for publication (see appendix).The idea of the study arose in a supervisor meeting. I initially approached the NCSP's medical advisor, Dr Paula Baraitser (PB), to be one of the interviewees. The research question coincided with her own plans for evaluating the NCSP, so we undertook the study jointly. I have indicated throughout the chapter the aspects of the study I carried out alone and the parts undertaken jointly with PB.

7.2. Methods

7.2.1. Approach

7.2.1.1. NCSP as a complex intervention

Pawson (2006) notes the distinction between programmes that "rely on the decisions and actions of actors" (mainly) to make them work and biomedical interventions, where the participants are largely passive recipients of treatment. With notable exceptions such as McNulty et al.'s ongoing trial of GP uptake (2011), chlamydia screening in England appears to be conceptualised more in line with biomedical trials than complex interventions, resulting in purely summative evaluations of effectiveness.

In our approach to understanding the rationale for the NCSP, we conceptualised the programme as a complex intervention. This is because successful implementation of the NCSP requires agency amongst both professionals and young people; professionals need to be ready to open discussion about sex, to offer chlamydia screening to young people. It also requires young people to accept an invitation to be screened and if positive, to return for treatment, to identify partners and persuade them to attend for treatment also, and to refrain from sex for a week after treatment.

Evaluators of social interventions display some scepticism towards purely summative approaches that focus solely on the success or failure of that intervention to deliver certain outcomes. As Rossi points out in the forward to Chen's *Guide to Program Evaluation* (p8),"All too often these programs appear to fail", possibly because the assessments were "insensitive to the hopes and aspirations invested in the programme by its typically diverse set of stakeholders".

7.2.1.2. Theory driven evaluation

Theory-driven evaluation (TDE) is used to describe a family of approaches that first seek to articulate the links between what programme designers planned to do and what they expected to attain (sometimes called the 'normative' theory or the action model - Van Belle, et al., 2010). In one such TDE approach, realist methodology, Pawson (2006) conceptualises all interventions as theories: "if we do something then…it will bring about some improved outcome". These 'theories' are often based on assumptions (grounded or otherwise). He recommends that a review of interventions should track and critically evaluate the theories – or assumptions - underlying them. Lipsey and Pollard (1989) advocate using qualitative methods, either formally or informally, to explore the theory as an intrinsic part of evaluation at any stage of the process. This approach is required to fully understand the motivations for the establishment of new interventions and to explain the effectiveness of widespread adoption and dissemination of the intervention. The result of this exploration of the underlying motivations is to make implicit assumptions explicit so they can be subject to critical appraisal and so all of the goals imputed by program stakeholders can be identified (Chen, 1989, 2005). TDE can then go on to examine and explain programme outcomes (termed 'causal' theory or the 'change' model) in the light of any underlying theory identified, other assumptions or motivating factors.

As Van Belle et al. (2010) observe, there is little guidance available for translating a theory-driven approach to evaluation of health interventions. Their recent TDE of a sexual health programme provided the basis for the approach to addressing our aim. This approach involved identifying the themes underlying the introduction of the programme at its establishment. Changes in these themes are then documented as the programme develops so that the underlying themes present when the programme was first proposed can be compared with the drivers when the programme is implemented.

In contrast to the conventional biomedical approach to evaluating evidence, TDE does not necessarily require an exhaustive search through all the literature: the criterion for selecting a source is whether it illuminates understanding of programme theory (Pawson, 2006). Therefore, in line with the realistic evaluation principles of TDE, we sought evidence that would best illuminate the theory or other underlying drivers to the NCSP when it was established and how these changed following implementation. We focused our data collection on sources that would enable us to track the context in which the NCSP was first considered and later delivered and to recreate the thinking that underpinned the programme's initiation and implementation.

7.2.2. Data collection

We constructed a timeline tracking the scientific and policy context from 1996 to 2010 using:

- major research studies (randomised controlled trials and systematic reviews) on chlamydia screening
- English Department of Health documents
- NCSP strategy and annual reports
- Health Protection Agency surveillance data on chlamydia diagnoses rates

To make explicit any initial theory underlying the policy to establish the NCSP and to document changes as the NCSP was implemented, we used a combination of interviews and documentary analysis:

Interviews: we selected a purposive sample of 14 experts, chosen because of their integral involvement in the NCSP's establishment or implementation or because of their role as independent academic experts during the period 1996-2010. These included; national policy makers (Department of Health civil servants); people working within or advising the national team responsible for establishing the NCSP (e.g. members of the Chief Medical Officer's expert advisory group into *Chlamydia trachomatis*, NCSP steering group, the Independent Sexual Health Advisory Group and the National Screening Committee) and academics who have published on chlamydia control in England. I developed an initial topic guide (Appendix 7) which we both adapted to focus on the specific expertise/experiences of each interviewee. We conducted each of the interviews jointly from May 2010 to Mar 2011, except for

the pilot and one other, which I conducted alone. I audio-recorded and transcribed each interview.

Policy documents: to examine the stated rationale for key decisions, PB searched the Department of Health online publications library using the terms "chlamydia" and "sexual health" for the period 1996-2010. This generated 209 hits of which 45 were indirectly relevant to the NCSP and 18 had direct relevance. One document (Research to inform the national media campaign teenage pregnancy in England, 2000) was not available electronically but had no apparent relevance to the programme and so was not examined.

Commentaries: to understand contemporary scientific and clinical opinion on chlamydia screening, I searched the Web of Knowledge database for commentaries and editorials published in peer-reviewed journals 1996-2010 using the terms "chlamydia", "chlamydia screening", and "NCSP". Citation values and published responses were used as crude indicators of an article's profile within the clinical/scientific community. I selected articles with relevance to chlamydia screening in England that were cited at least 5 times and/or with published responses and identified 26 papers for inclusion into our detailed analysis.

Chlamydia Screening Steering Group minutes: In order to understand how key decisions were made as the programme became established we obtained minutes of steering group meetings from its instigation in 2002 until 2005.

7.2.3. Analysis

We organised data from the interview transcripts, policy documents and commentaries using the Framework approach developed by Ritchie & Lewis, (2003), as described in Chapter 5. PB and I developed a conceptual framework and independently coded several transcripts to identify themes (theories, assumptions, ideas, and context) of relevance to the initiation and implementation of the NCSP. For quality assurance, 10 sources were coded by PB and myself, areas of discordance discussed and the coding framework refined. We coded the remaining transcripts, policy documents and articles to identify the themes emerging most prominently. I summarised all coded data sources into charts organised by theme and stage of initiation and implementation (Appendix 7).

To establish whether our findings were consonant with those integrally involved in chlamydia screening, we presented our emerging themes to the NCSP strategic board (chlamydia operations group, comprising NCSP national and regional staff) and to one of our interviewees (the civil servant responsible for sexual health policy in England). I also shared a final draft of the paper with interviewees before submitting for publication.

7.2.4. Ethical approval

I sought ethical approval for this study from UCL research ethics committee. This study was considered exempt from the requirement for ethical approval because the research involved review of publicly available information and interviews with individuals, seeking their professional views on chlamydia screening not personal information.

7.2.5. Methodological challenges

Our evaluation occurred several years after the establishment of the NCSP. Therefore, memories of events amongst our interviewees may be inaccurate/ incomplete. To address this, we tried wherever possible to seek documentary evidence to triangulate the descriptions of events in our interviews. However, the steering group minutes provided little additional value to interviews and policy documents, so we made a decision not to include them further in the analysis.

Not surprisingly, we identified many issues on which there was little consensus between our interviewees (e.g. on the interpretation of the natural history evidence, rationale for an opportunistic screening approach). We also had our own views on several of these issues, so we were particularly cautious about over-interpreting our data or drawing wide conclusions based on only 1-2 sources, where others were discordant with this view. I used the thematic charts to visualise clearly where our analysis was supported by only 1-2 data sources or where the data did not support our initial analysis, prompting us to revisit/revise these themes.

In addition, we shared interim findings widely (e.g. with the NCSP strategic board and interviewees before submitting for publication). This was not to seek consensus on our findings, but was an additional check to pick up any factual errors, seek endorsement from our interviewees to be named on the paper and an opportunity to ensure our quotes were not identifiable.

7.3. Results

7.3.1. Timeline of events

Political and strategic developments in the NCSP are tracked against delivery and evidence for chlamydia screening (Figure 7-1).

The decision to introduce chlamydia screening in England (1996-2000)
In 1996, the Chief Medical Officer (CMO) convened an Expert Advisory Group to formally consider the establishment of a chlamydia screening programme in England. The Group's formation was in response to mounting interest in chlamydia screening in the UK, (e.g. see Taylor Robinson, 1994 and Johnson, et al., 1996) and promising observational studies of screening in other countries (e.g. see Addiss et al., 1993 and Kamwendo et al., 1996). At this time, the other scientific evidence to support the effectiveness of chlamydia screening comprised one trial of screening from the USA by Scholes et al. (1996). Data from GUM clinics across England showed increasing diagnoses in young people although there were no population-based estimates of chlamydia prevalence.

In 1998, the CMO published a report which proposed the introduction of chlamydia screening in England. It recommended an opportunistic screening model, targeted towards young women, delivered in general practice and community sexual and reproductive health services. It also called for a research programme including a randomised controlled trial of screening in England. The NHS Health Technology Assessment Programme (1997) commissioned cross-sectional feasibility and acceptability studies. The Department of Health also funded a pilot of opportunistic screening in two areas in 1999. As described by Pimenta et al. (1993a and b), these pilots – where practitioners were paid to offer tests - achieved high uptake in primary care (>50%) and found over 10% of young people tested positive for chlamydia.

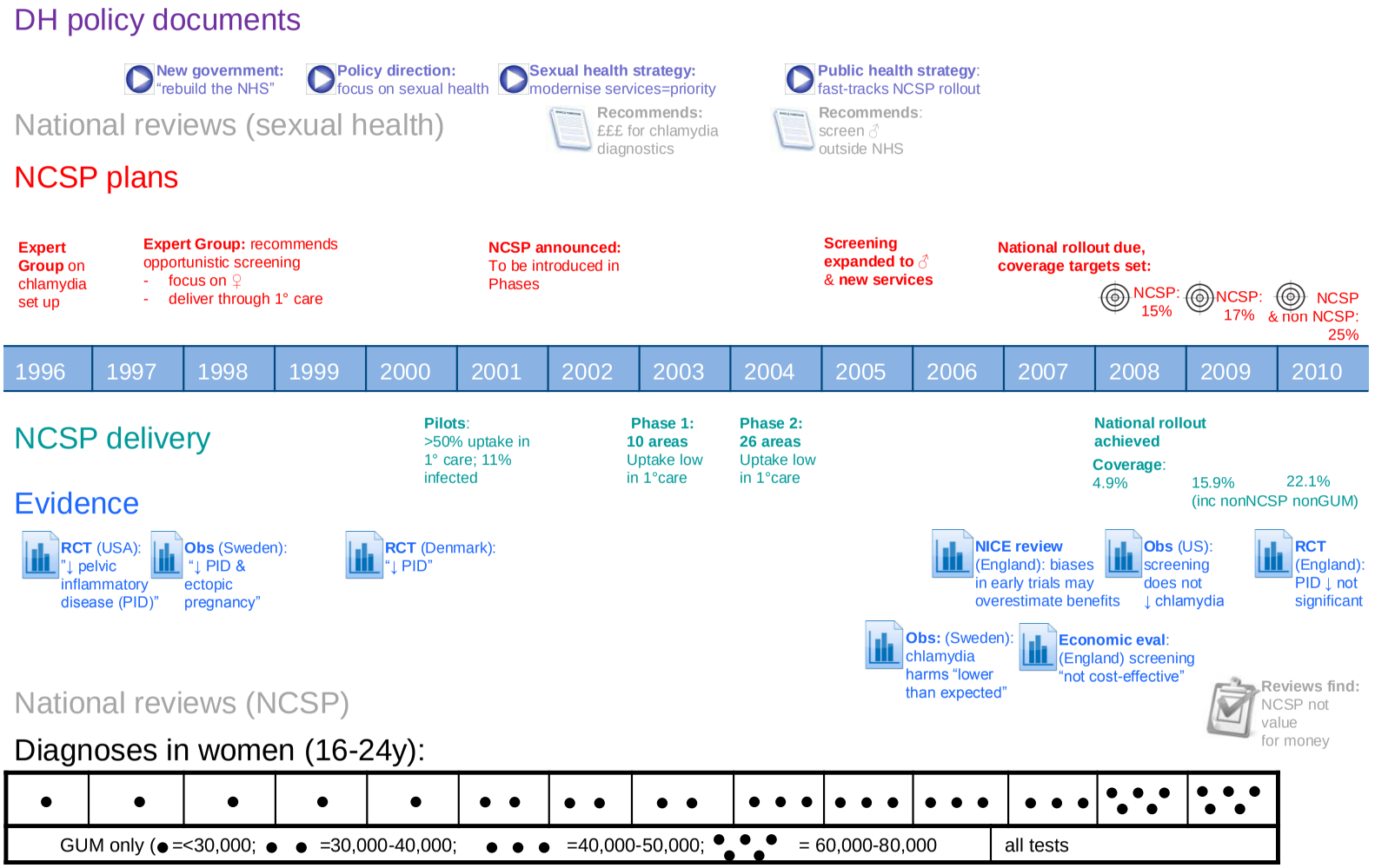
Establishment of the NCSP and rollout across the country (2001-2010)
In 2001, the Department of Health's sexual health strategy for England 2001-2011, *Better prevention, Better Services*, *Better Sexual Health,* was published. This strategy highlighted serious problems in sexual healthcare, including four-week waits for urgent appointments in GUM and patchy provision outside specialist GUM services, with few GPs providing sexual healthcare (health promotion, advice or STI testing and treatment) other than contraception. The strategy proposed a new model for delivering sexual health services, where

provision was expanded to primary care. As part of this model, it proposed a national screening programme based on the CMO's 1998 delivery recommendations, to be implemented in phases, with full rollout across England by 2008. Testing in GUM clinics was not part of this programme. In 2004, *Choosing Health*, the Public Health White Paper accelerated the schedule, promising national provision by 2007 and announced funding to support implementation. In the absence of empirical studies, modelling data estimated the level of coverage required to reduce prevalence (e.g. Turner et al. 2006). National targets for screening coverage were first announced in 2005. From 2007, local areas were monitored against these targets.

The NCSP delivery model changed as the Programme expanded. By 2003, the target population included men. By 2004, testing was conducted outside of general practice and sexual health services in non-traditional settings such as pubs, clubs, sporting events and festivals. Implementation did not occur as planned: national provision was later than expected, numbers of people tested remained low, particularly in primary care, which accounted for less than 20% of chlamydia test delivery, and amongst men, who account for less than 40% of NCSP tests. As a result, coverage targets were missed by a significant margin in 2007/2008. After 2008, chlamydia tests performed outside the NCSP (but not in GUM) were also counted towards coverage and targets were almost met (National Chlamydia Screening Programme, 2009b). While initially the pilots and early roll-out were part of the National Screening Committee, as illustrated by their description in their second annual report (Department of Health, 2000), the programme was not adopted by the National Screening Committee, whose website guidance in 2011 states that systematic screening for chlamydia is not recommended.

From 2006, the validity of earlier trials was more thoroughly and widely questioned in systematic reviews (Low et al., 2009), prompting more empirical research outside England to underpin screening policy (e.g. in Australia, see Hocking, Walker, Regan, Chen, & Fairley, 2008). Within England, in 2010 the only trial of chlamydia screening reported a non-significant benefit of screening for reducing pelvic inflammatory disease (Oakeshott et al., 2010). Chlamydia diagnoses continued to rise throughout implementation and rollout. Those testing positive fell from 11% in the pilot settings to 6% in screening settings across the country during 2009/2010 (National Chlamydia Screening Programme, 2009b).

Figure 7-1. NCSP timeline 1996-2010: policy, plans, delivery and diagnoses rates



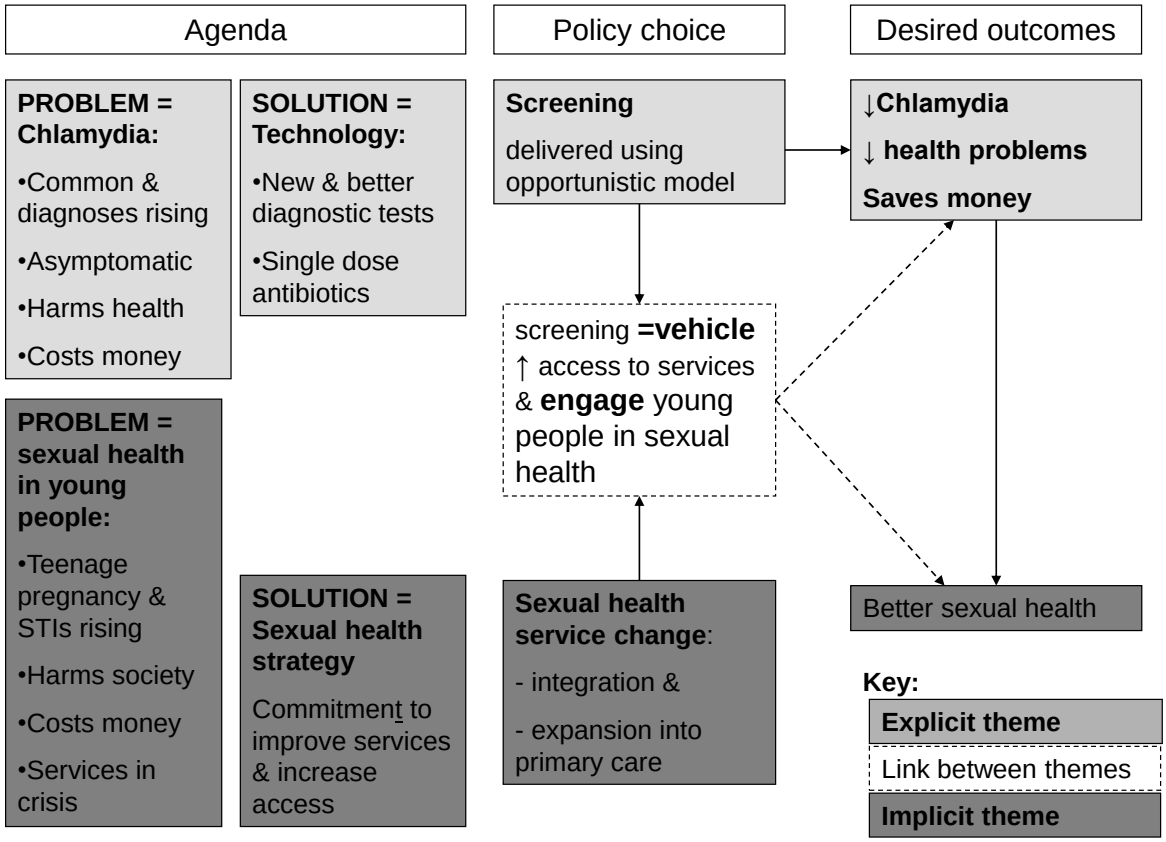
7.3.2 Underlying themes

7.3.2.1 *Establishing the NCSP*

We did not identify a coherent theoretical basis for the NCSP. However, two underlying themes emerged that underpinned the establishment and implementation of the NCSP. We refer to the first theme as 'explicit' because it is central to the stated aims of the programme and the second theme as 'implicit' because it was not stated in policy documents but emerged from interviews.

Theme 1**:** The first theme corresponds to the explicitly stated aims of the NCSP, which are to reduce chlamydia prevalence and sequelae, in response to concerns about rising diagnoses shown in the light grey boxes of Figure 7-2. Diagnosis was made possible by the advent of new technology, which was highly sensitive to detecting chlamydia and in contrast to older tests, was much less invasive, often requiring a urine test only. The importance of advances in diagnostic technology for the introduction of screening was corroborated by evidence from interviews, and other contemporary documents (Table 7-1).

Figure 7-2. Themes underpinning the establishment and implementation of the NCSP



The CMO's report identified chlamydia as a public health problem and screening as the policy response. This position was widely supported by the scientific and clinical community in England (Table 7-1). While the CMO's report acknowledged that data on prevalence of chlamydia sequelae were "incomplete" and "uncertain", its bold statements that sequelae were "severe" and that management would result in "considerable health benefit" went largely unchallenged in subsequent commentaries and letters, despite the lack of trial evidence from England and the incomplete knowledge of the prevalence and natural history of chlamydia. Instead, discussions focused on the extent to which screening would be acceptable to young people and how it should be delivered.

Table 7-1. Illustrative quotes: The case for screening

Chlamydia as a public health problem

"The personal and economic costs of untreated genital chlamydial infection are considerable."

Johnson, BMJ, 1996

"The role of chlamydia in infertility is well documented: the disease may be implicated in as much as 50% of cases."

Boag and Kelly, BMJ 1999

New technology as the solution: "We'd been seeing chlamydia figures going up and up and there was a growing awareness that it was a major cause of pelvic inflammatory disease…. ectopic pregnancy and I suppose to my mind the trigger for all of this probably was the advent of molecular diagnostics, the idea that actually you could undertake testing using so-called non-invasive specimens."

Interview, CMO Expert Advisory Group member (1996-2001)

Support for screening as the policy response

"The case for screening is made."

Boag and Kelly, BMJ 1999

"The Chief Medical Officer's plan for immediate action on *Chlamydia trachomatis*…is a step in the right direction, but it does not go far enough."

Letter from Opaneye, BMJ, 1999 (in response to Boag & Kelly editorial)

Delivery debates:

"I was shocked when I looked back at it [the CMO's report]. And actually it doesn't question whether there should be a screening programme, the decision has obviously been made and it's just which target groups, which tests."

