"THE NEED IS GREATER THAN THE OPTIONS AVAILABLE": AN EXPLORATION OF UNMET NEED WITHIN SEXUAL AND REPRODUCTIVE HEALTH AMONG WOMEN AGED 16 – 24

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A thesis submitted for the degree of Doctor of Philosophy in Epidemiology and Public Health
April 2023

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Thank you to Kayla Friedman and Malcolm Morgan of the Centre for Sustainable Development, University of Cambridge, UK for producing the Microsoft Word thesis template used to produce this document.

This thesis is dedicated to my mother, who taught me how to read, and my grandmother, who taught me how to write.

Declaration

I, Danielle Solomon, 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.

Signed:____ ______________________________________

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ACKNOWLEDGEMENTS

I would like to thank my supervisors, Caroline Sabin, Jo Gibbs and Fiona Burns for their unwavering support, guidance and enthusiasm over the past three years. This project would be nothing without the tireless work of the people who created and maintain the datasets that I used for my analysis – thanks in particular to Katy Sinka, Megan Glancy and Natasha Ratna for their help with the GUMCAD and CTAD datasets, and Mary Grinsted and Martin Duggan for their help with the abortion dataset. Many thanks to my thesis committee – Jo Gibbs, Hamish Mohammed and Steph Migchelsen – who went far above and beyond the call of duty, and who really helped me to think outside the box. Thanks also to the chair of my thesis committee, Nigel Field, for his incredible mentorship throughout my time as an academic clinician. I would also like to thank John Saunders and Sue Mann, for an upgrade viva that was somehow both challenging and enjoyable, and that definitely changed this project for the better.

This thesis wouldn't exist without the support of my friends and family. Particular thanks to Sarah Clegg, Anne Irfan, and Heather Bailey, who walked this road long before I did, and who gave me all the advice that I needed when things got tough. Thanks also to Eorann Lean and Afy Nourallah, who have been my cheerleaders from day one. And finally, huge thanks to my husband, whose overwhelming belief in me kept me going every time I was hit with self-doubt. Richard, I love you, and I couldn't have done this without you.

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PUBLICATIONS AND PRESENTATIONS RESULTING FROM THIS PROJECT

Publications

Solomon D, Cabecinha M, Gibbs J, Burns F, Sabin CA. How do we measure unmet need within sexual and reproductive health? A systematic review. Perspect Public Health. 2022 Sep 20:17579139221118778. doi: 10.1177/17579139221118778. Epub ahead of print. PMID: 36127856.

Presentations

Sexual health inequalities among women aged 16-24

D Solomon, J Gibbs, F Burns, H Mohammed, SJ Migchelsen, CA Sabin

Oral presentation at the 15th Annual European Public Health Conference (November 2022)

Abortion inequalities among women in England aged 16–24

D Solomon, J Gibbs, F Burns, CA Sabin

Oral presentation at the British Association of Sexual Health and HIV Conference (June 2022)

Awarded the prize for Most Publishable Work

Abstract

An understanding of unmet need is a key part of addressing health inequalities. The aim of this project is to create an indicator that can be used to measure patterns of unmet need within sexual and reproductive health (SRH) in England.

This project comprised five analyses. The first was a literature review investigating the measurement of unmet need within SRH. This revealed several gaps in the literature including: analyses of unmet need within sexual health, analyses of unmet need within reproductive health in high income countries, and longitudinal analyses of unmet need within SRH.

The second was a qualitative Delphi exercise investigating the opinions of SRH professionals on the concept of unmet need. Participants felt that vulnerable populations are more likely to experience unmet need, and that an understanding of unmet need would improve service design and delivery.

The third analysis used national datasets to investigate patterns of inequality in sexual and reproductive outcomes among women aged 16-24 in England. I found that rates of chlamydia and gonorrhoea testing and diagnosis, rates of abortion and rates of repeat abortion were higher among women living in more deprived areas (when compared to women living in less deprived areas), and higher among Black Caribbean women (when compared to White British women).