Interview, Independent academic expert (1996-2011)

"[A pilot of] opportunistic testing … achieved coverage of under 30% among its target population…If the low response … is repeated in national pilot studies using similar methodology then few individuals are likely to achieve long term health benefits and community transmission is unlikely to be greatly reduced."

Letter from Macleod et al., BMJ 1999 (in response to Boag and Kelly editorial)

Table 7-1 (continued)

"[The NHS pilots aimed to find out] how feasible was it to ask people to pee in a pot [*i.e. do a urine test*]… for an STI they hadn't actually gone along to ask about in the first place."
Interview, NCSP Steering Group member (1999-2008)

Theme 2**:** A second theme also emerged from the interviews, shown in the dark grey boxes of Table 7-2. It was not referenced in policy documents, and we therefore refer to it as an implicit theme. This was concerned with the contribution of chlamydia screening to advancing wider sexual health service delivery. As described in the timeline and in interviews, sexual health services in the late 1990s/early 2000s were in urgent need of serious investment. Rising chlamydia diagnoses were quoted by interviewees and widely in policy documents to support claims of increasing burden of sexual ill health. As shown in the timeline (Figure 7-1) and corroborated in the interview data, in contrast to the previous decade, significant efforts were now successful in gaining political recognition of this problem (Table 7-2).

Table 7-2. Illustrative quotes: Crisis in sexual health services and sexual health

Sexual health:
"England is currently witnessing a rapid decline in its sexual health. Around one in ten sexually active young women (and many men) are infected with chlamydia. Syphilis rates have increased by 500% in the last six years and those for gonorrhoea have doubled. Rates of teenage pregnancy are the highest in Europe. Sexual dysfunction is a largely silent problem within society. Sexual health services appear ill-equipped to deal with the crisis that confronts them."
Third report of session 2002-03 on sexual health, House of Commons Health Committee, 2003

Services:
"It was all part of a growing dissatisfaction with a resurgence in STDs. There were real concerns about access to clinical services, under capacity in GUM clinics waiting times, you know that was part of the narrative that had its origins in the late 1990s."
Interview, NCSP Steering Group member (2000-2004)

"At that point to put sexual health into a historical context, it was very much seen as the Cinderella service of all services right across the board…. We had the first ever national strategy on sexual health and that had taken 18 months or so to do."
Interview, Independent Sexual Health Advisory Group member (2002-2011)

Chlamydia screening was recognised as a vehicle to engage young people in discussions about their sexual health and an opportunity to drive increased access to services for management of STIs (white dotted-line box, Figure 7-2). This was evident from interviews and from an article by those leading the first English

screening pilots (Table 7-3). Specifically, implementing a programme of chlamydia screening was expected to expand sexual healthcare in primary care and contraceptive services. Although the Government frequently refers to chlamydia screening as part of its service reforms, neither expanding access to sexual healthcare nor engaging young people in sexual health were stated aims of the NCSP. Similarly, this theme does not feature in the CMO's report, despite interview evidence that it was discussed within the Expert Advisory Group (Table 7-3).The aspiration to use screening in order to expand community sexual health services and to promote discussion of sexual health with young people therefore appears as an important, but largely implicit, influencing factor in establishing the NCSP.

Table 7-3. Illustrative quotes: Chlamydia as a vehicle for improving services and discussing sexual health with young people

"[Chlamydia screening was] an opportunity for driving up sexual healthcare, sexual health consultations."
"[Chlamydia] was a credible relevant topic to talk about and to open up that dialogue in sexual health matters in a broader sense so there was definitely discussion about that in the CMO group."

Interview, CMO Advisory Expert Advisory Group member (1996-1998)

"What one person [in the CMO's group] said to me was, 'we see this programme as being about the de-stigmatisation of sexual health services'."

Interview, National Screening Committee member (1996-2007)

"It was clear that what we were setting up was not just any proof of concept but a true opportunity to get STDs out of the GUM sector and into the mainstream of health protection in England."

Interview, NCSP Steering Group member (2000-2004)

"From a service delivery point of view we did also see this not only as increasing chlamydia testing and the effects on chlamydia, but also to improve access to sexual reproductive health services. If we could get more of the right people through the screening programme, it could have a positive effect on sexual reproductive health services."

Interview, National policy maker (2000-2005)

"The proposed screening programme would demand changes in clinical practice and closer alliances between health services. This provides an opportunity for new partnerships to be formed and facilitates a more integrated approach to healthcare. In many ways, it heralds the approach that is required to manage the wide variety of sexual health issues that confront us today."

Pimenta et al., BMJ, 2000

Our analysis also suggests however, that this implicit theme influenced key implementation decisions. These decisions included men's eligibility for screening,

where there is little empirical evidence to guide decisions; most published randomised controlled trials have been conducted on women. The CMO's Expert Advisory Group report (1998) initially recommended that screening should focus on women only. This proposal was adopted in the first phases of implementation. The CMO's recommendation was based partly on considerations of feasibility, recognising that women are "are more likely to attend healthcare settings" (Department of Health, 2000, p13). However, the NCSP policy changed since the initial phases to recommend that programmes should screen men and women equally (National Chlamydia Screening Programme, 2007). This was partly because studies such as Natsal-2 and ClaSS found that chlamydia prevalence similar in men and women (Fenton et al. 2001; Macleod et al, 2005). However, there was still no evidence that including men in the target population for the NCSP would be cost effective in preventing chlamydia-related harms. Our interviews (Table 7-4) suggest that the policy change was based less on the potential to control chlamydia, and more to promote equitable engagement of men in sexual health.

Table 7-4. Illustrative quotes: Factors influencing the decision to screen men

"[Screening men would] …give health professionals and researchers the opportunity systematically to investigate and address men's understanding of their sexuality and sexual behaviour."

Duncan and Hart, *BMJ* 1999

"There was not robust evidence to say – when the decision was made – that screening men would be cost-effective".

Interview, NCSP Steering Group member (2000-2004)

"There was concern we were focusing chlamydia screening efforts only on women and really missing an opportunity in engaging men in sexual health."

Interview, NCSP steering Group member (2002-2005)

"[A focus on women only] ignored the (albeit small) long-term health risks to men and, by placing the focus on women, seemed unfairly to place the entire responsibility on women too."

Men's Health Forum, 2005

7.3.2.2 Roll out of the Programme

The two themes evolved during implementation of the NCSP.

Theme 1: Following rollout across the country, the gaps in the evidence base to justify screening were now more widely recognised. Flaws in early RCTs and questions about the effectiveness of screening to control chlamydia and prevent reproductive ill health led to questions about the "alacrity" with which "influential groups have adopted chlamydia screening" (Ebrahim, 2009, p327). The gaps in the evidence surrounding the natural history of chlamydia became a central question for researchers and led to questions about the policy of funding chlamydia screening in England (Table 7-5).

Table 7-5. Illustrative quotes: Questioning theme 1

Chlamydia as a public health problem:

"What I think we really need to know is what the natural history of chlamydia is. We just simply don't know what we're dealing with and on what scale and if you don't know that you can't know whether your benefits are going to outweigh your harms. It's not enough to say you have some case control studies to say that pelvic inflammatory disease is associated with chlamydia or ectopic pregnancy is associated with chlamydia."

Interview, Independent Academic Expert (1999-2011)

Screening as the policy response:

"….the Department does not know how often infection leads to serious health problems and hence whether it is cost-effective to invest so much public money in tackling this problem."

National Audit Office, 2009

Theme 2: The focus of the NCSP's monitoring was entirely on delivery of testing and managing infections so any wider effects were not formally captured. Evidence from interviews suggests that early in implementation, the NCSP drove integration of services to some extent and did contribute to expanding sexual healthcare delivery beyond specialist services (Table 7-6). There was some evidence that providers in new services used chlamydia screening as an opportunity to discuss sexual health with young people outside services.

As the Programme expanded, pressure to achieve high coverage led to new services focusing solely on chlamydia testing. These services became divorced from mainstream care and offered little opportunity for sexual health promotion. The

National Audit Office reported that 40% of young people tested within the NCSP by did not receive sexual health advice (The Comptroller and Auditor General, 2009).

In addition, our interviews reflect the conflict between achieving testing volumes and providing integrated sexual healthcare through chlamydia screening. Some of those involved in implementing the NCSP at a national level stated it was unacceptable for health professionals to avoid discussing sexual health with young people. However, others minimised the input required from health professionals (Table 7-6).

Table 7-6. Illustrative quotes: NCSP's effects on service delivery

Service integration and opportunities for sexual health promotion:

"Even people who are critics of it [the NCSP] would say it's done more to bring together, force people to talk to each other, to work together… I think without the driver of the Programme, we wouldn't have seen it to the extent it has happened."

Interview, policy maker (2001-2010)

"I do think above everything else it [offering chlamydia screening] gives the opportunity to engage in a conversation about sexual health which we've not been able to do before."

Interview, Local implementer (2008-2011)

"I don't think the intention was ever that we would set up a programme separate and different from other aspects of sexual health locally, but unfortunately that's what seems to have evolved."

Interview, policy maker (2001-2010)

I'm still going to areas where they are missing a trick, that the chlamydia programme and the chlamydia staff, they've got a huge role to play in the teenage pregnancy agenda. It's part of sexual health. You know, it was very much put in its own little silo and even though we wanted it to be a sustainable programme

Interview, policy maker (2002-2005)

"The targets take away from what we're doing sometimes; it's very hard for people offering screening not to feel targets are all we care about."

Interview, Local implementer (2008-2011)

Mixed messages from the centre

The following two quotes come from two people involved during a similar period of the NCSP's development, both working to implement the NCSP at a national level:

"It still amazes me, last week, I was … hearing from the contraception service that … our ladies don't come here to talk about sex and sexually transmitted infections. As far as I'm concerned that's medically negligent"

Interview, policy maker (2002-2005)

"The amount of time that GPs need to spend directly talking about sex with their clients is zero frankly, they may have to say have you been screened for chlamydia this year …… and if the patient said no, give them a leaflet"

Interview, Implementer (2001-2004)

7.4. Discussion

7.4.1. Key findings

We identified two concurrent themes that drove establishment of the NCSP. The first (explicitly stated in the aims of the Programme) centred on the goal to control chlamydia. The second theme (clearly articulated in interviews, but not explicitly stated in policy) was the aspiration to use chlamydia screening as a tool to achieve wider improvements in young people's sexual health and service delivery.

7.4.2. Methodological considerations

Theory-driven evaluation approaches are commonly applied for social programmes but rarely used for healthcare interventions (Van Belle et al. 2010). We found that analysis of the theory underpinning a complex intervention was feasible for a public health programme and generated results directly useful to policy makers within a short time frame.

Both PB and I have been involved in chlamydia screening and have published on the programme (e.g. Kalwij et al. 2010, Sheringham, 2010). This position as 'insider' researchers meant that both of us had knowledge of and opinions on the subjects discussed in interviews. We sought to minimise the risk of bias due to this prior involvement by explicit reference to this involvement at all stages of the analysis and through the input of my supervisors in interpreting the analysis.

All of the experts approached agreed to be interviewed. However, our interviews diverged from a purely data collection exercise. This was partly because of our own involvement in the programme but also because one or both of us had worked with most of the interviewees before. As a result, we often participated in discussions more than we would normally in a qualitative interview process. There is a risk this unduly influenced our interviewees but actually it may have led to more productive interviews, as expressed by one of our interviewees: "*Actually for me, it's more useful to do as an interactive discussion so you don't get an answer from me saying it happened like this, this and this and from someone else something different and you have to say there were conflicting opinions. I think it's more useful to get a consensus for how these things started. And Paula you've been involved in the programme for a number of years so you've got your ideas about what's happened.*"

This evaluation occurred several years after the establishment of the NCSP. Therefore, memories of events amongst our interviewees may be inaccurate/ incomplete and informal conversations with others involved in chlamydia screening

indicated that interviewees were selective in the information they shared with us. In some cases individuals' accounts were at odds with their own written views expressed at the time and/or with other interviewees' accounts. To address this, we tried wherever possible to seek documentary evidence to triangulate the descriptions of events in our interviews.

7.4.3. Other related studies

The limitations in the evidence base that existed when the NCSP was established have been referred to elsewhere (Low, 2007b). Our analysis builds on this literature by providing an explanation for why chlamydia screening received such widespread support despite the lack of conclusive experimental evidence underpinning the NCSP. Policy makers, clinicians and researchers recognised that chlamydia screening could be used to expand sexual health beyond specialist services and engage young people in sexual health.

Low's 2007 analysis also considers how the NCSP diverges from recommended population screening models. Clearly, with the opportunistic model of delivery adopted by the NCSP, it is not possible to monitor uptake rates (i.e. population that accepted a test as a proportion of the population invited to test). Uptake rates form an important measure of the delivery of cancer screening programmes in the NHS, all of which are under the remit of the UK National Screening Committee. Indeed, lots of discussion amongst those we interviewed in this study also focussed on the extent to which the NCSP conformed to characteristics of screening programmes under the remit of the UK National Screening Committee. However, an undue focus on conformity to cancer screening programmes may not be helpful in thinking of how the NCSP can achieve health benefits through offering chlamydia testing to young people at risk. Cancer screening programmes target older populations with very different lifestyles and healthcare seeking behaviours to the 16-24 year old target population of chlamydia screening. This difference in target populations may explain why uptake of chlamydia screening (32% reported in Macleod et al 2005) in response to a postal invitation was appreciably lower than that achieved for bowel cancer amongst 50-70 year olds in its first years of operation (54% reported in von Wagner et al. 2011). In addition, cancer screening programme are less dependent on the agency/motivation of the partners of those screened to be effective; for chlamydia 'screening' to treat disease and tackle transmission, the sexual partners of young people that test positive have to return for treatment and also have to change their sexual behaviour until the infection is cleared.

The delivery of the NCSP has been subject to other critical reflection, most recently from the National Audit Office (2009) and the Parliamentary Committee of Public Accounts (2010). These reports focused on the NCSP's failure to reach coverage targets. They concluded that resources had been poorly used, due to "the difficulties which can arise when a national initiative is introduced into a locally-managed NHS" (The Comptroller General, 2009, p7). The National Audit Office recommended that criteria for the success of the Programme should be defined. Our analysis provides an argument to consider broadening the criteria for evaluating the Programme in addition to the measures of coverage and diagnoses rates. Possibilities could include measuring the proportion of tests performed outside of specialist services and the number of young people who discussed sexual health matters during screening.

7.5. Implications

Our analysis of the origins of the NCSP indicated that those involved in its establishment and implementation sought to achieve more than just chlamydia control. There were implicit aspirations to use chlamydia screening to expand sexual health services in the community and to engage young people in sexual healthcare. Our interviews suggest that expansion of service delivery beyond specialist GUM services has been achieved. However, this was sometimes without expected gains in service integration and did not always lead to a dialogue about sexual health with young people. In particular, as my examination of chlamydia testing in different service models in Chapter 6 indicated, an outreach model of delivery appeared to test a more representative sample of the local population than the other mainly clinic-based models of delivery. However, this model was not integrated with NHS service provision, and had limited opportunities to deliver wider sexual health promotion.

NHS reforms may significantly change the way in which the NCSP is delivered. For example, commissioning of sexual health services by local authorities is proposed and for the first time integrated data are available on chlamydia testing and positivity across all services (Department of Health, 2010a, b). These changes offer an opportunity for closer working between infection control and health improvement.

Having uncovered the implicit theory, future research could explicitly address it through examining the provision of sexual health advice delivered within the Programme, and by exploring the Programme's impact on attitudes to testing and testing behaviour.

PART V. THESIS CONCLUSIONS

Chapter 8. Conclusions and implications for research and policy

8. Conclusions

The first six chapters of this PhD concerned the delivery of chlamydia testing to young people in England. It examined socio-economic inequalities in access to testing measured by the supply and use of testing in relation to chlamydia positivity in young people. A systematic review (**Chapter 2**) and analysis of data from Natsal-2000 (**Chapter 3**) identified the most appropriate measures of SEC to address this objective. To examine socio-economic associations in access to testing and chlamydia positivity at a national level, analysis of NCSP data from its first year of delivery was undertaken (**Chapter 4**). Informed by focus groups with young people (**Chapter 5**), a cross-sectional study compared local socio-economic variations in access to testing across other models of service delivery and sought to examine the association between area disadvantage over and above variations in chlamydia positivity by individual SEC (**Chapter 6).**

Chapter 7 of this thesis sought to understand the public health relevance of the delivery of chlamydia screening in the absence of a strong evidence base for chlamydia control. A qualitative study, combining semi-structured interviews with documentary analysis, evaluated the rationale for establishing a programme of chlamydia screening in England.

8.1 Key findings

8.1.1. Socio-economic variations in access to testing

My work in this part of the thesis has four main findings.

Firstly, my systematic review indicated that, in contrast to other sexual health outcomes and sexual risk behaviours, disadvantaged SEC was not consistently associated with an increased risk of chlamydia. This chapter, in combination with a re-analysis of Natsal-2000 data, illustrated the methodological limitations and heterogeneity of existing empirical research. Therefore, the conclusions that I reached are limited. However, there are indications that the strength and existence of associations may depend on which measure is chosen to measure SEC. Measures of education and area circumstances were most sensitive to variations in chlamydia diagnoses, positivity or prevalence amongst young

people, where those in more disadvantaged circumstances were generally at higher risk of testing positive for chlamydia.

Secondly, access to the NCSP (measured by both supply and coverage) at a national level was higher in disadvantaged areas. At a local level, coverage was also high in the most disadvantaged areas but most service models tested individuals with higher levels of educational participation than their local population.

Thirdly, chlamydia positivity in the NCSP at a national level was higher in young people living in areas of disadvantage than those living in less deprived areas. However, area SEC explained little of the variation in chlamydia positivity at a local level. It is possible that other geographical characteristics may exert a stronger influence on behaviours and conditions that drive STI transmission.

Fourthly, the association between chlamydia positivity and current educational participation was not consistent; there was no association in men or women in Southampton, while in DBRB both men and women outside of education were more likely to test positive for chlamydia than those currently in education. In Camberwell, whilst there was no association for women, men outside of education were more likely to test positive for chlamydia than those in education. This last finding is perhaps surprising, given the research presented in Chapter 1 of the thesis which described how indicators of poor sexual health such as teenage pregnancy are more common amongst those leaving education early. In addition, the age that young people first have sex is lower amongst those that have left education early than those remaining in education (Wellings et al., 2001), which may place them at risk of STIs for a longer period of their lives than those who start to have sex at a later age. There is some evidence from the USA that earlier age of first sexual experience is related to a higher risk of STIs in teenagers (Kaestle et al. 2005). However, this association disappeared by young people reach their early to mid-twenties. So, this research suggests that even though early sexual experience makes young people susceptible to STIs from a younger age, it does not necessarily place them on a trajectory of engaging in sexual behaviours that place them at high risk of STIs when they reach young adulthood.

8.1.2. Rationale for chlamydia screening

The second part of my thesis indicated that the rationale for the establishment of the NCSP was based not just on its explicit goal of achieving chlamydia control, but also on an implicit goal of improving young people's sexual health. This driver has been an important influence on implementation of the programme and its existence may explain the widespread support for the establishment of the NCSP in the absence of robust evidence for chlamydia control. However, the implicit goal of using the programme to improve young people's sexual health suffered by virtue of being poorly articulated.

8.2 Implications

8.2.1. Meeting the NHS principle of equal availability to all

It is encouraging that I found young people living in socio-economically deprived areas faced no significant barriers to access across all models currently used to deliver chlamydia testing to young people in England. At a local level, my findings suggest that an outreach delivery model may be more effective than mainstream NHS services at reaching young people who are not in education. In addition, given that all service models struggled to test young men at high risk of chlamydia to the same extent as women, different approaches would be needed to reach this group.

8.2.2. Achieving national health and social service delivery targets

The Government's Public Health Outcomes Framework consultation proposes to monitor local chlamydia diagnosis rates for young people aged 15-24 years (Department of Health, 2010c). In contrast to the coverage targets set for areas in the past, which focused solely on volume of testing, this measure takes into account both the numbers of people tested and the proportion testing positive for chlamydia. Therefore, to achieve high diagnosis rates, areas not only need to achieve high volumes of testing, they also need to reach individuals at high risk of chlamydia.

In the Netherlands, the level of educational participation has formed part of an approach to targeting screening to young people at greater risk of chlamydia (van den Broek 2012). In contrast, my findings provide little justification for using educational participation to target screening in England. At a national level,

targeting chlamydia testing to disadvantaged *areas* may reach more young people at higher risk of chlamydia compared with seeking to achieve equal coverage across areas of all SEC. However, a different strategy would be needed within local areas, where it is not valid to assume higher rates of chlamydia amongst individuals or areas characterised by social disadvantage. In order to reach the highest diagnosis rates, therefore each area would need to measure its own local variations in chlamydia positivity in order to identify populations at highest risk.

8.2.3. Improving sexual health in young people

The Government proposes to include chlamydia diagnosis rates as an indicator of a local area's success in preventing ill health in its population. Given the uncertainties in the evidence base, it is not justified to assume that achieving high diagnoses rates will lead to a reduction in chlamydia incidence and reproductive outcomes. Further research on the natural history of chlamydia and trends in prevalence of infection are required to address whether testing asymptomatic young people through programmes such as the NCSP (even if delivered well) have the potential to benefit population health.

However, as the implicit rationale behind the establishment of the NCSP indicates, delivery of chlamydia testing to asymptomatic young people may have an impact on a wider range of process and outcomes related to sexual health in young people. To use this implicit rationale as a basis for service change, it should be articulated in more detail by the NCSP's stakeholders at national and local levels. Conceptualising chlamydia testing as an indicator for unmet sexual health need could mean:

- at an individual clinical level, a positive chlamydia test identifies a young person who has had unprotected sex and is therefore at risk of a range of adverse sexual health outcomes. Some US clinic-based research has described high rates (40-70%) of subsequent STIs amongst individuals that test positive for an STI including chlamydia at an earlier clinic visit (e.g. Peterman et al 2008; Orr et al. 2001). Clearly research is needed to establish the extent to which those that test positive for chlamydia in the UK are at additional risk of repeat chlamydia infection, other STIs or other adverse sexual health outcomes eg unwanted pregnancy. If there is an association between adverse sexual health outcomes and a previously

chlamydia infection, then these individuals may benefit from sexual health information, advice, contraception, condoms or other STI testing.