The fourth analysis involved the creation of the Index of Unmet Need within Sexual and Reproductive Health (IUSRH), which combined measures of the disparities in sexual and reproductive outcomes linked to deprivation and

ethnicity. The fifth analysis was a spatial analysis of the IUSRH, which investigated geographical patterns of unmet need among women aged 16-24 in England.

Overall, I found that the IURSH has the potential to aid understanding of unmet need within sexual and reproductive health, particularly when used alongside other tools that aim to measure unmet need.

IMPACT STATEMENT

The overarching aim of this thesis was the creation of a tool that can be used in practice to directly impact the commissioning and delivery of sexual and reproductive health services. Both this tool (the Index of Unmet Need within Sexual and Reproductive Health, or IUSRH) and the work used to create the IUSRH have the potential to directly impact our understanding of unmet need within sexual and reproductive health, at both a national and international level.

The literature review within this project was the first to investigate the measurement of unmet need in sexual and reproductive health within the international published literature. This piece of work directly identifies the improvements that are required to bring utility to the measurement of unmet need, and the findings have been published in the journal *Perspectives in Public Health*.

As well as collating the opinions of SRH professionals across England, the qualitative Delphi exercise within this thesis is one of very few examples of the use of the qualitative Delphi method as a way of facilitating discourse between health professionals, and provides a justification for further use of this method in the investigation of similar concepts.

The quantitative analyses within this project outline patterns of SRH inequality among women aged 16-24 in England, a group who experience significant sexual and reproductive morbidity. These analyses indicate an increased risk of chlamydia and gonorrhoea diagnosis, and higher rates of abortion and repeat abortion, among women living in more deprived areas and women of Black Caribbean ethnicity – results that can be used to support the promotion of preventative and clinical services among these particularly vulnerable groups. These results have been presented both nationally and internationally (at the British Association for Sexual Health and HIV conference, and the European Public Health conference).

The IUSRH has the potential to aid the professionals who design, fund and commission sexual and reproductive health services to target resources towards geographical areas that are experiencing unmet need. In addition, the IUSRH can provide a starting point for local investigations of disparities within sexual and reproductive outcomes (such as Health Equity Assessments) and can serve as a quantitative foundation for qualitative analyses of health inequalities. The utility of the IUSRH has already been discussed with professionals working within both local and national public health, and I plan to expand of the work within this thesis to develop the IUSRH into a functioning health equity tool.

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List of Abbreviations and Acronyms

ARR – adjusted rate ratio
BASHH – British Association for Sexual Health and HIV
CCG – Clinical Commissioning Group
COVID-19 – Coronavirus Disease 2019
CPR – Chlamydia positivity rate
DHS – Demographic and Health Survey
DHSC – Department of Health and Social Care
GIS – Geographic Information Systems
GP – general practitioner
GPR – Gonorrhoea positivity rate
GUMCAD – Genitourinary Medicine Clinic Activity Dataset
HIV – human immunodeficiency virus
HPV - human papillomavirus
ICD-10 – International Classification of Disease version 10
IMD – Index of Multiple Deprivation
IUD – Intrauterine device
IUSRH – Indicator of Unmet Need within Sexual and Reproductive Health
JRC — Joint Research Centre
LA – Local authority
LSOA – Lower Layer Super Output Area
LMUP – London Measure of Unplanned Pregnancy
MSOA – Middle Layer Super Output Area
MSM – Men who have sex with men
Natsal – National Survey of Sexual Attitudes and Lifestyles
NAAT – Nucleic acid amplification test
NCSP – National Chlamydia Screening Programme
NSFG – National Survey of Family Growth
NUTS - Nomenclature of territorial units for statistics
OA – Output Area
OECD – Organisation for Economic Co-operation and Development
ONS – Office for National Statistics
OHID – Office for Health Improvement and Disparities
PCT – Primary Care Trust
PID - pelvic inflammatory disease
PHE – Public Health England
PRISMA – Preferred Reporting Items for Systematic Reviews and Meta-Analyses
RAR – repeat abortion rate
SES – socioeconomic status
SPOT – spend and outcomes tool
SRH – sexual and reproductive health
STI – sexually transmitted infection
SII – Slope Index of Inequality
TOP – termination of pregnancy
UTLA – Upper Tier Local Authority
UKHSA – UK Health Security Agency