- at a population level, chlamydia positivity rates by area could be used to decide the location of a range of sexual health services, not just chlamydia screening. Similarly, by identifying population groups where delivery of chlamydia testing is low despite services being available (for example men aged 20-24 years), it may indicate that different strategies are also needed to engage these groups in other aspects of their sexual health.

8.3 Learning from this PhD

Some of the areas in which my PhD did not go as planned provided me with useful learning for the future. This learning relates to understanding the central question of this thesis, conducting NHS research in the future and understanding the policy context through which new public health programmes emerge.

Firstly, my understanding of whether or how socio-economic circumstances can affect chlamydia positivity in young people is limited by deficiencies in the design of my cross-sectional study (Chapter 6). In particular, I was not able to examine the extent to which social variations in sexual behaviour explained the observed variations in chlamydia positivity. I am now working with one of the study sites to link these data to my dataset to examine this retrospectively.

Secondly, the problems I encountered in the recruitment of sites, variations in data completeness and maximising involvement across of participating venues provided useful learning to me in how I would seek to set up and conduct a study in the NHS in the future. In relation to recruitment, as a result of navigating the NHS research governance approvals processes, I now understand better the levers available to me for recruiting sites to take part in research. As a result, in future studies I would contact research networks at an earlier stage to ensure the study is promptly adopted onto the NIHR portfolio formally. I found this raised awareness of the study. Thus, by ensuring prompt formal adoption onto the NIHR portfolio in future, I may open opportunities to collaborate with more sites. In relation to data completeness, even for the implementation of simple surveys in health services, I would identify a dedicated person onsite to monitor data collection and maintain awareness of the study amongst clinicians. To ensure that participating sites have sufficient resources to carry out this activity, I would seek to build this consideration into applications for service support costs.

To maximise the involvement of all venues within participating sites involved in a study, written communication is not sufficient. I would visit or set up meetings with as many venues as possible within each participating location to explain the study myself and seek their participation.

Finally, when I commenced my PhD I had implicitly assumed that the evidence base to support public health interventions would be reasonably robust. High profile evaluations such as that carried out by the National Audit Office and my own review of the peer-reviewed literature led me to question this assumption. My qualitative policy analysis of the NCSP was extremely helpful to me in understanding, not just why the NCSP was established, but also helped me to place this programme in the context of other large-scale national health programmes. It also illustrated some of the challenges of conducting research in a constantly changing policy area.

8.4 Areas for further research

This thesis focused on socio-economic variations in the delivery of chlamydia screening and chlamydia positivity. The delivery of treatment to those testing positive and of interventions to prevent repeat infections e.g. effective partner management were beyond the scope of this thesis. However, they are important components of chlamydia control and socio-economic variations in their delivery should form part of future research.

8.4.1. Monitoring inequalities in delivery

Since my research was conducted, there have been developments in the recording and storage of information on chlamydia testing in the NHS. The Chlamydia Testing Activity Dataset in England now combines data across all service models (Department of Health, 2010b). This dataset could be used to conduct a population-wide approach to monitoring inequalities in testing and positivity and will also enable monitoring of repeat testing and reinfections.

8.4.2. Understanding the role of social factors in chlamydia infection

As my research indicates, appropriate indicators of SEC need to be collected and used in order to examine socio-economic variations in chlamydia prevalence or positivity in young people. My background literature review indicates that there is a theoretical basis for selecting measures based on educational participation and as my cross-sectional study shows, it is also

sensitive to detecting variations in chlamydia positivity. There is an excellent opportunity to examine socio-economic variations in chlamydia prevalence in a nationally representative sample of young people in Natsal-2010, where measures of educational participation will be collected on all respondents and chlamydia testing will be carried out on a larger sample of 18-24 year olds than in Natsal-2000.

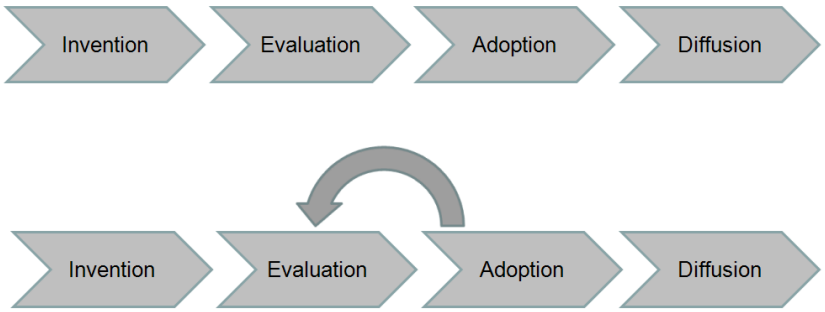
My cross-sectional study illustrates that is also feasible to further examine socio-economic variations in chlamydia positivity in young people attending sexual health service settings if organisational obstacles can be overcome (for example with dedicated onsite research support). If collection is extended to more settings and to other study designs it could further develop our understanding of how social factors influence young people's risk of, and from, chlamydia. Given that repeat chlamydia infections may pose a greater risk to young women's reproductive health (Haggerty et al, 2010), this research needs to encompass not just chlamydia positivity, but also predictors and rates of reinfection.

Given that SEC failed to explain area variations in chlamydia positivity in at least one area, examination of social factors influencing chlamydia should be expanded to consider the role of geographical characteristics other than SEC, such as social disorder.

8.4.3. Using delivery studies to inform evaluation of efficacy?

As shown in the National Institute for Health Research website (2011), research to inform the NHS in the UK is assumed to follow a pathway, where evaluation follows the invention of an intervention or technology; adoption and diffusion come later (Figure 8-1 – top). However, published trials into the health benefits of chlamydia screening produced inconclusive findings because they did not achieve sufficient adoption/uptake of testing (Oakeshott et al., 2010; Andersen et al., Soldan & Berman, 2011; Sheringham, 2010). Findings from studies of the adoption and delivery of screening may inform the design of future studies into the effectiveness of screening so they can achieve sufficient levels of uptake to make valid conclusions. So, when seeking to develop any new public health programme, the learning from chlamydia screening would suggest that it is not always possible to evaluate effectiveness in isolation from adoption: a feedback loop is also needed (Figure 8-1 – bottom).

Figure 8-1. NIHR research innovation pathway.



Top: redrawn from NIHR website (www.nihr.ac.uk/research); Bottom: pathway explicitly recognising the need to use findings relating to adoption of innovations to inform evaluation

8.5 Overall conclusions

Chlamydia screening reached more individuals in disadvantaged areas, but delivery varied by service model when SEC was measured by educational participation. However, other individual, household and contextual circumstances need to be taken into account to understand how local socio-economic circumstances may affect young people's risk of chlamydia.

Without evidence that chlamydia screening is effective in achieving its explicit goals, it is not possible to assume that delivery of testing to asymptomatic young people at high risk of chlamydia will control chlamydia incidence or prevent reproductive ill health. However, it may be productive to use measures of chlamydia testing delivery and positivity to identify areas of unmet sexual health need.

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APPENDICES

Appendix 1. Key to acronyms and abbreviations used in this thesis

Appendix 2. Area SEC measures considered for use in this thesis

Appendix 3. Systematic review study materials

Appendix 4. NCSP data analysis: additional analyses

Appendix 5. Focus group study materials and analytical frameworks

Appendix 6. Cross sectional study materials and additional analyses

Appendix 7. NCSP qualitative study materials

Appendix 8. Papers written during this thesis

Appendix 1. Key to the acronyms and abbreviations used in this thesis

ACORN	Full brand name is given as ACORN (in capitals). Commercially produced tool for segmenting the population according to socio-economic characteristics
CASH	Contraceptive And Sexual Health services (primarily contraceptive services which also provide testing for some sexually transmitted infections)
CLRN	Comprehensive Local Research Networks (organisations responsible for ensuring research governance arrangements are in place for research in the NHS)
CSO	Chlamydia Screening Offices (groups through which local chlamydia screening programmes are coordinated)
CSP	Chlamydia Screening Programme within local areas
DBRB	Doncaster, Bassetlaw, Rotherham and Barnsley (cluster of 4 primary care trust areas in South Yorkshire through which chlamydia screening is delivered by Terrence Higgins Trust in South Yorkshire/East Midlands)
GUM	GenitoUrinary Medicine clinics (often located within hospitals, provide specialist testing and treatment for all sexually transmitted infections)
HPA	Health Protection Agency (public body responsible for disease surveillance and management of the National Chlamydia Screening Programme at a national level)
IMD	Index of Multiple Deprivation (composite deprivation measure used in England)
LSOA	Lower-Level Super Output Area (administrative boundary in England, covering on average an area with 1000 people)
MSOA	Middle-Level Super Output Area (administrative boundary in England, covering 5 LSOA areas)
MSM	Men who have Sex with Men
NAATs	Nucleic Acid Amplification Tests (technology used to diagnose the majority of chlamydia infections. NAATs are more sensitive than older methods of diagnosis such as cell culture and immunoassays).
Natsal	National Survey of Sexual Attitudes and Lifestyles (cross-sectional survey of a representative sample of the UK population, undertaken every ten years since 1990).
NCSP	National Chlamydia Screening Programme (NHS programme delivering chlamydia testing to asymptomatic, sexually active young people)
PCT	Primary Care Trust (NHS body responsible for commissioning sexual health services including Chlamydia screening for their local population)

PID	Pelvic Inflammatory Disease (a possible consequence of untreated chlamydia infection and risk factor for infertility)
REC	Research Ethics Committee
SEC	Socio-Economic Circumstances (used in this thesis to describe the living and working conditions of individuals, households or the areas in which they live)
SNS	Social Networking Sites (e.g. Facebook)
STIs	Sexually Transmitted Infections (used as a generic term in this thesis in preference to Sexually Transmitted Diseases to capture both asymptomatic and clinically apparent infections).
THT	Terrence Higgins Trust (third sector sexual health organisation and provider of chlamydia screening in certain NCSP local areas)

Appendix 2: Publicly available composite SEC indices used in England to study health inequalities

Index	Description & method	Lowest geographical level	Advantages as a measure of SEC in this context	Disadvantages as a measure of SEC in this context
Index of Multiple Deprivation(Noble M et al., 2008)	• developed by ODPM (now Local Communities & Government) for resource allocation in England. • based on indicators in 7 domains: income (22.5%), employment (22.5%), health deprivation and disability (13.5%), education, skills and training (13.5%), barriers to housing and services (9.3%), living environment (9.3%)and crime (9.3%). • Several variables within each domain aggregated & weighted to produce a single score for an area. • Data mainly drawn from 2001 census and administrative data such as benefits systems, weighted to produce a single score for an area.	LSOA	• developed from established measure, ID2000, with extensive evidence base • encompasses a wide definition of deprivation, not just absence of material goods • available at small area level (LSOA, which have mean pop'n of 1500) • information sources are relatively current (2001 and more recent) • widely recognised as a measure of deprivation • could use individual domain scores/ranks as well as overall index • used in previous studies of chlamydia prevalence/diagnoses in England (e.g. Macleod et al 2005)	• inclusion of health data as part of the index could reduce its validity for measuring health inequalities. However, removing health domain had little, effect on socio-economic inequalities for other health outcomes(Adams J. & White M, 2006)
Child Well-being Index (CWI)(Bradshaw et al., 2009)	• part of the Index of Multiple Deprivation • first attempt to create a small area index exclusively for children in England • 7 domains, all equally weighted(ie 14.3%) - Material well-being; Health; Education; Crime; Housing; Environment; Children (at risk of being) in need	LSOA	• has measures specifically applicable to children and young people • may be possible to use part of the index	• Relates mainly to 0-15y, though some measures up to 18 or education has HE up to 21 • Index only available since Jan 09, has not been

				extensively tested
Output Area Classification (OAC), and Super output area classification(Output Area Classification User Group, 2011)	Classification at SOA level has seven supergroups, 20 groups and 53 subgroups ONS produces summaries of the each super/group/subgroup characteristics(106)	OA, LSOA	• Freely available • Methodology transparent • Has demographic information as well as deprivation data • Postcode look up dataset has an OAC code attached	• Not a hierarchical socio-economic classification • more cumbersome to use than other indices
Carstairs(Carstairs & Morris, 1989)	• Single measure of deprivation drawn from four equally weighted characteristics of **RESIDENTS** in an area • residents in households headed by unskilled • unemployed males • overcrowding • residents without a car	Ward	• Widely used in health research • used in previous studies exploring chlamydia prevalence and deprivation at ward level in UK (e.g. Norman et al 2004, Williamson et al 2007). • Relates to 2001 census at ward level	• limited by limitations in census collection – ie based on data up to 10 years old • Measure of deprivation rather than affluence • Meaning of car ownership has changed over time, from indicator of affluence to the norm(107)
Townsend(Morris & Carstairs, 1991)	Single measure of deprivation drawn from four equally weighted characteristics of **HOUSEHOLDS** in an area: • Unemployment – unemployed residents over 16 years as a % of all economically active residents aged over 16. • Overcrowding – households with 1 and over persons per room as a % of all households. • Non car ownership – households with no car as a % all households. • Non home ownership –	Ward	• Widely used in health research • used in previous studies exploring chlamydia prevalence and deprivation at ward level in England (e.g. Das et al 2005) • Relates to 2001 census at ward level	• only captures aspects of material deprivation. • More people live in deprived households so this may underestimate the variability between rich and poor

	households not owning their own home as a % of all households.			
Jarman Under Privileged Area (UPI) score(Carr-Hill & Chalmers-Dixon, 2005)	Factors and weights derived by a survey of GPs, asking them to rate the degree to which they were likely to increase a GP's workload. • Unemployment • Overcrowding • Lone pensioners • Single parents • Born in New Commonwealth • Children under 5 • Low social class (measured by % people where head of household is unskilled manual worker) • One year migrants	ward	• Good measure to support health service resource allocation	• Often used as a measure of social deprivation but not intended as a measure of deprivation • Suffers from same problems as other census based indices– ie based on data up to 10 years old •

Appendix 3: Systematic review materials

Search strategies

- EBSCO conducted 23.2.09
- SCOPUS conducted 20.2.09
- Web of Science conducted 20.2.09
- Medline conducted 19.2.09

Data extraction and appraisal tool

Detailed appraisal scores of all studies meeting inclusion/exclusion criteria

A. Generic study quality (adapted from SIGN guidelines)

B. Relevance to research question

EBSCO search strategy

Used for CINAHL and IBSS databases

Search id #	Query	Results (23/2/09)
S16	S5 and S12	1615
S15	S5 and S12	1921
S12	(S7 or S8 or S10) or (S9)	5186
S10	TI wart* and TI (genital OR anogenital OR anal)	120
S9	SU sexually transmitted disease or SU sexually transmitted infection or STD or STI	3389
S8	SU chlamydia or SU chlamydial	1758
S7	TI Condyloma* or TI human papilloma virus	109
S5	S4 or S3 or S2 or S1	1002412
S4	TX townsend or TX carstairs or TX mosaic or TX acorn or TX superprofiles or TX index of multiple deprivation	3433
S3	TX Public housing or TX vulnerable populations or TX residence characteristics or TX housing tenure or TX overcrowding or TX geography or TX neighbourhood or TX neighborhood	46320
S2	TX wealth or TX underprivilege or TX educational status or TX qualifications or TX school or TX university or TX occupation or TX unemployment or TX employment or poverty or level of education or income	933233
S1	TX socioeconomic or TX social class or TX socio-economic or TX social determinants or TX social status or TX disparit* or TX psychosocial deprivation or disdvantaged	61681

Retrieved 1615 (251 ibss, 1364 from cinahl 23/2/09)

IBSS

Search id	Terms	Options	Results (13/1/09)
S14	S13 and S12 and S7	Limiters - Date Published: 199901-200912; English Only Expanders - Also search within the full text of the articles Search modes - Boolean/Phrase	29
S13	S5 or S4 or S3 or S2 or S1	Expanders - Also search within the full text of the articles	240383
S12	S11 or S10 or S9 or S8	Search modes - Boolean/Phrase	551993
S11	GE Canad* or GE America or GE (United States OR USA) or GE Australia* or GE New Zealand		118523
S10	Canad* or America or (United States OR USA) or Australia* or New Zealand		192886
S9	GE (Austria OR Germany OR Belgium) or GE (Denmark OR Norway OR Sweden) or GE (France OR Italy OR Spain OR Portugal OR Greece) or GE (Andorra OR Finland OR Gibraltar) or GE (Iceland OR Ireland OR Luxembourg) or GE (Malta OR Netherlands OR Switzerland)		276785
S8	GE Engl* or GE brit* or GE (united kingdom OR UK) or GE wales or GE scotland or GE Northern Ireland		108401
S7	SU Chlamydia or SU (gonorrh* OR gonococcal OR GC) or SU sexually transmitted or SU (STI OR STD) or SU Chlamydia trachomatis or Chlamydial		1051
S6	TI (Chlamydia OR Chlamydial OR		301

	Chlamydia trachomatis) or TI (gonorrh* OR gonococcal OR GC) or TI sexually transmitted or TI (STI OR STD)		
S5	TX Townsend or TX Carstairs or TX (superprofiles OR super profiles) or TX mosaic or TX Acorn or TX Index N5 Deprivation or Indices N5 Deprivation		1340
S4	TX Public housing or TX Vulnerable populations or TX residen* characteristics or TX housing tenure or TX overcrowd* or TX geograph* or TX (Neighbourhood OR Neighborhood) or TX Poverty areas		55763
S3	TX education* AND (level OR status OR university OR school OR college OR qualifications)		29327
S2	TX wealth or TX underprivilege or TX Income or TX Unemploy* or TX Occupation or TX Employ* or TX poverty		141512
S1	TX Socioeconomic or TX socio-economic or TX Social status or TX Disparit* or psychosocial or disadvantage*		

NB: none of the key references picked up

SCOPUS search strategy (20 feb)

To paste directly into ‘advanced’ engine:

((TITLE(chlamydiaOR"chlamydia trachomatis"OR"genital warts"ORhpvOR"human papilloma virus"OR"Condylomata acuminata"OR"anal wart"OR"anogenital wart")ORTITLE("sexually transmitted"OR"STIs"ORstd))ANDPUBYEARAFT1998)AND((((TITLE-ABS-KEY(schoolORqualificationsORuniversityORcollegeOR"educational status")ORTITLE-ABS-KEY(unemploy*ORemploy*ORoccupation)ORTITLE-ABS-KEY(wealthORincomeORpovertyORasset)))OR((TITLE-ABS-KEY("public housing"OR"housing tenure"ORovercrowding)ORTITLE-ABS-KEY("vulnerable populations"OR"residen* characteristics")ORTITLE-ABS-KEY(geograph*ORneighbo*rhoodORgeospatial)))OR((TITLE-ABS-KEY(townsendORcarstairsORsuperprofilesORacornORmosaicOR"Index of Multiple Deprivation")ANDTITLE-ABS-KEY(geograph*ORneighborhoodORneighbourhoodORgeospatial)))OR((TITLE-ABS-KEY(education)ANDTITLE-ABS-KEY(statusORlevelORparticipationORattainment)))OR((TITLE-ABS-KEY(social)ANDTITLE-ABS-KEY(classORstatusORdeterminant)))OR((TITLE-ABS-KEY(socioeconomicORsocio-economic)ORTITLE-ABS-KEY(inequalit*ORdisparit*)ORTITLE-ABS-KEY(povertyORdisadvantage*ORunderprivilege*))ANDPUBYEARAFT1998)))

Retrieves: 1698 records (20/2/09)

*same search strategy minus warts synonyms restricted to 2009-2011 Engllish Language: 386

Web of Science search

1.	Title=(chlamydia OR chlamydial OR chlamydia trachomatis) OR Title=(sexually transmitted infection* OR sexually transmitted disease* OR STD* OR STI) OR Title=(Condylomata Acuminata OR human papilloma virus OR genital wart* OR anogenital wart* OR Condyloma OR anal wart*)	30,470
2.	Topic=(vulnerable populations OR residen* characteristics OR poverty areas) OR Topic=(geograph* OR neighborhood OR neighbourhood OR geospatial) OR Topic=(public housing OR housing tenure OR overcrowding)	>100,000
3.	Topic=(wealth OR income OR poverty OR asset)	>100,000
4.	Topic=(geograph* OR neighborhood OR neighbourhood OR geospatial) AND Topic=(townsend OR carstairs OR superprofiles OR acorn OR mosaic OR Index of Multiple Deprivation)	1,368
5.	Topic=(unemploy*) OR Topic=(employ*) OR Topic=(occupation*)	>100,000
6.	Topic=(school OR qualifications OR university OR educational status)	>100,000
7.	Topic=(education*) AND Topic=(status OR level OR participation OR attainment)	>100,000
8.	Topic=(social) AND Topic=(class OR status OR determinant*)	>100,000
9.	Topic=(Socioeconomic OR socio-economic) OR Topic=(inequalit* OR disparit*) OR Topic=(poverty OR disadvantage* OR underprivilege*)	>100,000
10.	5 OR 6 OR 7 OR 8 OR 9	>100,000
11.	10 AND 1	896