1 INTRODUCTION

1.1 Unmet need

Unmet need within health is an epidemiological conundrum. NHS England defines health inequality as 'unfair and avoidable differences in health across the population, and between different groups within society'[1]. Under this definition, addressing this type of inequality requires a full understanding of both the health needs of a population and the needs that aren't being met. It is notoriously difficult, however, to define health needs, or to capture information on the disparity between desirable and observed outcomes, particularly at the population level. As we gain an improved understanding of the drivers of health inequality[2], comprehension of concepts such as unmet need becomes increasingly difficult.

Although unmet need is a concept that is pervasive throughout discussions of health and healthcare, it remains relatively ill-defined. In England, for example, although NHS England's resource allocation formulae require a geographic measure of unmet need, proxies such as standardised mortality ratio are substituted for any direct measure of service demand and utilisation, an approach which has been repeatedly criticised[3,4]. Similarly, when £500 million was ring-fenced to provide additional financial support to local authorities during the 2019 coronavirus (Covid-19) pandemic, the allocation of these funds was decided using a 'Covid-19 Relative Needs Formula'. This formula took into account a borough's level of deprivation and contained an Area Cost Adjustment (to allow for geographical differences in labour costs and rents), but did not contain any direct measure of need related to the Covid-19 pandemic itself[5].

A 2015 analysis of universal health coverage in Europe defined unmet need as 'being unable to obtain care when people believed it to be medically necessary'[6], a definition that is similar to those used during many other investigations of unmet need within health[7,8]. This definition, although useful, has two significant flaws. The focus on belief requires a person to know that they have an unmet medical need, and the focus on care goes against the increasingly recognised definition of health that is laid out in the constitution of the World Health Organisation[9], which specifically states that that health is 'not merely the absence of disease or infirmity'. A 2010 analysis of unmet need in Canada went into more detail, declaring that unmet need 'arises when an individual does not receive an available and effective treatment that could have improved her health' and dividing unmet need into five categories[10]:

- Category 1, **unperceived unmet need**, requires an individual to be unaware of their need for healthcare.
- Category 2, **subjective, chosen unmet need**, requires an individual to be aware of the need but choose not to seek services.
- Category 3, **subjective, not-chosen unmet need**, involves the perception of need combined with barriers to healthcare access that are beyond the individual's control.
- Category 4, **subjective, clinician-validated unmet need**, is the perception of need combined with access to care that a clinician would deem to be inadequate.

- Category 5, **subjective unmet expectations**, in which an individual perceives themselves as not having received adequate care.

This definition adds breadth and depth to the concept of unmet need, judging quality, rather than just access to care, as a potential unmet need, and highlighting the importance of an individual’s perception and desires. There is still, however, a focus on healthcare, meaning that a need for preventative services or structural change may be excluded from this definition.