Ovid Medline search strategy

Undertaken 19/2/2009

chl_b OR warts OR STD AND exposure
feb 19_3395 retrieved
1. Socioeconomic Factors/
2. Social Class/
3. Psychosocial Deprivation/
4. Vulnerable Populations/
5. Unemployment/
6. Income/
7. Educational Status/
8. Poverty Areas/ or Poverty/
9. Public Housing/
10. Residence Characteristics/
11. Social class.mp. [mp=title, original title, abstract, name of substance word, subject heading word]
12. socio-economic.mp. [mp=title, original title, abstract, name of substance word, subject heading word]
13. Socioeconomic.mp. [mp=title, original title, abstract, name of substance word, subject heading word]
14. Social status.mp. [mp=title, original title, abstract, name of substance word, subject heading word]
15. inequalit*.mp. [mp=title, original title, abstract, name of substance word, subject heading word]
16. disparit*.mp. [mp=title, original title, abstract, name of substance word, subject heading word]
17. social determinants.mp. [mp=title, original title, abstract, name of substance word, subject heading word]
18. Deprivation.mp. [mp=title, original title, abstract, name of substance word, subject heading word]
19. disadvantaged.mp. [mp=title, original title, abstract, name of substance word, subject heading word]
20. Occupations/
21. Employment/
22. Psychosocial.mp. [mp=title, original title, abstract, name of substance word, subject heading word]
23. unemployment.mp. [mp=title, original title, abstract, name of substance word, subject heading word]
24. employment.mp. [mp=title, original title, abstract, name of substance word, subject heading word]
25. occupation.mp. [mp=title, original title, abstract, name of substance word, subject heading word]
26. qualifications.mp. [mp=title, original title, abstract, name of substance word, subject heading word]
27. overcrowding.mp. [mp=title, original title, abstract, name of substance word, subject heading word]

28. neighborhood.mp. [mp=title, original title, abstract, name of substance word, subject heading word]
29. neighbourhood.mp. [mp=title, original title, abstract, name of substance word, subject heading word]
30. housing tenure.mp. [mp=title, original title, abstract, name of substance word, subject heading word]
31. Townsend.mp. [mp=title, original title, abstract, name of substance word, subject heading word]
32. carstairs.mp. [mp=title, original title, abstract, name of substance word, subject heading word]
33. superprofiles.mp. [mp=title, original title, abstract, name of substance word, subject heading word]
34. mosaic.mp. [mp=title, original title, abstract, name of substance word, subject heading word]
35. acorn.mp. [mp=title, original title, abstract, name of substance word, subject heading word]
36. Index of Multiple Deprivation.mp. [mp=title, original title, abstract, name of substance word, subject heading word]
37. underprivilege.mp. [mp=title, original title, abstract, name of substance word, subject heading word]
38. wealth.mp. [mp=title, original title, abstract, name of substance word, subject heading word]
39. Income.mp. [mp=title, original title, abstract, name of substance word, subject heading word]
40. geography.mp. [mp=title, original title, abstract, name of substance word, subject heading word]
41. impoverish*.mp.
42. less educated.mp.
43. sociodemography/ or sociodemograph*.mp.
44. 32 or 33 or 21 or 7 or 26 or 2 or 17 or 1 or 18 or 30 or 16 or 25 or 27 or 28 or 40 or 14 or 20 or 24 or 10 or 31 or 35 or 11 or 42 or 22 or 23 or 13 or 29 or 6 or 39 or 3 or 36 or 9 or 41 or 12 or 15 or 8 or 38 or 4 or 34 or 37 or 43 or 19 or 5
45. exp *Papillomavirus Infections/ep, tm, pc [Epidemiology, Transmission, Prevention & Control]
46. exp *Warts/pc, tm, ep [Prevention & Control, Transmission, Epidemiology]
47. exp *Condylomata Acuminata/pc, tm, ep [Prevention & Control, Transmission, Epidemiology]
48. human papilloma virus.mp.
49. genital warts.mp. [mp=title, original title, abstract, name of substance word, subject heading word]

50. anogenital warts.mp. [mp=title, original title, abstract, name of substance word, subject heading word]
51. anal warts.mp. [mp=title, original title, abstract, name of substance word, subject heading word]
52. condylomata acuminata.mp. [mp=title, original title, abstract, name of substance word, subject heading word]

53. anal wart.mp. [mp=title, original title, abstract, name of substance word, subject heading word]
54. genital wart.mp. [mp=title, original title, abstract, name of substance word, subject heading word]
55. anogenital wart.mp. [mp=title, original title, abstract, name of substance word, subject heading word]
56. Condyloma.mp. [mp=title, original title, abstract, name of substance word, subject heading word]
57. 50 or 55 or 47 or 51 or 53 or 46 or 56 or 52 or 45 or 48 or 54 or 49
58. exp *Chlamydia Infections/pc, tm, ep [Prevention & Control, Transmission, Epidemiology]
59. Chlamydia.m_titl.
60. Chlamydia trachomatis.m_titl.
61. chlamydial.m_titl.
62. 58 or 60 or 59 or 61
63. Sexually Transmitted Diseases/tm, pc, ep [Transmission, Prevention & Control, Epidemiology]
64. Sexually Transmitted Diseases, Bacterial/tm, ep, pc [Transmission, Epidemiology, Prevention & Control]
65. Genital Diseases, Female/pc, tm, ep [Prevention & Control, Transmission, Epidemiology]
66. Genital Diseases, Male/tm, pc, ep [Transmission, Prevention & Control, Epidemiology]
67. Sexually Transmitted Diseases.mp. [mp=title, original title, abstract, name of substance word, subject heading word]
68. sexually transmitted infections.mp. [mp=title, original title, abstract, name of substance word, subject heading word]
69. Venereal disease.mp. [mp=title, original title, abstract, name of substance word, subject heading word]
70. STI.mp. [mp=title, original title, abstract, name of substance word, subject heading word]
71. STD.mp. [mp=title, original title, abstract, name of substance word, subject heading word]
72. 68 or 65 or 69 or 71 or 64 or 70 or 66 or 63 or 67
73. 57 or 72 or 62
74. 73 and 44

Apply limits:

English language

Published: 1999-2009

Retrieved 1735 records

** 7 June rerun: limited to 2009-2011: 566 records retrieved

** 7 June EMBASE rerun limited to 2009-2011 English lan: 654

Ran same search on EMBASE: 1449 records retrieved w limits

Appraisal and data extraction tool (used online with SurveyMonkey) July 2009 2009

Chlamydia and SES systematic review - data extraction test2

1. Researcher details and study design

This data extraction form is designed to record the relevant information from studies reporting an association between chlamydia and socioeconomic circumstances.

*** 1. Checklist completed by:**

*** 2. Date of data extraction**

	MM	DD	YYYY
Date data extraction completed			

*** 3. Study ID**

Filename number

*** 4. Publication date (if only year given, put 01/01/xxxx, or only month, put 01/xx/xxxx)**

	MM	DD	YYYY
Year study was published			

*** 5. When were data collected?**

*** 6. What is the study design used?**

- ◯ systematic review/meta-analysis
- ◯ RCT
- ◯ cohort
- ◯ cross-sectional
- ◯ ecological
- ◯ case-control
- ◯ Secondary analysis of routinely collected data
- ◯ case study (EXCLUDE)
- ◯ opinion piece (EXCLUDE)
- ◯ not known

Other (please specify) or give details if study design unclear

Page 1

Chlamydia and SES systematic review - data extraction test2

2. For routinely collected diagnostic data

This is to record details of studies that use records rather than bespoke data on participants.

1. Number of records

2. Source of data (may include STI clinics, all hospitals, private and public settings.)

Please complete the rest of the study population data as requested on page 3 of the form.

Chlamydia and SES systematic review - data extraction test2

3. Study population

This page is designed to extract the information required to assess:
a) the size of the study. This gives an indication of the relative weight of the study's findings compared with others included in this review. It may also help to appraise the study's power - ie for small sample sizes, indicate in the methods checklist that the power of the study was NOT 'well addressed'.
b) the extent to which the study population were representative of the eligible population
c) applicability of the study to the NCSP population
This information should be reflected in the methodology checklist question. If the study sample has 0-40% participants aged 15-24, please answer 'no'. If it has 40-75%, please answer 'somewhat'.

1. Study size

No. participants

2. What proportion of the eligible population took part in the study?

- ◯ 80-100%
- ◯ 50-78%
- ◯ 20-49%
- ◯ less than 20%
- ◯ not reported

*** 3. Study participant characteristics**

Male (%)
Female (%)
Not given

*** 4. Age range of study participants**

From
To
% aged 15-24yrs
not given

*** 5. Is ethnicity of participants recorded?**

6. Give proportions of the different ethnic groups

% white
% BME

7. Add further ethnicity information if it is reported. (eg % completeness, finer breakdown of ethnic categories)

*** 8. Is this study population part of a defined subgroup?**

- ◯ yes
- ◯ no

Page 3

Chlamydia and SES systematic review - data extraction test2

9. Please select the subgroup or subgroups in the study population

- ☐ Student - higher education (university or college)
- ☐ Student - school or FE
- ☐ Incarcerated (eg prison, youth detention centre)
- ☐ Military
- ☐ Homeless
- ☐ MSM
- ☐ Sex worker
- ☐ Migrant/asylum seeker
- ☐ Patient (give further details of comorbidity under 'other')

Other (please specify)

10. What proportion of the study population comes from the subgroup?

11. Comments on study size, participants included, and the applicability to NCSP population (ie sexually active 15-24 year olds living in England)

Page 4

Chlamydia and SES systematic review - data extraction test2

4. Study setting

The setting and country in which diagnoses were performed has been shown to be associated with different levels of chlamydia prevalence.

This information is needed to identify whether an association between chlamydia and SES is also related to particular settings or countries.

*** 1. Where is the study population taken from? (select one or more options)**

- [ ] Genito-urinary/sexual health clinic
- [ ] A&E/emergency department
- [ ] Family planning
- [ ] Paediatric/Child health service
- [ ] antenatal clinics (hospital or community)
- [ ] School
- [ ] Hospital gynaecology outpatients
- [ ] University/college
- [ ] Termination of pregnancy
- [ ] Prison/detention centre
- [ ] General practice
- [ ] Population

Other (please specify), and further details if given

*** 2. Where did the study take place?**

- ◯ Australia
- ◯ New Zealand
- ◯ Belgium
- ◯ Norway
- ◯ Britain
- ◯ Portugal
- ◯ Canada
- ◯ Sweden
- ◯ Finland
- ◯ USA
- ◯ Netherlands

Other (please specify)

3. Give the state, region or locality of the study

Chlamydia and SES systematic review - data extraction test2

5. Exposure

This page is designed to assess the validity and reliability of the exposure measures. If the study is compromised by either a poor s/e measure, missing s/e information, incomplete data collection, this should be reflected in the methodology checklist. The overall study assessment should be 'medium', 'poor' or excluded.

*** 1. Is socioeconomic exposure the primary exposure of interest?**

◯ Yes ◯ No

If no, what is?

*** 2. At what level is socioeconomic circumstance measured?**

☐ individual (subject's own) ☐ household

☐ individual (maternal or parental) ☐ area

If area, state at what level eg ward, census tract, postcode, institution, eg school, service provider etc

*** 3. Which indicators of socioeconomic circumstances have been reported?**

☐ Employment status (employed or not)
☐ Occupation
☐ Social class
☐ Income
☐ Receipt of benefits/support
☐ Educational achievement (eg no. GCSEs)
☐ Educational participation (eg in school/completed school)
☐ Poverty
☐ Housing tenure (eg own home/rented/temporary)
☐ Residence characteristics
☐ Index of Multiple Deprivation/Index of Local Conditions/ Local Deprivation
☐ Townsend
☐ Carstairs
☐ Jarman
☐ Superprofiles/ Mosaic/ Acorn
☐ other

If ticked 'other', please give details

4. How are socioeconomic circumstances collected?

◯ self report ◯ assigned by clinician ◯ assigned by researcher

Other (please specify)

Chlamydia and SES systematic review - data extraction test2

*** 5. How is the socioeconomic exposure compared across groups?**

- ◯ dichotomous (eg deprived/not deprived)
- ◯ continuous (sliding scale of SEC)
- ◯ ordered categorical (discrete levels of SEC)

Other (please specify)

*** 6. How complete is the socioeconomic information collected?**

- ◯ 80-100%
- ◯ under 50%
- ◯ 50-80%
- ◯ not reported

GUIDANCE: this question relates to methodology checklist x.jj, i.e. if less than 80% collected, this is NOT well addressed, if less than 50% collected, this is poorly addressed.

7. Additional comments on the reliability or validity of exposure information (measurement, collection or reporting).

Chlamydia and SES systematic review - data extraction test2

6. The Outcome

This page is designed to assess the completeness, validity and reliability of the diagnostic methods used and reported.

If the outcome data collected compromise the validity of the findings, please describe in the comments box, and reflect in the methods checklist.

*** 1. Is chlamydia the only study outcome?**

- ◯ Yes
- ◯ No

If no, please give the other outcome(s)

*** 2. What outcome measures are reported?**

- ☐ number of new diagnoses
- ☐ incidence
- ☐ prevalence
- ☐ re-infections
- ☐ positivity
- ☐ other

please give details if 'other' or if you disagree with the measure they have reported

*** 3. How is chlamydia diagnosed?**

- ◯ NAATS
- ◯ Clinical exam only EXCLUDE
- ◯ DNA non amplification system
- ◯ Self report only EXCLUDE
- ◯ enzyme immunoassay (EIA) only (EXCLUDE)
- ◯ Not sure (DISCUSS WITH JS/SM)
- ◯ direct immunofluorescence (DFA) only (EXCLUDE)
- ◯ Not reported
- ◯ Tissue culture only EXCLUDE

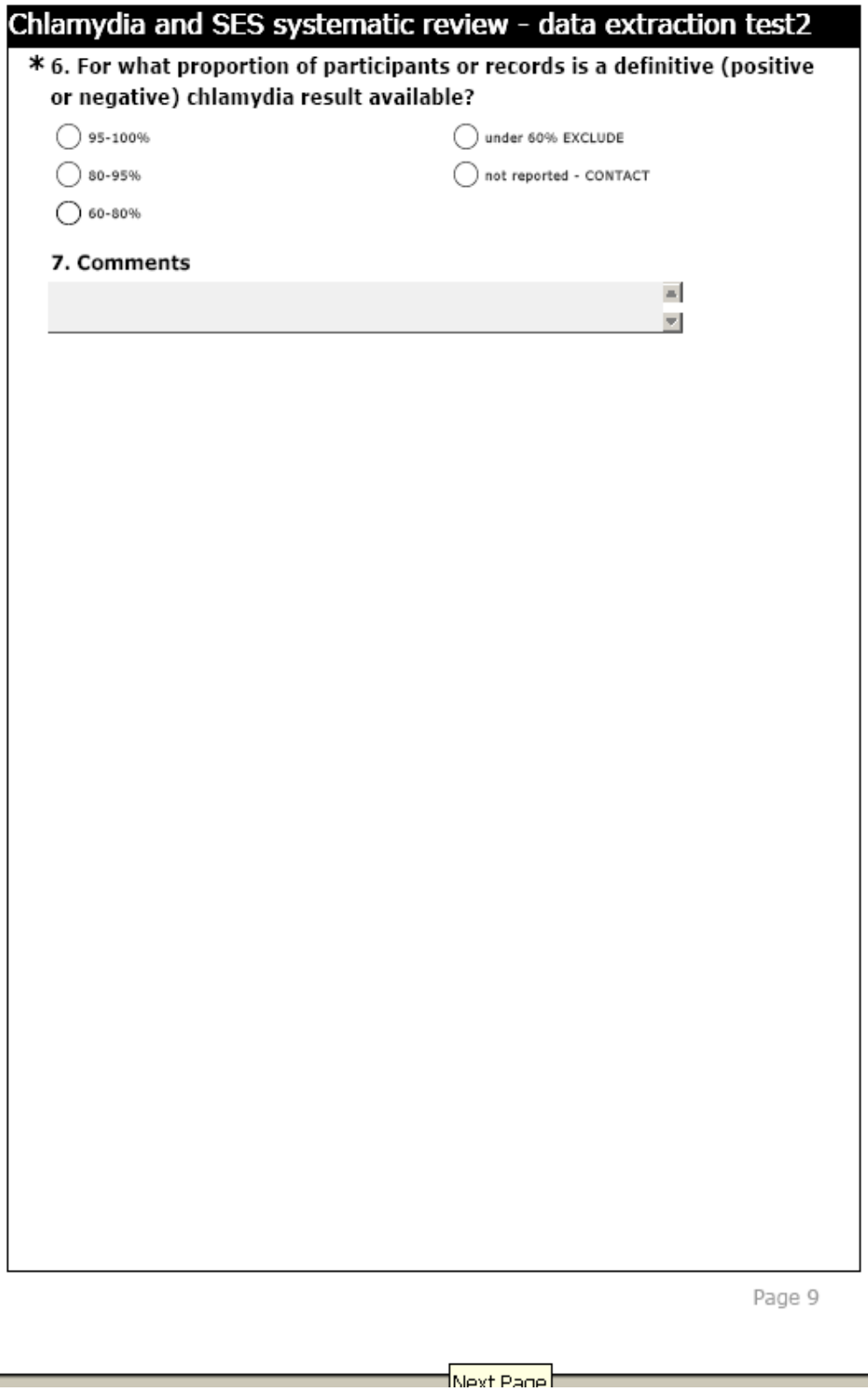
4. If NAATS was used, what type?

- ◯ polymerase chain reaction (PCR or LCR)
- ◯ transcription mediated amplification (TMA)
- ◯ strand displacement amplification (SDA)
- ◯ not known

Other (please specify)

5. Where was the test specimen collected?

- ☐ Urine
- ☐ Urethral
- ☐ Conjunctival (EXCLUDE)
- ☐ Cervix
- ☐ Rectal(EXCLUDE? DISCUSS)
- ☐ Not known
- ☐ Vulvo-vaginal
- ☐ Pharyngeal(EXCLUDE? DISCUSS)


Chlamydia and SES systematic review - data extraction test2
* 6. For what proportion of participants or records is a definitive (positive or negative) chlamydia result available?
95-100%
80-95%
60-80%
under 60% EXCLUDE
not reported - CONTACT
7. Comments
Page 9
Next Page

Chlamydia and SES systematic review - data extraction test2

7. Findings - association between chlamydia and SEC

This page is designed to
a) provide a summary of the main study findings, to use as the basis for synthesis of all the studies
b) assess the validity wrt confounding
If the study did not adjust their results for confounding factors when an association was found, please reflect in the methods checklist section and in the overall assessment, either EXCLUDE or give an overall assessment of POOR.
c) assess the precision of the study
If the study did not report any significance tests, please reflect in the methods checklist section and in the overall assessment, either EXCLUDE or give an overall assessment of POOR.

*** 1. What measure of association between chlamydia infection and socioeconomic circumstance is reported?**

- ☐ no measure - EXCLUDE
- ☐ Odds ratio (adjusted)
- ☐ Risk ratio (unadjusted)
- ☐ Risk ratio (adjusted)
- ☐ Risk difference
- ☐ Attributable risk
- ☐ Other

If ticked 'other', please give details

*** 2. What was the UNADJUSTED association(s) between SEC and chlamydia reported in the paper?**

3. If yes, was the result significant at the p=0.05 level?

- ◯ Yes
- ◯ No

*** 4. Was the significance of the association reported?**

- ◯ Yes
- ◯ No

5. If an association between SEC and co-infection between chlamydia and another infection is reported, please give it here.

*** 6. In the analysis of association, did they adjust for confounding?**

- ◯ yes
- ◯ no

Chlamydia and SES systematic review - data extraction test2

7. IF YES TO QU 6, which factors did they use to adjust for confounding?

- [ ] gender
- [ ] age
- [ ] ethnicity
- [ ] number of partners
- [ ] age of sexual debut
- [ ] other
- [ ] reported use of condoms
- [ ] Study setting eg family planning, A&E etc

If ticked 'other', please give details

8. What was the ADJUSTED association(s) between SEC and chlamydia reported in the paper?

*** 9. Was the significance of the ADJUSTED association reported?**

- ◯ Yes
- ◯ No
- ◯ N/A - no adjustment made

10. If yes, was the ADJUSTED result significant at the p=0.05 level?

- ◯ Yes
- ◯ No

11. Please add any other comments on the associations with socioeconomic circumstances

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Chlamydia and SES systematic review - data extraction test2

8. Additional relevant references

Please handsearch the reference lists of the selected paper.
References are relevant if:
- meet the search inclusion/exclusion criteria (eg published 1999 or after, on STDs or chlamydia)
- they are not already in the 'excluded' list of references from the initial search for the review

*** 1. List below the numbers of full titles of references that should be considered for full paper review. Record as 'none' if none are relevant.**

Chlamydia and SES systematic review - data extraction test2

9. Methodology checklist

This checklist has been adapted from SIGN critical appraisal tools. It will be used to form an assessment of the quality of included studies and to exclude studies of insufficient quality from the review.

The information reported in the data extraction should provide the evidence to support the assessment you make in the methodology assessment. If you feel it's helpful to provide a reference to the relevant part of the data extraction survey for your judgement, please include this in qu 7.6.

*** 1. Please indicate the extent to which the following criteria are met**

	Well covered	Adequately addressed	Poorly addressed	Not addressed	Not reported	Not applicable
The study's aim is to investigate the relationship between socioeconomic circumstances and chlamydia (ref 5.1 and 6.1)	◯	◯	◯	◯	◯	◯
The group(s) being studied are comparable to the source population(s) under investigation. (ref page 3 - study pop)	◯	◯	◯	◯	◯	◯
The study indicates how many of the people eligible to take part are included.(ref page 3)	◯	◯	◯	◯	◯	◯
Where possible, comparison or adjustment is made between participants and those missing outcome data, by exposure status. (ref form page 5-7)	◯	◯	◯	◯	◯	◯
The outcome (eg acquisition of chlamydial infection, repeat infection, transmission) is clearly defined.	◯	◯	◯	◯	◯	◯
The method of assessment of socio-economic exposure is complete, valid and reliable. (ref. p4 - outcome)	◯	◯	◯	◯	◯	◯
The outcome assessment is complete, valid and reliable. (to be adequately addressed, all diagnoses need to be confirmed by NAATS)(ref form page 6)	◯	◯	◯	◯	◯	◯
The study has sufficient power to detect an association if one existed	◯	◯	◯	◯	◯	◯
An appropriate measure of association is reported if one exists	◯	◯	◯	◯	◯	◯
The main potential confounders are identified and taken into account in the design and analysis.(ref form page 7)	◯	◯	◯	◯	◯	◯

2. Overall study quality assessment: How well was the study done to minimise the risk of bias or confounding, and to establish a causal relationship between exposure and effect?

◯ ++ good quality

◯ + satisfactory/medium

◯ - poor

◯ -- quality too poor to include (EXCLUDE)

Chlamydia and SES systematic review - data extraction test2

3. Are the results of this study directly applicable to the population of interest, ie young people aged 15-24 in England?
(refer to page 2 of the form)

- ◯ yes
- ◯ somewhat
- ◯ no

If somewhat give reasons or refer to an answer to a previous question

4. Add any additional comments you feel are relevant to the quality of this article that a) relate to any of the questions above or b) that are not covered by these questions.

Summaries of all studies meeting inclusion/exclusion criteria

First author, date	Design	Study population	Socio-economic measure	Appraisal rating		
				Relevance	Quality	Overall
Fenton 2001	Cross-sectional survey	Geography: Britain Setting: population Age range: 18-44 yrs	Social class (I)	medium	high	Medium
Macleod 2006	Cross-sectional survey	Geography: Britain Setting: primary care Age range: 16-24 yrs	Index of Multiple Deprivation 2004 (A)	high	medium	medium
Götz 2005	Cross-sectional survey	Geography: Netherlands Setting: population Age range: 15-29 yrs	Educational participation (I)	medium	high	medium
Asbel 2006	Cross-sectional survey	Geography: USA Setting: schools Age range: 12-20 yrs	School type (A)	medium	high	medium
Stein 2008	Cross-sectional survey	Geography: USA Setting: AddHealth survey Age range: 18-26 yrs	Poverty (I) Occupation (I) Education (I)	medium	high	medium
Evenden 2006	Ecological study	Geography: Britain, Portsmouth Dataset: opportunistic screening Population: ♀, aged 15-24yrs	Index of Multiple Deprivation (2000) plus range of individual domains of the index (A)	high	medium	medium
Krieger 2003	Ecological study	Geography: USA, Massachusetts Dataset: STI surveillance notifications Population: 85% 15-44	Range of composite and individual indicators (A)	medium	medium	medium

Bush 2008	Ecological study	Geography: Canada, Calgary Dataset: STD mgt system notifications Geography: Australia, Victoria	Education, employment, housing, income (A)	medium	medium	medium
McNamee 2008	Ecological study	Datasets: Medicare Australia, Melbourne STI centre, Disease Surveillance Scheme VA Population: 15-60+ y, 26% 15-24 y	Index of Relative socioeconomic advantage/ disadvantage	medium	high	medium
Andersen 2003	Cross-sectional survey	Country: Denmark Setting: population Age range: 21-23 yrs	Education (I)	medium	low	low
Dolan 2008	Ecological study	Geography: USA, Virginia Dataset: STD mgt system Age: not given Country: USA	Poverty (A)	medium	low	low
Dunne 2008	Cohort	Settings: GU clinic, primary care, prison, community Age range: 15-35 yrs Geography: USA	Education (I)	low	low	low
Geisler 2006	Cross-sectional survey	Setting: AddHealth survey Age range: 18-26 yrs Country: Australia	Health insurance (I)	low	high	low
Heal 2002	Cross-sectional survey	Setting: general practice Age range: 18-24 yrs Geography: USA	Education (I)	medium	low	low
Holtgrave 2003	Ecological study	Dataset: public health records Geography: USA, Chicago	Poverty, income inequality (A)	medium	low	low
Kaplan 2009	Ecological study	Dataset: public health records		low	low	low

Klausner 2001	Cross-sectional survey	Country: USA Setting: population Age range: 18-29 yrs	Income (H)	medium	low	low
Kufeji 2003	Ecological study	Geography: Britain, Nottingham Dataset: primary care Population: Under 15- over 30	Townsend Index (A)	medium	low	low
Miller 2005	Cohort	Country: USA Setting: antenatal/TOP Age range: not given	Employment status (I)	low	low	low
Norman 2004	Cross-sectional survey	Country: Britain Setting: antenatal/TOP Age range: 20-30 yrs	Carstairs Index (A)	low	medium	low
Radcliffe 2001	Case control	Country: USA Setting: GUM clinic Age range: 20-30 yrs	Occupation (I)	low	high	low
Todd 2001	Cross-sectional survey	Country: USA Setting: A&E/ emergency Age range: 18-30 yrs	Employment (I) Poverty (receipt or benefits) (I)	low	medium	low
Verhoeven 2003	Cross-sectional survey	Country: Belgium Setting: primary care Age range: 15-40 yrs	Occupation (I) Education (I)	low	high	low
Vuylsteke 1999	Cross-sectional survey	Country: Belgium Setting: schools Age range: 16-23 yrs	School type (A)	low	medium	low
Williamson 2007	Cross-sectional survey	Geography: Britain Setting: pharmacists, record stores, drop-ins, FE college, SHS Age range: 13-25 yrs	Carstairs Index (A)	high	low	low
Zenilman	Cross-sectional survey	Country: USA Setting: army medical centre Age range: 64% u30	Military rank (I)	medium	low	low

Detailed appraisal scores of all studies meeting inclusion/exclusion criteria

A. Generic study quality (adapted from SIGN guidelines)

First author, date	Sample **comparable to source pop**	**% eligible** population participated	Accounted for **missing data**	**Outcome** = valid complete, reliable	Sufficient study **power**	Appropriate **measure of association**	**Confounders** taken into account	**Overall quality rating**
Fenton 2001	adequate	adequate	well addressed	adequate	adequate	well addressed	n/a	high
Macleod 2006	adequate	poorly/not addressed	adequate	well addressed	well addressed	well addressed	well addressed	medium
Götz 2005	adequate	adequate	adequate	well addressed	well addressed	well addressed	well addressed	high
Asbel 2006	well addressed	adequate	well addressed	well addressed	well addressed	well addressed	poorly/not addressed	high
Stein 2008	adequate	adequate	adequate	well addressed	well addressed	well addressed	well addressed	high
Evenden 2006	adequate	adequate	poorly/not addressed	adequate	adequate	adequate	adequate	medium
Krieger 2003	well addressed	well addressed	adequate	poorly/not addressed	well addressed	adequate	poorly/not addressed	medium
Bush 2008	adequate	adequate	adequate	poorly/not addressed	well addressed	well addressed	n/a	medium
McNamee 2008	adequate	adequate	n/a	adequate	well addressed	well addressed	adequate	high
Andersen 2003	poorly/not addressed	poorly/not addressed	poorly/not addressed	well addressed	adequate	poorly/not addressed	well addressed	low
Dolan	poorly/not addressed	adequate	adequate	poorly/not addressed	well addressed	adequate	adequate	low
Dunne 2008	poorly/not addressed	adequate	poorly/not addressed	well addressed	poorly/not addressed	adequate	adequate	low
Geisler 2006	adequate	well addressed	adequate	adequate	well addressed	well addressed	adequate	high
Heal 2002	poorly/not addressed	well addressed	n/a	adequate	adequate	adequate	poorly/not addressed	low

Holtgrave 2003	well addressed	n/a	n/a	poorly/not addressed	well addressed	well addressed	poorly/not addressed	low
Kaplan 2009	adequate	poorly/not addressed	poorly/not addressed	poorly/not addressed	well addressed	adequate	adequate	low
Klausner 2001	adequate	well addressed	poorly/not addressed	well addressed	poorly/not addressed	poorly/not addressed	poorly/not addressed	low
Kufeji 2003	adequate	well addressed	poorly/not addressed	adequate	adequate	poorly/not addressed	poorly/not addressed	low
Miller 2005	n/a	poorly/not addressed	poorly/not addressed	poorly/not addressed	n/a	adequate	poorly/not addressed	low
Norman 2004	adequate	well addressed	n/a	well addressed	adequate	adequate	poorly/not addressed	medium
Radcliffe 2001	adequate	well addressed	poorly/not addressed	well addressed	adequate	well addressed	well addressed	high
Todd 2001	adequate	well addressed	n/a	well addressed	poorly/not addressed	well addressed	poorly/not addressed	medium
Verhoeven 2003	adequate	adequate	adequate	well addressed	adequate	adequate	well addressed	high
Vuylsteke 1999	adequate	well addressed	poorly/not addressed	well addressed	well addressed	poorly/not addressed	well addressed	medium
Williamson 2007	poorly/not addressed	poorly/not addressed	n/a	well addressed	adequate	adequate	well addressed	low
Zenilman	poorly/not addressed	well addressed	poorly/not addressed	adequate	well addressed	well addressed	poorly/not addressed	low

B. Relevance to research question

First author, date	a. Topic/population				b. Methods: measurement of exposure			Overall relevance rating
	Purpose: to exan	**Setting**	**Age** (most 15 -24y?)	**Ethnicity** (similar to UK?)	**Validated?**	**Sensitive** to gradients?	**Discriminates** within population?	
Fenton 2001	not primary aim	England	no/ not given	somewhat	somewhat	somewhat	somewhat	medium
Macleod 2006	not primary aim	England	Yes	yes	Yes	Yes	Yes	high
Götz 2005	not primary aim	Outside UK	somewhat	yes	somewhat	somewhat	somewhat	medium
Asbel 2006	not primary aim	Outside UK	yes	yes	somewhat	somewhat	somewhat	medium
Stein 2008	not primary aim	Outside UK	somewhat	no	somewhat	no	somewhat	medium
Evenden 2006	yes	England	yes	no	yes	somewhat	somewhat	high
Krieger 2003	yes	Outside UK	no / not given	no	yes	somewhat	somewhat	medium
Bush 2008	yes	Outside UK	no / not given	no	somewhat	somewhat	somewhat	medium
McNamee 2008	yes	Outside UK	no / not given	no	yes	somewhat	somewhat	medium
Andersen 2003	not primary aim	Outside UK	Somewhat	no	somewhat	somewhat	somewhat	medium
Dolan	yes	Outside UK	no/ not given	no	somewhat	somewhat	somewhat	medium
Dunne 2008	not primary aim	Outside UK	no/ not given	no	somewhat	no	no	low
Geisler 2006	not primary aim	Outside UK	yes	no	no	somewhat	somewhat	low
Heal 2002	not primary aim	Outside UK	yes	no	somewhat	no	somewhat	medium
Holtgrave 2003	not primary aim	Outside UK	no/ not given	no	somewhat	somewhat	somewhat	medium
Kaplan 2009	not primary aim	Outside UK	no/ not given	varied	somewhat	no	somewhat	low

Klausner 2001	not primary aim	Outside UK	somewhat	no	somewhat	somewhat	somewhat	medium
Kufeji 2003	not primary aim	England	no/ not given	no	yes	somewhat	somewhat	medium
Miller 2005	no	Outside UK	no/ not given	no	somewhat	no	no	low
Norman 2004	not primary aim	England	no/ not given	no	somewhat	no	no	low
Radcliffe 2001	not primary aim	England	no/ not given	no	no	somewhat	no	low
Todd 2001	not primary aim	Outside UK	somewhat	no	somewhat	no	somewhat	low
Verhoeven 2003	not primary aim	Outside UK	no/ not given	no	somewhat	somewhat	somewhat	low
Vuylsteke 1999	not primary aim	Outside UK	somewhat	somewhat	no	somewhat	no	low
Williamson 2007	not primary aim	Scotland	Yes	yes	yes	somewhat	no	high
Zenilman	not primary aim	Outside UK	no/ not given	no	no	somewhat	somewhat	medium

Appendix 4: NCSP analysis

Natsal-2000 analysis used to calculate effective screening rates

Proportions of Natsal 2000 that were sexually active within the last year

						n	
Male		**%**	**[95% CI]**	**Odds ratio**	**[95% CI]**	**weighted**	**unweighted**
Age group	13-15*	27.00	[23.77;30.23]	n/a		1419	1221
	16-17	48.41	[41.22;55.6]	1		358.6	291
	18-19	81.03	[75.35;86.71]	4.55	[2.87;7.23]	271.8	259
	20-22	88.75	[84.28;93.21]	8.41	[4.89;14.44]	314.1	248
	23-24	88.75	[85.14;92.35]	8.41	[5.31;13.32]	425.5	364
Female							
Age group	13-15*	27.87	[25;30.73]	n/a		1321	1361
	16-17	50.88	[43.93;57.83]	1.00		310.1	294
	18-19	81.81	[76.74;86.88]	4.34	[2.83;6.67]	269.6	276
	20-22	87.83	[83.91;91.75]	6.97	[4.43;10.96]	302.4	308
	23-24	92.02	[89.29;94.76]	11.14	[6.98;17.78]	392.2	439

*calculated using % of whole sample reporting having had sexual intercourse before aged 16, so no odds ratio calculated for % sexually active

IMD quintile	**%**	**[95% CI]**	**Odds ratio**	**[95% CI]**	**weighted**	**unweighted**
1st quintile (least depri	74.21	[68.16;80.25]	1		327	268
2nd quintile	75.58	[70.65;80.52]	1.075889	[0.72;1.62]	495.4	400
3rd quintile	79.03	[74.79;83.27]	1.309932	[0.87;1.97]	573.1	498
4th quintile	81.36	[77.71;85.01]	1.517443	[1.02;2.26]	618.3	548
5th quintile (most depri	76.44	[72.47;80.41]	1.127843	[0.77;1.66]	630.5	765

Figures shown for men and women of all ages, but there were no trends by IMD when broken down by age or gender either

Effect on positivity when missing ethnicity data excluded

	Bivariate analysis	Adjusted for ethnicity: missing included	Adjusted for ethnicity: missing excluded
Men			
SEC quintile			
1 (least deprived)	1.00	1.00	1.00
2	1.03 [0.95;1.1]	1.03 [0.96;1.11]	1.08 [1;1.18]
3	1.11 [1.03;1.19]	1.11 [1.03;1.18]	1.21 [1.12;1.31]
4	1.26 [1.18;1.35]	1.25 [1.18;1.34]	1.30 [1.21;1.41]
5 (most deprived)	1.42 [1.33;1.5]	1.40 [1.31;1.48]	1.44 [1.34;1.55]
Ethnicity			
White - British &nonspec		1.00	1.00
Irish		1.80 [1.49;2.17]	1.81 [1.49;2.18]
White other		0.84 [0.72;0.98]	0.84 [0.72;0.99]
Mixed		1.05 [0.85;1.29]	1.05 [0.85;1.29]
Black Caribbean		1.71 [1.56;1.87]	1.71 [1.56;1.87]
Black African		1.11 [0.99;1.25]	1.11 [0.99;1.25]
Black British, nonspec & other		1.60 [1.39;1.84]	1.59 [1.38;1.83]
South Asian		0.38 [0.32;0.46]	0.38 [0.32;0.46]
Chinese/other		0.73 [0.59;0.91]	0.74 [0.59;0.92]
Null/Missing		0.78 [0.75;0.82]	
Women			
SEC quintile			
1 (least deprived)	1.00	1.00	1.00
2	1.16 [1.11;1.22]	1.17 [1.11;1.23]	1.16 [1.1;1.22]
3	1.19 [1.13;1.24]	1.20 [1.14;1.26]	1.21 [1.15;1.27]
4	1.29 [1.24;1.35]	1.31 [1.25;1.37]	1.29 [1.23;1.36]
5 (most deprived)	1.47 [1.41;1.53]	1.48 [1.42;1.55]	1.44 [1.37;1.51]
Ethnicity			
White - British &nonspec		1.00	1.00
Irish		1.14 [0.99;1.32]	1.14 [0.99;1.32]
White other		0.67 [0.61;0.73]	0.67 [0.61;0.73]
Mixed		1.17 [1.05;1.31]	1.18 [1.06;1.31]
Black Caribbean		1.32 [1.24;1.4]	1.33 [1.25;1.41]
Black African		0.82 [0.76;0.89]	0.83 [0.76;0.9]
Black British, nonspec & other		1.11 [1;1.23]	1.12 [1;1.24]
South Asian		0.52 [0.47;0.58]	0.52 [0.47;0.58]
Chinese/other		0.72 [0.62;0.82]	0.72 [0.63;0.83]
Null/Missing		0.85 [0.83;0.88]	

Appendix 5: Focus group study materials

Example topic guide (used in Group 4 Nov 09)

Vignette example as Facebook/instant messenger, written by K&C FE students

Coding frameworks

Sex and relationship norms

Facebook

Area

Thematic charts

- Sex and relationship norms: partner choice, expectations
- Facebook: general (stage 1); rules (stage 2)
- Area

Focus group Topic Guide

Overall length: 1.25-1.5 hrs

1.) Introduction to the focus group (10 mins)

Before group starts, participants to complete short form & sign consent form **Food and drink –** help yourselves now, and in the breaks

Welcome and **thanks** for taking part Introduction and **purpose** of study **Timing** (1 hr and15 min) **- break after 30-40min** Before we start: some things to make our discussion more productive **Confidentiality** **I'm recording this** so I don't miss any of your comments BUT in this discussion just first names and in my report, no names attached to any comments. **Also, I'd ask of you,** agree that the discussion should be confidential among respondents I interested in what **all** of you have to say. So, **I'd ask** that only one person speaks at a time. At times if you aren't saying much, I may ask for your opinion. No **right/ wrong** answers We're all different and I want to capture that – so I'm hoping for a range of views. So, **I'd ask of you,** respect for what others say. **Mobile phones** – calls/texts interfere with recording and can interrupt the discussion. Unless you have any exceptional circumstances, can you all **please turn off now.** Feel free to turn on for the break. **TURN OFF MY PHONE**
Participant **introductions**: Let's start by going round the table/group - with **your name** and **tell me how you travelled here** today.

2.) Local area perceptions – 1-1 and feedback; group discussion (20 mins):

AIM: PERCEPTIONS OF LOCAL, USE OF LOCAL [VS OTHER] FOR SOCIALISING

On post-its: *write the last 3 places you met friends (1 post-it for each place)*

What was the furthest you travelled in the past week?

Group feedback:

There are two stickers on the board:

Local

Not local

Where would you put your post-its?

What has influenced your decisions?

Prompts:

How is this different for you in the holidays vs during term time?

Transport?

Distance?

Safety?

- *Can you name any places where you [often] go where you know you are likely to bump into people/friends? (prompt: here? Uni/college? Other places? Eg people's homes?)*
- *Can you name any places you arrange* ***in advance*** *to visit together or meet with friends? Homes? Clubs? Concerts?*
- *What places (if any) would you avoid for meeting friends?*

3) SNS and meeting friends (15 mins)

AIM – OVERLAP BTWN SOCIAL NETWORKS - FACE TO FACE AND SNS; USE OF SNS FOR RELATIONSHIP FORMATION

How many of you have a profile on a social networking site? Facebook? Other site? (prompt: dating website?)

How many of you have accessed it in the last week? 2 days?

Facebook/SNS users:

1. What prompts you to add people? What prompts you to delete people from your network?

2. How similar are your SNS networks and your face to face friends?

Prompts: *Age? Geography? Size? Friends vs other (family, classmates, teachers, partners(gf/bf)…?)?*

NOW Thinking specifically about people [you or people you know] might have or have had a relationship with…

3. When might you [or when do people] use SNS?

a) Amongst people met face to face first to check out ptl partners? To contact with ptl partners? To signal the beginning /end of a relationship?

Prompts for me: Does it happen amongst people you know? [is it 'normal'?, under what circumstances might this happen?]

What do you think of this use of SNS?

b) People not met face to face first (e.g. to search for ptl partners, make contact with someone you like the look of?)

Prompts for me: Does it happen amongst people you know? [is it 'normal'?, under what circumstances might this happen?]

***[Non/occasional users:** thinking through your reasons for NOT using SNS…*

What are the top 3 reasons for NOT using FB (other sites) for keeping in touch with friends?

How might **not** being on facebook affect your social network/friendships?

Do you see any disadvantages to not being on facebook for your social network/friendships?]

4. Views on forming relationships: vignettes (20 mins)

AIM –norms around relationships,

- We'll use the same scenario (HAND OUT)
- READ OUT

Keira is 17. She went to a birthday party last Saturday where she got talking to Pete. They kissed at the party. Pete has just texted - he wants to meet her again tonight. She likes Pete – he's popular and funny and really good looking. She'd like to see him again but she's not sure what to do.
There are 3 questions that I'd like your views on. • What would you want to find out about Pete if you were Keira? PROMPT FOR ME: *How important is it to know: # partners he's had? Who previous partners were?* • How would you find out what you want to know if you were Keira? *Do you think girls would look him up on SNS/Facebook? Other sites? Would boys do the same about a girl?* • What do you think most girls of your age would do if they were Keira? • Do you think she should meet him again? • ***Prompts for me:*** *What influenced your decision about whether she should see Pete again?* • What do you think might happen between Keira and Pete if they met again?
NOW What if… …Keira's friend had previously been out with Pete? How would your advice change? What if… • …Pete left school when he was 16 • …Pete is currently unemployed • …Pete is 25 • …Pete attends private school How would your advice change? What if… • …They haven't met face to face before - they met online? **How would your advice change?**

5. Closing (5 mins)

FOCUS GROUP PARTICIPANT FORM

Please complete this form and hand it to Jessica or Helen.