Given the challenges inherent in defining unmet need, measurement of this parameter is likely to be equally complex. Growing concern regarding health inequality sparked attempts to measure unmet need in the 1940s and 50s; these analyses focused heavily on access to medical care, and often used a 'symptoms approach', asking respondents about the presence of certain symptoms and the subsequent utilisation of medical care or treatment[11,12]. In the 1960s, Wallace, Eisner and Dooley piloted a population-based approach, mapping certain health indicators (such as inadequate prenatal care and incidence of tuberculosis) and socioeconomic indicators (such as unemployment and overcrowding) to identify geographical areas of unmet need as an aid to health planners[13]. A combination of these two methods continued to be used to measure unmet need within health over the next few decades, however a change in discourse occurred in the 2000s [14]. In 2010, Allin, Grignon and le Grand outlined the importance of 'subjective' unmet need, or unmet need that is defined and reported by the person experiencing the need. Not only is this type of need easier to measure, they argued, given the number of regional and national-level surveys that ask questions pertaining to unmet need, but measurement of this type of need also takes agency into account, particularly among historically underserved communities. This group found, however, that subjective unmet need alone did not correlate with other measures of unmet need, and suggested that multiple concurrent analyses would be required to inform robust policy change[10]. A more recent paper from the Economic and Social Research Institute, Dublin, also rejected the idea that unmet need could be captured using a single outcome or measurement, and outlined the parameters that are key to an effective understanding of unmet need[14]. The authors argued that existing approaches do not translate into policy change, largely due to the absence of longitudinal data and the lack of distinction between need and demand (and as a result, a poor understanding of the relationship between the two parameters). They also suggested three trajectories of unmet need that should be explored further: non-use of health care (perceived need that is not converted into a demand for healthcare), delayed use of healthcare (perceived need that is converted into a demand for healthcare, combined with a delay in either demanding or receiving healthcare) and sub-optimal use of healthcare (perceived need that is converted into a demand for healthcare that is sub-optimally satisfied). Although thorough, this definition once again focuses specifically on the need for healthcare, and runs the risk of overlooking need for health interventions that aren't always perceptible within communities, such as certain public health interventions.

When exploring the discourse surrounding unmet need, it becomes increasingly clear that a single definition or method of measuring unmet health need is unlikely to be appropriate, and that unmet need is a concept that requires a nuanced understanding of its myriad applications when examining health inequality. A multidisciplinary approach, that is specific to the area of health being examined, is likely to be the most useful and effective way of exploring unmet need and generating implementable policy recommendations.

1.2 Epidemiology of sexual and reproductive health (SRH) in England

1.2.1 Sexual health

Although sexual health goes far beyond the absence or presence of disease, sexually transmitted infections (STIs) generate a significant burden of morbidity in England. In 2019[1], 468,342 new STIs were diagnosed – this represented a five percent increase when compared to the previous year[15]. The majority of these diagnoses (82%) comprised four infections.

- **Chlamydia** (49% of new diagnoses in 2019 [15]) is an infection caused by the bacterium Chlamydia trachomatis[16]. Although often asymptomatic (a feature that aids in its transmission) and easy to treat with antibiotics, if left untreated chlamydia can lead to pelvic inflammatory disease (PID) in women. PID occurs when infection spreads up the genital and reproductive tract, causing inflammation of the ovaries, fallopian tubes and uterus. At its most severe, the scarring resulting from PID can lead to ectopic pregnancy and tubal factor infertility. It is estimated that 10-20% of untreated cases of chlamydia can lead to PID, making testing and treatment for chlamydia an important public health intervention that has implications for both quality of life and healthcare costs [17].

[1] Recorded STI prevalence and patterns of sexual health service activity in 2020 and 2021 were heavily impacted by disruption to service provision caused by the Covid-19 pandemic *(Sexually transmitted infections and screening for chlamydia in England: 2021 report, UK Health Security Agency)*. This chapter will therefore be using the data collected in 2019 to demonstrate prevalence within the UK population.

- **Gonorrhoea** (15% of new diagnoses in 2019 [15]) is an infection caused by the bacterium Neisseria gonorrhoeae. Although sexually transmitted, gonorrhoea can present as inflammation of both genital and extragenital sites. These symptoms are more common in men – women are far more likely to experience asymptomatic infection. Gonorrhoea is treatable with antibiotics, however untreated gonorrhoea (which is more common among those who are asymptomatic) can lead to PID, chronic pelvic pain, ectopic pregnancy and infertility, and can also be vertically transmitted to neonates during childbirth, causing the severe ocular infection opthalmia neonatorum[18]. Although less prevalent than chlamydia, gonorrhoea is a particularly significant public health concern in England for two reasons. Firstly, incident gonorrhoea has displayed a dramatic increase over the past few years – new cases rose by 26% between 2018 and 2019 [15]. Secondly, gonorrhoea has become progressively resistant to antibiotics, particularly over the past decade[19], leading to concerns about the potential for outbreaks of infections that will be increasingly difficult to treat[20].
- **Genital warts** (11% of all new diagnoses in 2019[15]) are lesions that develop on the skin and mucous membranes as a result of infection with certain strains of human papillomavirus (HPV). They are treatable using topical treatments, freezing, burning or curettage[21]. Although often thought of as benign lesions, genital warts have a significant impact on health-related quality of life[22], and generate a sizeable financial burden within the healthcare system[23,24]. Diagnoses of genital warts have been declining over the past few years – between 2018 and 2019, first