Age: _____ years

Gender: (please tick one box) ☐ Male ☐ Female

Ethnicity (please tick one box)

White
☐ British ☐ Irish

Black or Black British
☐ Caribbean ☐ African

☐ Any other White background (please add) _____

☐ Any other Black background (please add) _____

Mixed
☐ White and Black Caribbean ☐ White and Black African ☐ White and Asian

☐ Any other mixed background (please add) _____

Asian or Asian British
☐ Indian ☐ Pakistani ☐ Bangladeshi

☐ Any other Asian background (please complete)_____

☐ *Chinese*

☐ *Other (please complete)* _____

☐ *Not stated*

Access and use of internet/mobile phones for social networking

Do you use **the internet** for social networking through sites such as Facebook?

☐ Yes, 1x day or more ☐ Yes, often but less than 1x day ☐ rarely or never

Do you have access to the internet at home?

☐ Yes, in my own room ☐ Yes, shared with household ☐ No

Do you use **your mobile** to access social networking sites e.g. Facebook?

☐ Yes, 1x day or more ☐ Yes, often but less than 1x day ☐ rarely or never

Living situation (please tick one box)

☐ with parents ☐ with other family/ friends ☐ college/uni hall of residence

☐ private rent ☐ council house ☐ own home

☐ other (please write in)

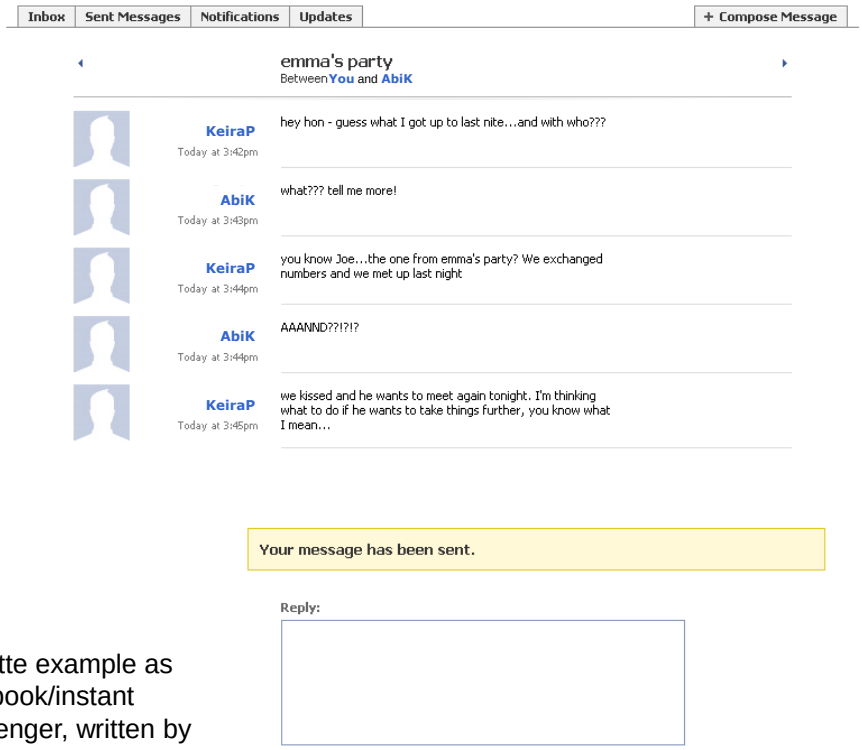
How long have you lived in your current situation? (please tick one box)

☐ Less than 6 months ☐ 6 months-1year ☐ 1-2 years ☐ 2+ years

Residential postcode _____

Thank you for taking part in this focus group.

Focus group vignette example – developed by students at Kensington and Chelsea Further Education College



Vignette example as Facebook/instant messenger, written by K&C FE students

Thematic charts

Thematic chart: Area

Group	distinguish local vs not local	going beyond local, or not	Centres/Nodes/ networks	No go areas (general)
1_BOYS	discussed city, borough boundary. One argued 'walking dist' not the point, considered whether frequency (go there every year) made something local to him	during termtime don't really go beyond sc and home (yardikums). weekends: to explore/possibly to find see girls. Holidays - trips org by YC. 'Once in a lifetime' - ie not routine. Sketchy geog outside of area and particularly London eg Heathrow; transport, money no constraint	NOTE: NOT IN SCHOOL - things might be different termtime. Most talk of Crescent (the youth club), "my yard", bacton **LINK TO girls; FB NETWORK (SCH)	outside of their area; risk of attack
2_GIRLS	geog: LINK TO PTNER CHOICE - middle of the tube network, not essex or brighton (too far). Most of their stuff wasn't geog: time, transport (bus ride OK sometimes but if it's too far to walk then not, familiar (by nickname)= local?, do it often (even if it's a bus ride); boring walk.	money a constraint cos they'd want to shop if they went outside the area, lack of awareness where they went geog esp if outside of area. all walked to crescent, not gone far. Lang anti going outside of local (we have to trek out, drag you far out into the countryside; date: can't they pick you up**LINK TO DATES STUFF)SEE HORIZONS CODE - THIS IS ENOUGH?, sketchy perceptions of further afield - eg boat and where Mme Tuss is	crescent, people;s housesNOTE: NOT IN SCHOOL - things might be different termtimeFB NETWORK (SCH)	home for parties; **virtual places bacton - actually a 'go' area, cf boys - discussed it openly as a place they went
3_FE	geog CAN'T SAY MUCH. But...	all travelled routinely much further than the rest - at least 2 buses to get to college ** **see post-its**	college is routine but not a big social hub.	south london, East?risk of attack
4_MEDSTU	geog: a building, even a part of a building not geog: relates to routine	daily life extremely local - uni, people in same estate, lecture theatre (side of LT), would be same halls if they were still there. Weekends different (at home, family, catching up with wk, seeing home friends).fostered by college - uni bar closed)TYPICAL STUDENTS? DOES THIS MATTER? ref: code: weekendsBUT zoro, indian family, travelling ref: international networks	home home univ home; node =uni (classes and social)	these are actually go: "mooneys", "huntley st": all described as places you don't go but actually everyone goes **see FG2 girls and bacton
5_STMUMS		didn't travel (go out) much routinely. Constraints: money (before but esp after baby em ch, em); risks - from men (in pubs/clubs) and partner; time (t - baby)	2 who met ptners f-f, thru school networks	**home** for dates; **virtual places
6_Brentwood boys	time, transport (walking distance or a short car distance, only a couple of stops), money, familiarity (routine, so you just sort of don't think about it being a long journey). Recognised differences: "my local slightly bigger than..."	1/5: lives "in the sticks" school, friends were all "not local"; others at school mainly stayed "local" but clubbing a little further afield? And M's local definitely wider than that for others	3-4/5: school = node, and friends houses. Romford: everyone goes to the main area, where people are going to hang out. Working participant: football and golf mates - meet at training	Dagenham: "got a reputation"

** see also:

Thematic chart: Facebook

Group	Define soc networks	Meeting partners	Privacy (their own)	Stalking (looking st others)	Arrange to meet	Contact others	Other uses
1_BOYS	people they talk to, people from school. Mutual friends, met on holiday, family, fb network numerous; wouldn't: random, don't talk to	any single girl - (joked)	doesn't come up	doesn't come up	doesn't come up	reunion, reunite	farmville 2x day - 1st usage
2_GIRLS	people went to school with; add lots: face to face friends, their fb network numerous (100s), mutual friends, don't like - see if they've got fat; Would't add: younger siblings - annoying. Delete lots!: forget, clear up, boys you don't want anymore, fallen out with	michelle joke - fancy them?	Them to you: constantly talking to you, annoying	You to them: Add people so you can see if their lives better than yours (whether you like them or not). Constantly checking their page. FB has an application – your #1 stalker. Used LACK OF CONTROL OVER RESULT?	don't use - invites everyone, even with closed invite. Might use to find list of people. Danger of gategrashing	not discussed except for younger sibs (see priv)	
3_FE	89	One boy would add girls you like the look of. Others laughed - he defended, would just as easily delete them. FB		would definitely look at profiles. For boys: 108: would still approach but act differently	find commercial events from promoters		
4_MEDSTU	wouldn't add: strangers (J), sometimes mutual friends (N) teachers (guidance) (H), generations (J), guys-girls C - it would be taken as a move)LINK TO PARTNER CHOICE rel status: hide; big deal to change from single to in a rel (H),	not normal (acceptable). Know of occasions where it happens - but largely for exeptional circumstances eg disparate religious group, msn when younger	Parents can see what children are doing; Detag photos to prevent them seeing embarrassing pictures; don't accept rels as friends; change settings: so only friends or friends of friends can see pics; need to be careful; set so searches only show name;privacy laws - increased?; don[t put personal details	do a lot, look at photos of people you don't know but def wouldn't say I've seen you on fb. Can't miss finding out stuff (whether you want to or not) - newsfeed	n - org society events - open linvites, would'nt bother with fb for less than 10; j - org get togethers for her group of friends	for doctors (in India) not on EWTD! Keep in touch with travelling	looking at photos
5_STMUMS	not much on who added or not	2/4 met partners thrugh fb; one - baby's father. Note: both through mutual friends **LINK TO GEOG	cf MySpace - use your own name on FBI; ca - notes changed privacy settings so anyone can add you	would 'snoop' on fb – see their friends; bf – cos he has lots of girls on there.	don't use for this.	useful when movement restricted because no money to go out;	
	rel status: big deal to change - everyone comments; means something	1 trivial rel at 14 with stranger thru msn; story of 'dodgy old man' illus this outside of social norm; em: comes down to money -	his family – what's going on in your rel'ship? Bf – watching me, deletes boys I'm friends with. Harassment: deactivated profile	get newsfeeds of couples arguments - don't want to know about it. Cople of deactivated their profile because he saw she was talking to another man			
6_Brentwood boys	selective "actually have to like th	702: don't go through going no,no yes… 703: once you've met better than asking for their no. People check out girls I don;t	340-352: can find info, intercept mtgs 1066-1075: account closed to friends only; pictures = friends only 1045: written evidence 1046: hackers can be malicious 656: frape = people alter others' profiles: it's funny	835: check if she's seeing someone else; 706: there are signs in a profile someone is not good news; 881: use pictures, to work out what things she gets up to; 901: judge her on what others say to her – and that;	504: settings for events – people abide by them		

Thematic chart: Sex and relationship norms - Partner choice

Group	(where from)	(where meet)	(friends)	Age	s/e	Sexual network	Other
1_BOYS	from different area - would def bring a mate (link to exp)	risk of a set up for boys		20's too old - 'paedo' 1 year older 2 years younger'	didn't come up	didn't come up	personality, drunk/on E when they kissed?
	mixed opinions. Matters for some. Too far = inconvenient. Middle of tube network ok. Outside london no good	expect him to come to you. Saves money	unprompted - don't go near him if friends aren't nice	20s too old, the 'rule' apply to school but egs where it's different and it works.Can't do much with you if you're 15. questioned social networks 15-20yrs - raised poss. Siblings	if he's going to college - but din't explore	didn't come up	
2_GIRLS	wouldn't meet people from certain areas, but not all the group agreed	risk of a set up for boys and for girls. Boys: Would seek to go to someone's house			boys: doesn't matter if not your girlfriend. Does if they are. Girls want £ for things, more likely to get a number if you have visible signs of money (car, clothes).	Ch: shouldn't happen but it does. her past: whether you can respect her	
3_FE		Girls: house=sleazy (you're such a dog)	if you know people in common		girls: don't want £ or would choose a guy because of it. Have their own £, can buy own stuff. Want guy to have a goal & not sponge off them	G - exes; depends how close a friend. Close friends - border you don't cross.	
4_MEDSTU	doesn't come into it much. Some comment from n-where they are from, stereotypical but true?	doesn't come into it	assumption met at a *friend's* party, it's OK. Everything else is secondary	some want to know - out of interest. Boundary you don't cross	came up unprompted, felt it told you about a person. Wouldn't expect to meet someone not at uni.It's a surprise when it happens. 'useful contact for the future' rather than sexual partner?	exes: most don't care if he's got exes - deal with it later, carver does - risk of danger from him. BUT if it's a friend it's a matter of 'etiquette'	emotional concerns, make sure they both want the same thing out of it LINK EXPEC'NS
5_STMUMS						her past: will mean more if she's waiting for a nice guy (long term or short term); works the other way - 'man slag'	facebook: he wouldn't add her because would be taken as a move **FB
	range of opinions: don't speak good english, behave worse? Mixed area/girl - just men	boys assume they'll come to your house (cos you've got kids?). Not OK - 2nd best, sex assumed, cheap.	look him up on fb to see his friends (are they bimboys?players ?)	range of opinions - one quite likes older men, depends on th eperson, how they behave, they SHOULD want women their own age; anecdotes about older men from t and ch	range of opinions about uni: plus - got drive; neg - go for the parties and loans (to get a car), selfish?	his past: how many partners he's had;exes: shouldn't really of friends, use protection? How recent?t: first thing is does he have a girlfriend but ch wouldn't think about it	
6_Brentwood boys	partly depends on what he's looking for - girlfriend different from other sexual relationships				if g/f -go for someone with goal		

Thematic chart: Sex and relationship norms - Expectations

Group	Would they meet?	Is sex expected to happen?	Condoms	Does it matter where?	other risks?
1_BOYS	Yes, might bring a mate. Range of views'you only live once -0 it's enough he's popular and good looking', others find out more	possibly - vague "get pregnant". Age diff - 15 - underage - so one thinks that sex will happen but this questioned by another	did not discuss	yes LINK TO CHOICE - BRING A MATE. House=he likes her. Options - cinema, nandos	to girls: boys might lie about whether girl kissed him (if she's drunk/on E) to boys: violence
2_GIRLS	yes, might bring mates	yes, for older guy, less so for 15 year old but probably guy is out for sex. idea of dates = funny		see partner choice - very little about personal safety	
3_FE	yes.	not necessarily but probably.	"you take a cap [condom?] where you're going...say no more..."	yes. Home a no-no for girls.	to boys: violence; to girls: violence, rape
4_MEDSTU	yes - they would advise the girl to meet	not necessarily sex. Could be dinner (traditionalist). "She's thinking of it, so it will go as he wants it to." Prob some sexual contact "fumble in the dark" "first base"	needed to prompt disucssion of this. "patronising to mention it". Would need to be "especially stupid" or "very drunk" not to		emotional - about aligning expecationas not assumed woman would get hurt
5_STMUMS	now: go with people, NEUTRAL PLACE - LINK TO PLACE	now: one raises it upfront - don't expect sex, don't think she should at 2nd meeting, In this scenario - yes. She's kissed him, she's thinking about it, it's what he wants (he's a man)	range of opinions: she should have them definitely, maybe see if he's prepared (test), could indicate she's a slag,would want to know if he used in the past; indicates if he's fussy;	yes - sex could happen anywhere, but less likely in a park; taken 'out'/dates: 'old days', doesn't often happen. About self worth/second best? Ch: no - all our £ goes on the kidsLINK TO AREA PARTNER	reputation: she's a slag. And lie about whether you slept with them; rejection - he'll disappear after sex
	then: yes, wouldn't' think about it	in the past: would have sex (=you're attractive). Know that's not true now	in the past didn't want to ask and got pregnant		
6_Brentwood boys		does happen. anecdote about friend: met at w/e, had sex wed am.	any of our friends going to know about [condoms], not to know=stupid; condoms=Standard procedure,= main thing		

Facebook thematic chart stage 2. The rules of Facebook use in starting sexual relationships (according to focus group participants)

Evidence tables

NB: focused on older groups (3-6) because discussion in younger groups (1-2) indicated they had little experience of relationships (transcript references given as numbers)

Use of Facebook in general

Group	
6	"It's kind of weird if you don't have [a profile] nowadays. "if someone's like, oh, have you got a picture of your girlfriend and they're like, no, they don't have Facebook, you're like, he's chatting rubbish, you've got to be joking." "It's mainly a daily... You don't really realise it, like, but I've got it on my iPhone, but you don't actually think, oh I'm going to check my Facebook, you're just like, when you're sitting on the train, you just go on it and you just do things and check your messages and stuff. It becomes part of a daily thing, you don't even realise it."
5	"I was on there 20 minutes ago, when xx picked me up."
4	"That's an achievement for me if I haven't been on Facebook that day. " " Like people who don't have it now sort of get excluded "
3	Generally, accessed FB, MSN and Twitter. In response to whether they had accessed in the last 2 days, most replied yes, today.

Don't use FB to find a new partner

Group	**Supportive**	**Counter/When applied differently**	**Counter/when Ok to break**
FG4: uni	650-657: you can't just start talking 663-665: FB not used like that		801-816: rare religious group
	787-790:oddballs – using stalking	660-670: 745:"stalk" - look at photos of people you don't know on friends profiles; 1173-1181: BUT don't admit it!	

	831-835: Ok to further a relationship		
FG5: Stmums	271:people can present misleading info (nice guy, life going somewhere)	199-219: met baby's dad Was thru friends	260: you feel safer –can get away from them; money – it's expensive to go out
	143-159: Dodgy old men/crazy	188:met current pt on FB thru friends	427-447: couldn't go out (domestic violence)
FG6: essex boys	702: don't go through going "no…no… yes" "People check out girls. I don't"		

Don't introduce yourself (make friends requests) to people you haven't met face to face

Group	Supportive	Counter/When applied differently
	Blanket no from all girls to adding people as 'friends' who they had not met first, though with prompting they might add someone who knew a mutual friend after they had asked the mutual friend what they were like. Fears – might be a paedophile, also can be hackers. Would ignore friend request.	Boy x was the only one who really used FB as a tool to expand his social (and sexual?) network. x was the most open to adding people he didn't know: "If I liked the look of a girl I'd invite her". He defended this in response to the derision from the group, saying "loads of girls have done it to me".
FG4: uni	673: stray, weird people	1263: might be more likely to be taken as a move for boy adding a girl than v v
FG5: Stmums		1062: 'utter perv' BUT she replied!
FG6: essex boys	702: don't go through going no,no yes…	703: better than asking for their no.

OK FOR BOYS to further tenuous connections on FB

Group	Supportive	Counter
FG6: essex boys	703: better than asking for their no.	750: can accelerate rel more than you want.
FG3:	FB helped to follow up when you're	

	at a party….	

To find out about (investigate//screen) potential sexual partners, view their profiles

(All open about 'stalking' ("it's a stalking site"), it's more than OK to be nosey)

Group	**supportive**	**Counter /Applied differently**	**Current partners**
FG3	502 – look at his profile	108: act differently – would still approach	
FG5: Stmums	982: definitely look him up (looking for partners/ex)	Status: 995 – "players" leave it blank 1008: it's complicated – better than single	287-301: 410; looking on each others' profilescauses arguments
FG4: uni		1221-1257: rel.n status updates =a big deal, and interpreted differently	
FG6: brentwood boys	706: there are signs in a profile someone is not good news; 835: check if she's seeing someone else	656: frape = people alter others' profiles (SEE 4)	
	881: use pictures, to work out what things she gets up to; 1150:someone met in a club to see what they actually look like	901:judge her on what others say to her – and that	

Protect your privacy (and the privacy of your information)

Group	**Supportive – strategies used,**	**awareness of problems**	**conscious self disclosure**	**Lack of concern, awareness**
Fg 6	504: settings for events – people abide by them	340-352: others can find info, intercept mtgs		1066-1075: account closed to friends only; pictures = friends only
		1045: written evidence – can be incriminating		

		1046: hackers can be malicious		656: frape = people alter others' profiles: it's funny
STMums	75: hassle – deactivated profile		570: more confident than f-f	92: lack of awareness that private isn't completely private
				286: 6 months to notice all the boys deleted
Uni	867: don;'t put ph no, date of birth	861: fear for family, nothing concrete		836: liam – it's funny
	722: Be vigilant – detag yourserf, aware of limitations	Family will see things she doesn't want seen		

Select your 'friends' carefully (no parents)

Group	**parents – yes**	**Parents - no**	**delete**
Uni		716: feel bad, but they'll see ridiculous photos	
Stm	357 - 394: all my family on there. Ch: family/bf family not bothered. T: moderates content Not a problem	Out of that generation	
FG6		757: no mums, no guilt	

Appendix 6: Cross sectional study materials

Participant information sheet v4 270810 (tailored for DBRB site)

Survey instrument V4 050111 (tailored for DBRB site)

Practitioners' guidance 280910 (tailored for DBRB site)

Camberwell clinic advertisement v2 112010

Flowcharts of data inclusion by site

Positivity by ethnicity categories in Camberwell

Stepwise regression models

HEALTH CARE EVALUATION GROUP
DEPARTMENT OF EPIDEMIOLOGY & PUBLIC HEALTH
Version: 4

Date: 27 August 2010

Study of chlamydia infection and use of screening services

Participant Information Sheet

1. Invitation

We would like to invite you to take part in a study of chlamydia that we are conducting in this service. Please read this leaflet which tells you about the study and what it involves.

This study is being carried out by researchers at University College London, working with the Terrence Higgins Trust, with funding from the Medical Research Council. Here is some information about this research project but do ask the person offering your chlamydia test if there is anything you are unclear about.

2. Why are we doing the study?

Chlamydia, a sexually transmitted infection, is common in young people. We need to know who is most likely to have chlamydia in order to make sure that people most at risk of infection are offered screening. If we know why some people are more at risk than others, this might also help us to deliver better services to prevent infection and improve sexual health too.

In this study we are looking at whether the risk of chlamydia is more common in certain people depending on their educational experience, who they live with and how they met their last partner.

3. What is involved?

We are asking everyone screened for chlamydia from October 2010 in your area to answer three questions. You will find these questions attached to the screening form. All of the questions can be answered simply, for example by ticking boxes, and there are no right or wrong answers. You do not have to do anything else and you will not be contacted further about the study.

4. Do I have to take part?

No - the decision is entirely up to you. If you do not wish to take part, just leave the questions blank – this will not affect your care in this service in any way. However, please complete the screening form to ensure you receive your chlamydia test result.

5. What will happen with my information?

All the information you give for this research and your contact details will be kept strictly confidential. Information identifying you (e.g. your date of birth and your postcode) will not be sent to the researchers. The handling, processing, storage and destruction of data collected will be conducted in accordance with the Data Protection Act (1998).

6. What will happen to the results of the study?

A summary of the study results about the distribution of Chlamydia testing will be made available and sent to your clinic. Of course all individual Chlamydia results are private and kept strictly confidentially.We will also write a report about our findings so that we can begin to understand who is most at risk of chlamydia and why, in order to plan future services better.

7. What do I do if I wish to make a complaint about the research?

If you wish to complain about any aspect of the research, you should contact the Chief Investigator, Rosalind Raine, ✉: r.raine@ucl.ac.uk, ☎ 020 7679 1713. If you feel you do not receive a satisfactory response and you wish to take the matter further you should contact the **UCLH Complaints Manager** giving the project title and the Chief Investigator's contact details at: Complaints Department, 2nd Floor West, 250 Euston Road, London NW1 2PQ ☎ 0845 1555 000 ext. 3413 Fax: 020 7380 9595

8. Useful contacts

You can take this information away with you. If you have any questions about the study afterwards, you might find it useful to contact some of the people listed below:

For any queries about the research, contact the researcher on the study, **Jessica Sheringham**, who will be happy to answer them: Dept Epidemiology & Public Health, 1-19 Torrington Place, London WC1E 6DH

☎020 7679 8286 ✉j.sheringham@ucl.ac.uk

If you'd like to know more about the Terrence Higgins Trust's role in this study, contact the **local chlamydia screening office** at: 7 Nether Hall Road, DoncasterDN1 2PH

☎: 01302 730 400 ✉info.doncaster@tht.org.uk

If you'd like an independent view on taking part in research, contact the **PALS services** at ✉ pals@nhs.uk

Survey instrument v4 050111

DEPT EPIDEMIOLOGY & PUBLIC HEALTH
Version 4: 5 January 2011

UCL

Survey

The Terrence Higgins Trust is taking part in a research study with University College London to help us make sure screening gets to the right people. We are asking everyone aged 16-24 years to answer these questions.

Your care will not be affected if you choose leave one or all of these questions blank. Your name or any information that can identify you will not be passed on to researchers and you will not contacted any further about this study.

Health Care Evaluation Group, 1-19 Torrington Place London WC1E 6BT, www.ucl.ac.uk/hceg

1. Are you currently in full time education?

0 ☐ **NO**

☐ **YES** Where are you studying now?

n At what age did you complete your full time education?

_____yrs

11 ☐ school

12 ☐ further education/ 6th form college

13 ☐ university

14 ☐ e2e

2. Who do you live with? (in term time if you are at school/college/uni)

Sharing a house/flat with…

21 ☐ …parents

22 ☐ College/university hall of residence

23 ☐ …friends

24 ☐ Alone in a house or flat

25 ☐ …a partner

26 Other_____

(please write in)

3. Thinking of the person you had sex with most recently, where did you FIRST meet that person?

31 ☐ At work

32 ☐ At school, college or university

33 ☐ In a club

34 ☐ In a pub or a bar

35 ☐ Facebook

36 Other_____

(please write in)

<<SITE LOGO TO BE ADDED IF REQUIRED BY LOCAL R&D>>
DEPARTMENT OF EPIDEMIOLOGY AND PUBLIC HEALTH

Version 3: 28 September 2010

Research study: Socio-economic inequalities in the risk of chlamydia infection and use of screening in young people

Guidance for practitioners delivering screening in participating sites

<< The Terrence Higgins Trust>>, is taking part in a study to examine social variations in chlamydia infection and screening, using the most relevant measures of socio-economic circumstance for young people. For the months of October, November and December, all young people aged 16 and over will be asked to complete 3 additional questions when they are tested for Chlamydia.

Thank you very much for your involvement - your role is crucial to the success of this research.

Why do we need this study?

NHS services need to comply with the NHS principle of 'equal access for all'. However, many NHS services are used at lower levels by people in poorer socio-economic circumstances (ie income, job status, education, living in deprived areas), who are often at greater risk of poor health. We do not know if this applies to sexual health services delivered to young people as well. This is because in the past, studies have been inconsistent in the ways they measure these circumstances in young people.

For the areas taking part, the study should provide a robust measure of socio-economic variations in chlamydia infection and screening coverage in your area, to inform future sexual health service delivery. This information could also be used for commissioners/ funders as evidence that services were appropriately targeted/ delivered.

The results will also be used to inform national guidance on using measures of socio-economic circumstance to monitor sexual health service delivery in young people.

How will the study work?

The study has been designed align as closely as possible with the current chlamydia screening process. This is to make best use of the minimum dataset already collected for the NCSP, to minimise the burden on practitioners and young people. Anonymised data on chlamydia test result, age and gender of the individual that is collected routinely will be used. Based on individuals' area of residence and site of screening, I will assign a standard measure of socio-economic circumstances to each record. In addition, young people will be asked 3 more questions on: educational participation, who young people live with, where those screened first met their last partner.

What do I have to do?

1. For Q3 (ie 1 October – 31 December 2010), give out the standard Chlamydia screening form with the research survey instrument attached whenever you provide a Chlamydia screening test to a young person.
2. When you offer a chlamydia test to any young person aged 16 and over, ask if they will participate in the study. A suggested invitation script follows: *"During October, November and December Doncaster, Bassetlaw, Barnsley and Rotherham are taking part in a study to find out more about who is using the service and who is most at risk of testing positive for Chlamydia. The study should help us to ensure people most at risk of chlamydia receive screening. As part of the study, we are asking all young people aged 16 and over to complete an additional 3 questions when they are tested for Chlamydia. Here is a sheet giving you some more information about the study. Taking part is completely up to you – if you decide you don't wish to take part, just leave the attached form blank. Your clinical care will not be affected at all if you decide not to answer the questions."*
3. Hand out the participant information sheet to all aged 16 and over. For individuals under 16, just ask them to leave the additional form blank.
4. Support the patient in answering the questions if they require (see guidance below)
5. Send the sample, with the completed data collection form and survey instrument, to the administrator for transfer to the HPA as you would normally do.

How do I answer participants' questions about completing the survey?

Here are some questions that have arisen through piloting the survey that young people may ask when completing the form.

1. Why have I been asked this question?

- ***Educational participation****:* Research suggests that we should best measure social circumstances in young people by asking about education. While many young people have yet to get a job and earn an income, virtually all have experience of education. In contrast to other measures (e.g. family income), education is associated with young people's sexual health and behaviour e.g. young women at greatest risk of pregnancy often left education early or did not like school. However, we do not know how education is related to sexually transmitted infections in young people, or what affects this relationship.
- **Who young people live with**: Young people in less favourable social circumstances are more likely to live with parents during university than those

from more affluent backgrounds. Living circumstances may also affect sexual behaviour and therefore risk of STIs too.

- **Where those screened first met their last partner**: this question, which has been informed by focus group research with young people, enables us to explore whether educational participation influences how young people meet their sexual partners.

2. **What if I don't want to answer a particular question?**
   The study will work best if the response rate is as high as possible. However, study participants should feel under no pressure to complete all the questions on the form if they don't want to. Just ask them to leave the question(s) they don't want to answer blank.

3. **re. Q1, what counts as full time education?**
   Answer "yes" to full time education if the participant is in a study/placement for: at least 24 weeks of the year *and* an average of at least 21 hours of study a week. If young people in e2e or similar employment education programmes fit this definition, answer "yes" and write e2e on the survey.

4. **If I answer question 2, will my partner/housemates/parents be contacted?**
   No. We will not be contacting any friends/family/sexual partners as part of this study. The researchers will not have the names of participants or any other information to identify them.

5. **What if I can't remember where I met my last partner?**
   If possible, prompt participants to consider where they might have met their last partner, but if they really can't remember, ask them to tick "other" and write "can't remember".

   What if I am on a gap year before re-entering university/fulltime education?

   Ask them to answer 'yes' to the question "are you in fulltime education", and tick which type of education they were in before their gap year.

6. **What do you mean by 'who you had sex with'?**
   This question refers to sexual activity that could transmit Chlamydia (vaginal, anal or oral sex), so participants should answer for the last person they had vaginal, anal or oral sex with.

7. **Why are we only asking people aged 16 and over to take part?**
   This study is collecting information on educational participation to find out whether this information is useful in finding out who is most at risk of Chlamydia. Everyone under 16 is below the statutory leaving age for education in England, so asking about educational participation is much less relevant in this age group.

Who do I contact if I have any questions/problems arise?

If you have queries about the study or problems arise, contact **Naomi McCulloch** (naomi.mcculloch@tht.org.uk) in the first instance, or the researcher, Jessica Sheringham at UCL (07919 444064/ j.sheringham@ucl.ac.uk)

Thank you very much for your involvement in this study

Chlamydia screening survey
Are you aged 16-24 years?
Can you help us?

Camberwell Sexual Health Centre is taking part in a research study with University College London to help make sure chlamydia screening gets to the right people. We are asking everyone aged 16-24 years who has a chlamydia test to answer three questions.

The decision to take part is completely up to you. If you do decide to take part, you do not have to answer all of the questions. Your care will not be affected if you decide not to answer some or all of the questions. All the information given for this research will be kept strictly confidential.

Further information:

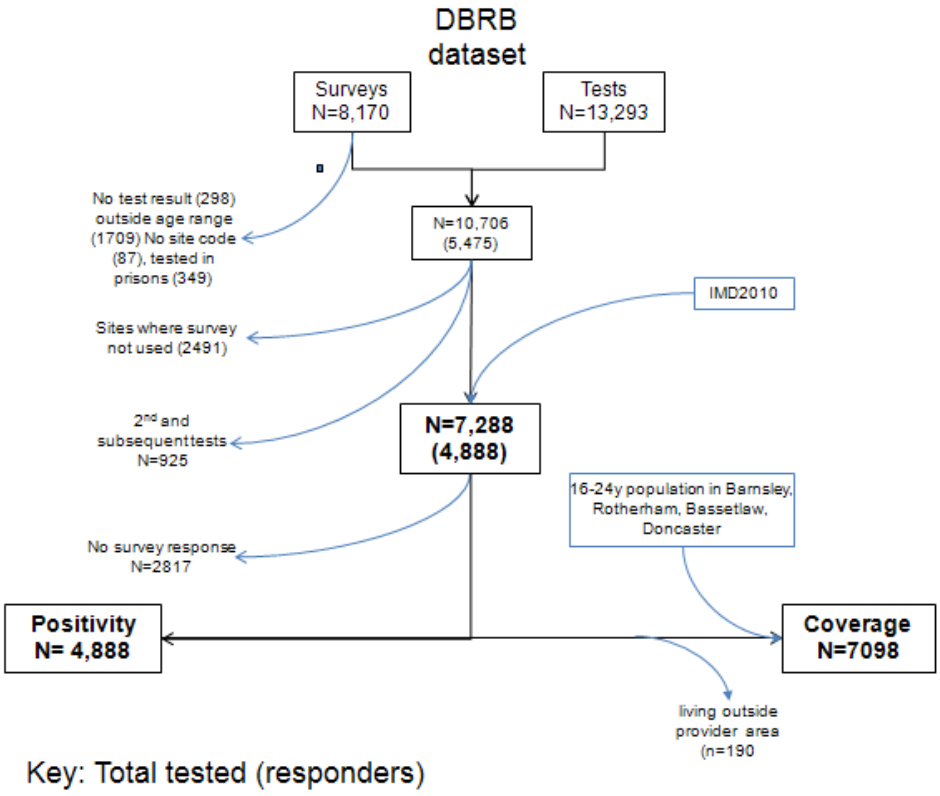
Jessica Sheringham, UCL, 1-19 Torrington Place, LondonWC1E 6DH

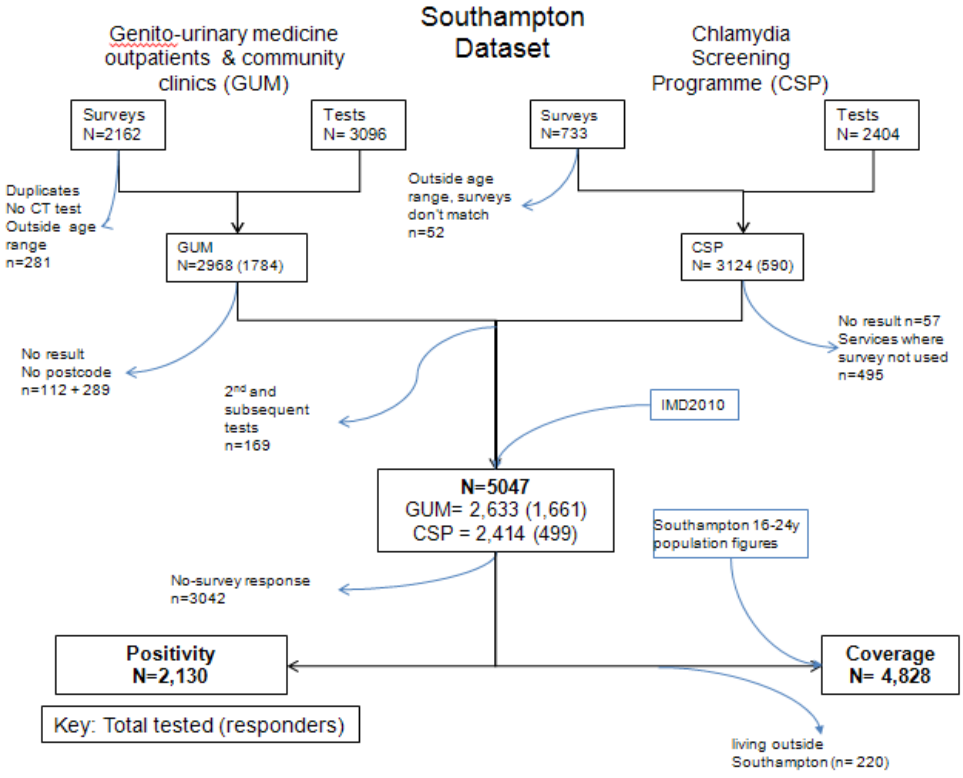
☏020 7679 8286 ✉j.sheringham@ucl.ac.uk

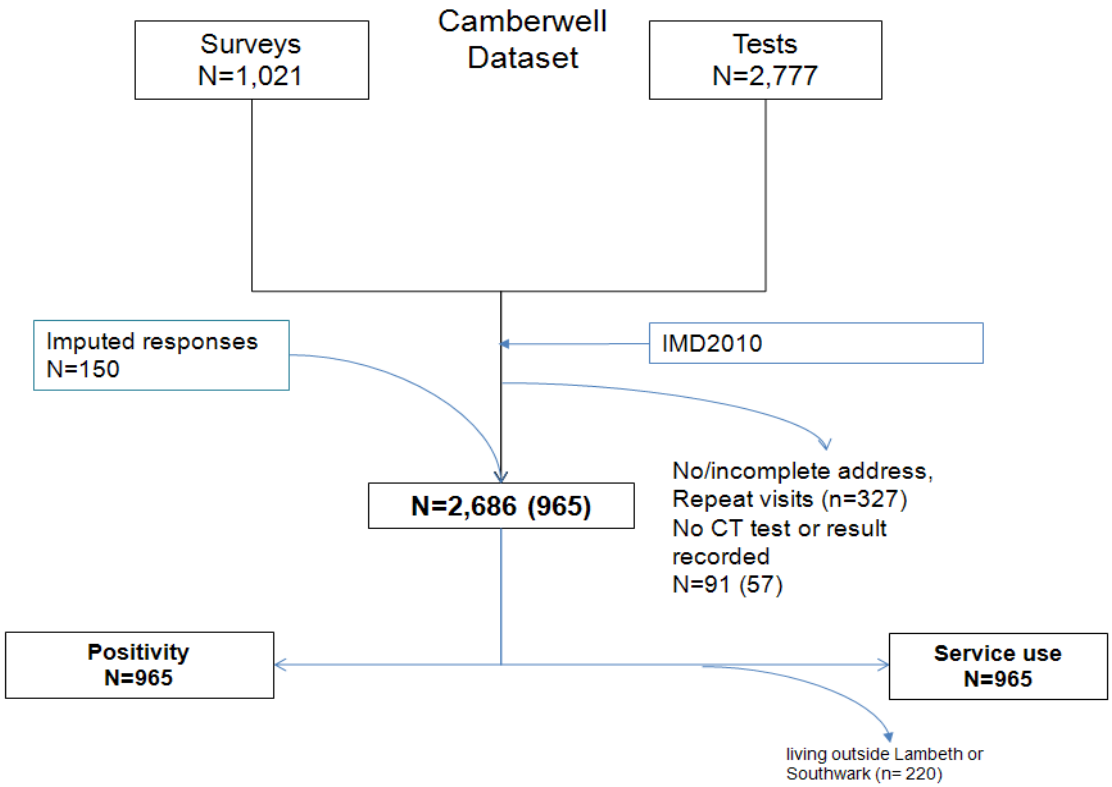
Dr Paula Baraitser, Camberwell Sexual Health Centre, 100 Denmark Hill, London, SE5 9RS. ☏020 3299 5000

The study has been approved by North London Research Ethics Committee ref: 10/H0709/54

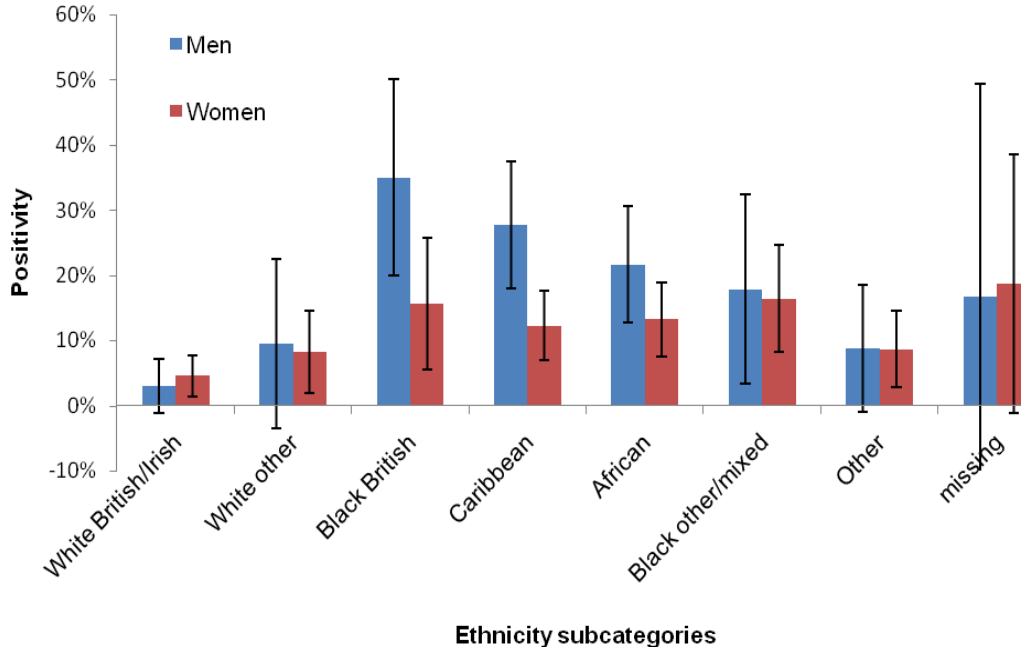
Flowcharts showing exclusions by location






Camberwell Dataset
Surveys N=1,021
Tests N=2,777
Imputed responses N=150
IMD2010
N=2,686 (965)
No/incomplete address, Repeat visits (n=327)
No CT test or result recorded
N=91 (57)
Positivity N=965
Service use N=965
living outside Lambeth or Southwark (n= 220)

Camberwell: Positivity by detailed ethnicity categories in men and women



Appendix: Stepwise models for each socioeconomic variable (DBRB)

		Model 1: Education (Current participation)			Model 2: Education			Model 3: Area deprivation (IMD)			Model 3: Area deprivation (education domain)		
		OR	95%CI	p	OR	95%CI	p	OR	95%CI	p	OR	95%CI	p
Education:													
Current participation	no	1											
	school/FE	0.69	[0.48;1]	0.05									
	uni	0.37	[0.15;0.93]	0.03									
Leaving age	left16												
	stayed17				0.8	[0.57;1.12]	0.19						
	missing				1.12	[0.72;1.73]	0.62						
	n/a				0.46	[0.22;0.94]	0.03						
IMD2010	1(least deprived)							1.00					
	2							0.95	[0.64;1.4]	0.78			
	3							0.75	[0.49;1.15]	0.19			
LSOA	4 (most deprived)							0.93	[0.62;1.38]	0.71			
ID10_ed	1(least deprived)										1.00		
	2										0.74	[0.49;1.12]	0.16
	3										0.93	[0.62;1.39]	0.71
LSOA	4 (most deprived)										0.89	[0.6;1.33]	0.58
Non-socioeconomic variables that improved model fit													
Gender	Male	1.00						1.00			1.00		
	Female	1.60	[1.19;2.15]	0.00	1.57	[1.17;2.11]	0.00	1.48	[1.1;2]	0.01	1.50	[1.11;2.02]	0.01
Service type	nonSHS	1.00						1.00			1.00		
	SHS	2.79	[1.77;4.39]	0.00	2.79	[1.76;4.4]	0.00	3.09	[1.87;5.1]	0.00	2.84	[1.74;4.64]	0.00
Age group	16-17y	1.00						1.00			1.00		
	18-19y	2.10	[1.37;3.22]	0.00	1.76	[1.11;2.8]	0.02	2.37	[1.58;3.56]	0.00	2.39	[1.59;3.6]	0.00
	20-22y	1.76	[1.06;2.91]	0.03	1.53	[0.93;2.52]	0.10	2.31	[1.5;3.56]	0.00	2.33	[1.51;3.59]	0.00
	23-24y	2.41	[1.34;4.35]	0.00	2.16	[1.2;3.87]	0.01	3.28	[1.94;5.56]	0.00	3.30	[1.95;5.58]	0.00