diagnoses in England fell by 11%[15]. This is largely attributed to the HPV vaccination programme, which began using a quadrivalent vaccine (that protects against the types of HPV that cause genital warts, as well as the types of HPV that cause cervical cancer) in 2012[25].

- **Genital herpes** (7% of all new diagnoses in 2019[15])is an infection caused by herpes simplex virus (HSV)[26]. HSV infection is often asymptomatic, and it is estimated that only 10-25% of those who have antibodies to the HSV-2 virus are aware of their infection[27,28], which is a significant risk factor for transmission[29]. Among those who are symptomatic, genital herpes can cause recurrent, painful genital lesions and is associated with significant psychological morbidity[26]. It can also be vertically transmitted to neonates, resulting in disseminated infection, which can be fatal[30].

In England, there are three groups who are thought to be at highest risk of STIs: men who have sex with men, people who identify their ethnicity as Black, and people aged 15-24[15]. Risk among these groups is often attributed to certain behavioural factors, particularly higher rates of partner change and lower rates of condom usage[31–33], and assortative mixing that results in sexual networks who share demographic characteristics[34]. However, research is increasingly finding links between socioeconomic status (SES) and sexual health, indicating that there may also be structural drivers of these inequalities[35–37].

1.2.2 Reproductive health

Although reproductive health covers a range of conditions that affect people of all genders and sexual orientations, the bulk of reproductive care in England centres around the prevention, management and facilitation of pregnancy[38]. In their strategic plan for health promotion within SRH and HIV, Public Health England (PHE), the executive body of the Department of Health and Social Care (DHSC) that managed English public health until 2021[2], outlined two main priorities within reproductive health[39].

- **Unintended pregnancy**: It is estimated that between one in three and one in six pregnancies in the United Kingdom are unintended[40,41]. Unintended pregnancies carry an increased likelihood of adverse outcomes, when compared to pregnancies that were planned. Women who have not planned their pregnancies are less likely to use prenatal supplements, have a lower number of prenatal visits, are more likely to smoke during pregnancy, and have an increased risk of pre-term delivery and maternal psychological distress[42,43]. Unintended pregnancy also has a significant financial cost, both within the health service and the wider economy. Unintended pregnancies are significantly more likely to result in abortion [41], which represents the bulk of direct medical costs associated with unplanned pregnancy (around £143 million in 2010)[44], and economic modelling has estimated the wider costs of unintended pregnancy to be between £27 billion and £57 billion, due to the associated increased public sector needs (including housing, childcare and social care)[45].
- **Conception among women under the age of 18**: England has one of the highest teenage pregnancy rates in Europe (16.7 per 1000 population

[2] In 2021, while this project was ongoing, Public Health England (the executive body that had previously managed the public health functions of the DHSC) was split into two, leading to the creation of two agencies – the UK Health Security Agency (UKHSA) and the Office for Health Improvement and Disparities (OHID). During this thesis, any discussion of the ongoing functions of UKHSA will use its current title, whereas any discussion of work that was done prior to 2021, or carried out alongside Public Health England (such as the analyses in Chapters 4 and 5) will refer to the organisation as PHE.

in 2018)[46]. Teenage mothers are more likely to experience poor mental health during the postpartum period, and their babies are more likely to have a low birth weight, be born preterm or be stillborn[47]. In the long term, teenage mothers and their children have poorer educational outcomes, higher rates of unemployment and less access to social support[48].

As with sexual health outcomes, unplanned and teenage pregnancies correlate significantly with both ethnicity and SES, indicating the potential role of certain structural barriers – in particular, access to effective, appropriate contraception[39].