Appendix: Stepwise models for each socioeconomic variable (Southampton)

		Model 1: Education (Current participation)			Model 2: Education (Leaving age)			Model 3: Area deprivation (IMD)			Model 3: Area deprivation (education domain)		
		OR	95%CI	p	OR	95%CI	p	OR	95%CI	p	OR	95%CI	p
Education:													
Current participation	no	1											
	school/FE	1.23	[0.68;2.21]	0.49									
	uni	0.92	[0.58;1.46]	0.72									
Leaving age	left16				1								
	stayed17				1.25	[0.8;1.96]	0.33						
	n/a				1.95	[0.52;7.41]	0.32						
IMD2010	1(least deprived)							1					
	2							0.85	[0.55;1.32]	0.47			
	3							1.23	[0.8;1.89]	0.34			
LSOA	4 (most deprived)							1.34	[0.89;2.02]	0.16			
ID10_ed	1(least deprived)										1		
	2										1.57	[1.03;2.41]	0.04
	3										1.19	[0.75;1.89]	0.46
LSOA	4 (most deprived)										1.88	[1.19;2.95]	0.01
Non-socioeconomic variables that improved model fit													
Service type	CSP	1			1			1			1		
	GUM	2.92	[1.78;4.8]	0	2.76	[1.7;4.47]	0	2.91	[1.79;4.72]	0	2.85	[1.76;4.61]	0
Age group	16-17y	1			1			1			1		
	18-19y	2.54	[1.17;5.49]	0.02	2.75	[1.05;7.2]	0.04	2.34	[1.13;4.85]	0.02	2.34	[1.13;4.85]	0.02
	20-22y	2.7	[1.21;6.01]	0.02	2.81	[1.1;7.22]	0.03	2.42	[1.2;4.89]	0.01	2.4	[1.18;4.86]	0.02
	23-24y	1.43	[0.58;3.49]	0.43	1.51	[0.54;4.17]	0.43	1.29	[0.58;2.87]	0.54	1.26	[0.56;2.82]	0.57
Living circur	Alone	1.51	[0.77;2.97]	0.23	1.74	[0.92;3.29]	0.09	1.51	[0.81;2.84]	0.2	1.47	[0.78;2.75]	0.23
	Friends	1			1			1			1		
	Halls	1.98	[1.21;3.24]	0.01	1.91	[1.17;3.09]	0.01	1.78	[1.09;2.92]	0.02	1.73	[1.04;2.87]	0.03
	Other	2	[0.7;5.7]	0.19	2.33	[0.85;6.38]	0.1	1.96	[0.72;5.32]	0.19	1.99	[0.74;5.4]	0.17
	Parents	1.65	[1.02;2.66]	0.04	1.89	[1.29;2.78]	0	1.75	[1.2;2.56]	0	1.68	[1.15;2.44]	0.01
	Partner	0.46	[0.14;1.56]	0.21	0.52	[0.16;1.72]	0.29	0.5	[0.15;1.63]	0.25	0.48	[0.15;1.56]	0.22
	_lIving_99	1.52	[0.32;7.19]	0.59	1.82	[0.4;8.33]	0.44	1.59	[0.35;7.21]	0.55	1.43	[0.31;6.48]	0.65

Appendix: Stepwise models for each socioeconomic variable (Camberwell men)

		Model 1: Education (Current participation)			Model 2: Education (Leaving age)			Model 3: Area deprivation		
		OR	95% CI	p	OR	95% CI	p	OR	95% CI	p
Socio-economic variables										
Education										
Current participation	No							b		
	School/FE	0.34	[0.14;0.82]	0.02						
	University	0.42	[0.16;1.09]	0.07						
Leaving age	Left 16y or under									
	In education 17y+				0.46	[0.18;1.2]	0.11			
	Missing				1	[0.34;2.98]	0.99			
	Not applicable				0.45	[0.03;7.06]	0.57			
IMD2010 (LSOA)	1(least deprived)									
	2							2.17	[0.8;5.92]	0.13
	3							3.4	[1.3;8.9]	0.01
	4 (most deprived)							3.09	[1.22;7.8]	0.02
Non-socioeconomic variables significantly associated with chlamydia positivity										
Age group	16-17y									
	18-19y	0.65	[0.2;2.09]	0.47	0.82	[0.25;2.64]	0.73	0.89	[0.29;2.75]	0.84
	20-22y	0.43	[0.13;1.41]	0.16	0.66	[0.22;2.03]	0.47	0.78	[0.27;2.24]	0.64
	23-24y	0.24	[0.07;0.88]	0.03	0.37	[0.11;1.27]	0.11	0.44	[0.14;1.42]	0.17
BME	White									
	Other	2.67	[0.63;11.32]	0.18	2.5	[0.59;10.6]	0.21	1.79	[0.43;7.56]	0.43
	Black	6.16	[2;19.03]	0.00	5.94	[1.93;18.35]	0.00	4.56	[1.5;13.83]	0.01
	missing	4.14	[0.76;22.42]	0.1	3.57	[0.67;19.06]	0.14	2.78	[0.52;14.8]	0.23
Living circ-umstances	Alone	1.59	[0.47;5.31]	0.45	1.51	[0.45;5.11]	0.5	1.73	[0.51;5.86]	0.38
	Friends									
	Other	2.34	[0.44;12.34]	0.32	2.58	[0.49;13.54]	0.26	2.21	0.41;11.96	0.36
	Parents	1.41	[0.47;4.26]	0.54	1.28	[0.42;3.88]	0.66	1.52	[0.5;4.64]	0.46
	Partner	7.56	[1.22;46.74]	0.03	7.55	[1.27;44.87]	0.03	9.12	1.42;58.59	0.02
	Missing	2.71	[0.73;10.06]	0.14	2.45	[0.64;9.34]	0.19	3.16	0.83;12.01	0.09

Appendix: Stepwise models for each socioeconomic variable (Camberwell women)

		Model 1: Education (Current participation)			Model 2: Education (Leaving age)			Model 3: Area deprivation		
		OR	95% CI	p	OR	95% CI	p	OR	95% CI	p
Socio-economic variables										
Education										
Current participation	No									
	School/FE	0.66	[0.4;1.11]	0.12						
	University	0.42	[0.24;0.75]	0						
Leaving age	Left 16y or under									
	In education 17y+				1.04	[0.41;2.64]	0.94			
	Missing				1.45	[0.48;4.41]	0.51			
	Not applicable				1.82	[0.47;6.98]	0.38			
IMD2010 (LSOA)	1(least deprived)									
	2							1.05	[0.53;2.09]	0.89
	3							0.68	[0.32;1.43]	0.3
	4 (most deprived)							0.88	[0.42;1.83]	0.72
Non-socioeconomic variables significantly associated with chlamydia positivity										
BME	White									
	Other	1.96	[0.99;3.88]	0.05	1.88	[0.84;4.2]	0.12	2.03	[0.91;4.51]	0.08
	Black	3.07	[1.8;5.25]	0	1.97	[1.02;3.82]	0.04	2.15	[1.1;4.2]	0.03
	missing	2.15	[0.91;5.07]	0.08	2.1	[0.75;5.91]	0.16	2.2	[0.78;6.19]	0.14
Age group	16-17y									
	18-19y	0.95	[0.5;1.78]	0.86	1.15	[0.44;3]	0.78	0.98	[0.47;2.05]	0.95
	20-22y	0.65	[0.33;1.26]	0.2	0.6	[0.23;1.55]	0.29	0.53	[0.26;1.09]	0.08
	23-24y	0.34	[0.16;0.7]	0	0.37	[0.13;1.05]	0.06	0.32	[0.14;0.75]	0.01
Meeting in education?	Yes	0.6	[0.37;0.97]	0.04	0.4	[0.2;0.81]	0.01	0.39	[0.19;0.78]	0.01
	No									

Appendix 7: NCSP qualitative study materials

Topic guide

Coding frameworks

NCSP qualitative study sample topic guide

Brief introduction to the study:

We are conducting a series of expert interviews to build a coherent and comprehensive account of how and why the NCSP was established and delivered as it was. The study is partly to inform [my] PhD (into the equity of delivery of the NCSP), but we anticipate it may also yield useful learning for the development of public health programmes in the future.

We would like all participants to feel able to contribute as candidly as possible. For this purpose, would like to keep the identity of those interviewed confidential. While I would like to acknowledge your input in the PhD, in any public reports/ publications, we will use anonymised quotes only, so no comments will be directly attributed to you. (Or if you would prefer, we would be happy not to use direct quotes at all).

[NB: guide tailored to each interviewees' area of expertise]

THE PAST I: introducing a programme (from pilots to early phases)

1. **Your involvement:** When did you first become involved in chlamydia screening?

2. **Why a programme?** From what you remember, what was the prime reason for introducing a chlamydia screening programme in England?

Prompts: *What role did the following factors play?*

- *rise of STI diagnoses (in young people)/Reducing the prevalence of chlamydia*
- *concerns about sexual health in young people generally in the late 1990s*
- *Reproductive health problems in women*
- *Opportunity to improve the testing and treatment of STIs (ie use new technologies, climate of SH strategy/services more generally: GU 48 hour access, time of investment for the NHS, increasing emphasis on integrated services, moving services out into the community)*
- *International response to STIs (e.g. screening available in USA)*
- *CMO's report (any other key scientific meetings and/or publications?)*

3. How the **delivery model** adopted by the NCSP was reached:

Prompts:

- *Who to screen, including the decision to include young men*
- *How to screen (Opportunistic)*
- *How many to screen and how often*
- *Phased implementation of the programme*
- *Focus on chlamydia screening outside GUM*

- *Organisation: national coordination (HPA), local delivery – PCTs, CSOs, SHAs*

THE PAST II: developing the NCSP (from early phases to national rollout)

What do you see as key events/turning points in the **development** of the NCSP *Prompts:*

- *HPA as the coordinating body, drivers to move it out of the DH*
- *Staffing changes in core NCSP team*
- *Phased delivery/national roll out & timescales for this*
- *Programme targets*
- *Local NHS organisation/wider NHS policy*

THE PRESENT

Current goals of the NCSP:

- In your opinion, what is the programme is trying to do?

- How do you work locally to achieve these objectives? What helps/hinders this?

- To what extent do you think these objectives are being achieved? What's the problem if not?

- What should be the outcomes of a national chlamydia screening programme?
- Measure(s) of 'success'

THE FUTURE

In your opinion, **what do you think might happen** to the programme in the future?

- what would you like to see happen?
- What might be lost if it stopped?

Prompts:

- *Sexual health risks to young people*
- *Lack of resources/prestige for sexual health services/loss of jobs*
- *Loss of coherence/confusion/loss of reputation re. national sexual health policy*
- *Opportunities for research*

Descriptive coding themes

Health service	Technology	National policy	Social	Decision making	Delivery	Evaluation
Levers for delivery a) payment structures b) Targets and pressures	NAATs	SH position in policy agenda	Ideas about young people a) dangerous & unpredictable b) needing protection c) needing control	Evidence base a) Time lag/Pace of change b) evidence ignored, overlooked, misinterpreted	Providers (GP ..smear tests FP, infertility gynae, colposcopy GUM Antenatal, TOP Other (health/ nonhealth) Prisons/remand 3rd sector)	Definitions of success/time horizons
local reorganization (StBOP)	Azithromycin	Decentralised NHS/structural change	response to STI rates including HIV and teen pregnancy in young people	Influencers… a) experts b) organisations NSC, NICE, BASHH Labs/ test manufacturers	Demographics Age Men Women	Professional capacity to discuss sexual health/STIs (knowledge & attitudes?)
Comparable services a) piggy back b) territory c) conceptual aid	Communicating with patients a) mobile phones b) Internet	Choice	public stigma associated with STIs	International practice & learning	Occup groups /behaviour •Military •Students •School leavers •Sexually active •change of partner	QA
Professional cultures a) disease control b) requirement for specialist (eg GU for PN) c) stigma of STIs		Budget/ resource allocation		Criteria for national screening programmes	Targeting vs whole pop'n, eg by… •positivity/prevalence •symptoms??? •Morbidity •partners	Public knowledge/ attitudes
Sexual health service capacity a) GU b) infrastructure		New government & new NHS plans			'Invitation' strategies •opportunistic vs call/recall •screening interval vs coverage	Prevalence

Analytical coding trees

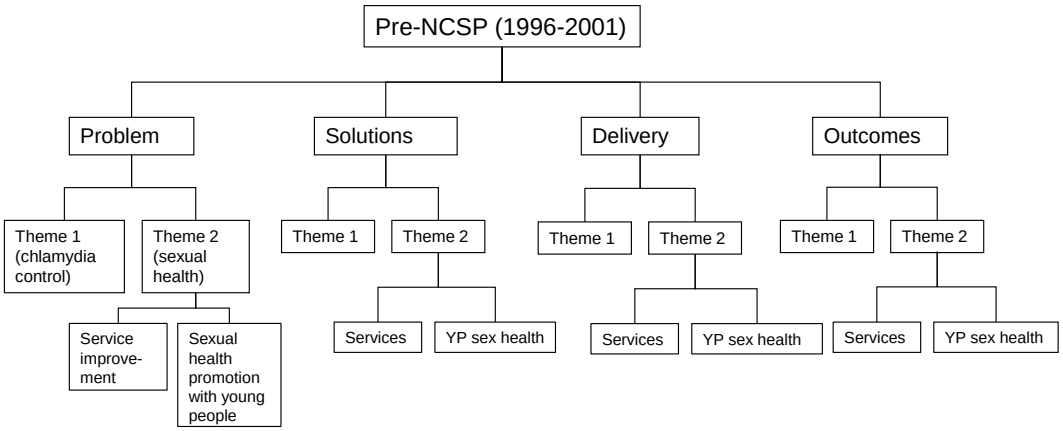


Chart 1

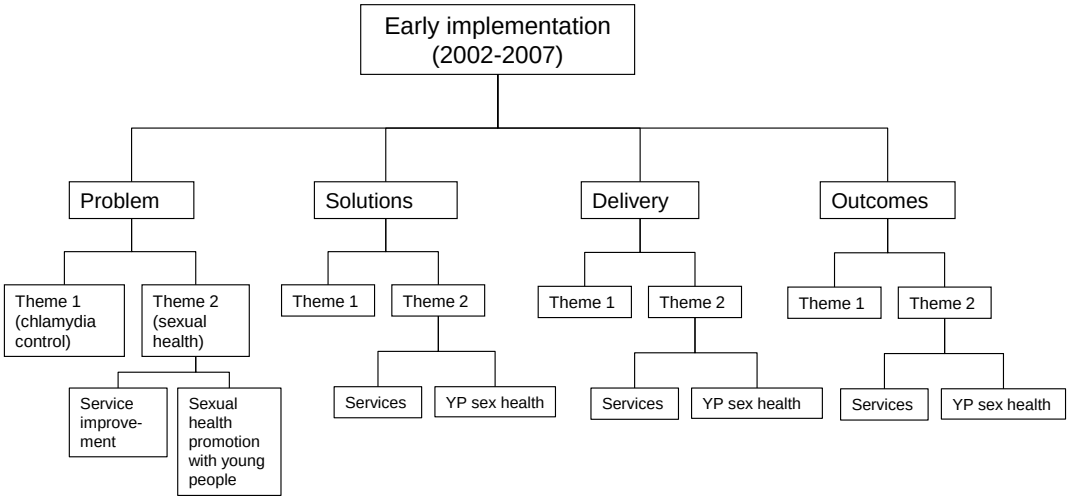


Chart 2

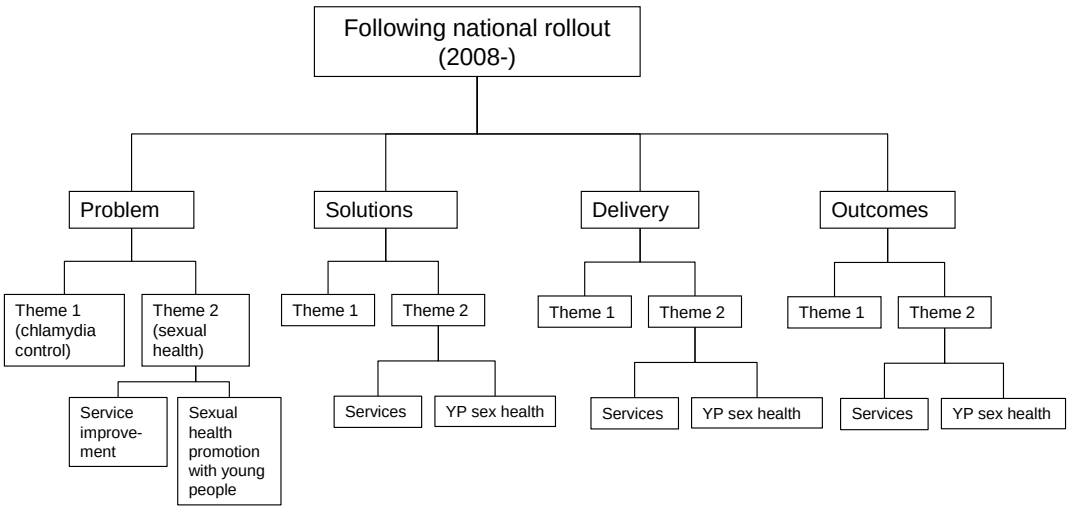


Chart 3

Appendix 8: Papers written during this PhD and contributions of other authors

Published

Sheringham J. (2010). Screening for Chlamydia. *BMJ*, *340*, c1698.

Sheringham, J., Simms, I., Riha, J., Talebi, A,, Emmett, L., Macintosh, M., Raine, R.(2011). Will chlamydia screening reach young people in deprived areas in England? Baseline analysis of the English National Chlamydia Screening Programme delivery in 2008. *Sex Transm Dis,* 38, 677-684.

AUTHORS' CONTRIBUTIONS STATEMENT

- JS drafted the paper and undertook the analysis. JS, the corresponding author, had full access to the data used in this study and had final responsibility for the decision to submit for publication.
- IS provided guidance on study design, the NCSP and commented on all drafts of the paper.
- AT and JR prepared the dataset and LE provided advice on analyses.
- MM commented on interim analyses and drafts of the paper.
- RR provided guidance on study design, interpretation of the results and commented on all drafts of the paper.
- All authors commented on advanced drafts of the paper and approved the final version.

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- Dr Cath Mercer, Senior Lecturer, Centre for Sexual Health & HIV Research, UCL for providing access to Natsal-2000 dataset
- Dr Mai Stafford, Senior Lecturer, Department of Epidemiology and Public Health, UCL, for her helpful advice on this analysis

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Baraitser, P., Alexander, S., **Sheringham, J.***Chlamydia trachomatis* screening in young women. *Current Opinion in Obstetrics & Gynecology* (supplement). 2011. DOI: 10.1097/GCO.0b013e32834ac776

AUTHORS' CONTRIBUTIONS STATEMENT

- PB drafted the paper and had final responsibility for the decision to submit for publication.
- JS drafted sections of chlamydia prevalence, natural history and effectiveness of screening interventions
- SA drafted the section on chlamydia diagnoses

Submitted for publication

Sheringham, J., Baraitser, P., Simms, I., Hart, G., Raine, R. The English National Chlamydia Screening Programme: politics, policy and practice. Submitted to: *BMC Public Health*, October 2011

AUTHORS' CONTRIBUTIONS STATEMENT

- The initial idea for the study came from a meeting between RR, IS, GH and JS.
- JS and PB jointly undertook the interviews, developed the study design, undertook the analysis and interpretation of the findings.
- JS drafted the introduction, results and discussion sections of the paper.
- PB searched for policy documentation, drafted the methods section of the paper, results figures and commented extensively on each draft of the paper.
- GH provided guidance on study design, commented on interim analyses and commented on all drafts of the paper.
- RR and IS commented on interim analyses and drafts of the paper.
- All authors commented on advanced drafts of the paper and approved the final version.

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Dr Jane Hocking, Deputy Director, Centre for Women's Health, Gender and Society, Melbourne School of Population Health
Dr D. Scott LaMontagne, PhD, MPH, FRSPH, CS – currently at PATH, HPV vaccine project, country research manager; formerly at HPA, NCSP, lead scientist, 2003-2005.

Professor Nicola Low, MD MSc FFPH, Professor of Epidemiology and Public Health, University of Bern

Dr Anne Mackie, National Screening Committee Director of Programmes
Ms Rupal Patel, Terrence Higgins Trust
Dr Sarah Randall, Medical Advisor to the NCSP, 2003-2008
Dr Sue Skidmore, Dept of Microbiology, Princess Royal Hospital
Professor Judith Stephenson, Margaret Pyke Chair of Sexual & Reproductive Health, University College London

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Sheringham, J., Mann, S., Simms, I., Stafford, M., Mercer, C. Hart, G., Raine, R. It matters what you measure: A systematic literature review examining whether young people in poorer socio-economic circumstances are more at risk of chlamydia. Submitted to *STIs*. July 2011. Revisions requested. Due to resubmit. 4 December 2011.

AUTHOR CONTRIBUTIONS STATEMENT

- JS, the corresponding author, had full access to the data used in this study and had final responsibility for the decision to submit for publication.
- JS and SM screened all retrieved references and reviewed papers meeting the inclusion criteria.
- JS, SM, IS, MS, GH and RR commented on the inclusion criteria and reviewed the list of included references.
- CM provided the Natsal-2000 data and advised on analysis.
- JS drafted the paper. All authors commented on advanced drafts of the paper and approved the final version.

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