1.3 Epidemiology of SRH in England among women under 25

1.3.1 Sexual health

When disaggregated by age, rates of STI diagnosis in England are found to be highest among people under 25[15]. This is somewhat attributable to marked differences in sexual behaviour when compared to other age groups. The third National Survey of Sexual Attitudes and Lifestyles (Natsal-3), conducted between September 2010 and August 2012, found that 16-24 year olds reported a lower age of sexual debut and reported a larger number of partners in the previous year, when compared to other age groups[49]. Within this group, women are more likely to be diagnosed with an STI than men[15]. The reasons for this are complex. The National Chlamydia Screening Programme (NCSP), which facilitates opportunistic screening of women (and other people with a womb) under the age of 25, has resulted in a significantly higher rate of testing among women in this age group[50], which may explain the observed increase in chlamydia incidence within this population. There is also a significant increase in incidence of other STIs, however – between 2018 and 2019, diagnoses of gonorrhoea and syphilis both increased by 31% among women under 25 (compared to increases of 22% and 9%, respectively, among men under 25 during the same period). Disassortative sexual mixing may also play a role – Natsal-3 found that around one-third of opposite-sex partnerships involved an age gap (most commonly involving a male partner who is at least five years older), and that these relationships are associated with lower odds of condom use, and higher odds of casual partnerships, both of which are independently associated with STI risk[51]. Whatever the drivers of this disparity, understanding the patterns of STI risk among young women in England is crucial — the continuing increase in STI incidence, combined with the potentially devastating consequences of infection among this population, should make this a public health priority.

1.3.2 Reproductive health

Unplanned pregnancy is a significant concern for women in England under the age of 25. An online survey carried out by PHE in 2017 found that 53% of women aged 16-24 rated ‘not getting pregnant’ as their most pressing reproductive health concern, compared to 48% of women aged 25-34, and 30% of women aged 35-44[52]. This is borne out by the data surrounding abortion. Although the abortion rate is increasing among women over the age of 25 in England, abortions are most prevalent among women under 25 (in 2019 the abortion rate was highest among 22 year old women, at 31.6 per 1000 women)[53]. There is also a significant correlation with deprivation. In 2019, women aged 20-24 who lived in the most deprived areas in England had an abortion rate of 45 per 1000 women, compared to 27 per 1000 women who lived in the least deprived areas[53]. Abortion, however, is not the only measure of unplanned pregnancy, given that not all unplanned pregnancies result in abortion, and not all pregnancies that result in abortion were unplanned. Natsal-3 used the London Measure of Unplanned Pregnancy (LMUP)[3] to assess the features that correlated with unplanned pregnancy within their dataset, and found similar trends to those seen within analyses of abortion. Of those who reported a pregnancy in the past year, women aged 16-24 were more likely to have not planned the pregnancy at all or be ambivalent about the pregnancy. Within the Natsal analysis, unplanned pregnancy was associated with less reliable access to sex education, lower educational attainment and increased deprivation[54]. The apparent structural patterns of unplanned pregnancy, combined with the potential physical, psychological and social effects (as described above), should make unplanned pregnancy, particularly among this age group, another public health priority.

1.4 Sexual health and reproductive health provision in England

1.4.1 Provision of SRH services

SRH service provision in England is divided into three tiers. Level three services are specialist sexual and/or reproductive health services that are usually consultant led. These centres often focus on complex SRH needs, including the provision of STI care to those who are symptomatic, SRH services for certain risk groups and management of psychosexual issues. Level two services are non-

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[3] The validated London Measure of Unplanned Pregnancy uses self-reported pregnancy circumstances (including factors such as desire for pregnancy, contraceptive use, and pre-conceptual preparations) to measure pregnancy intention on a scale of zero to 12, on which zero is unplanned and 12 is highly planned (*Barrett G, Smith SC, Wellings K Conceptualisation, development, and evaluation of a measure of unplanned pregnancy Journal of Epidemiology & Community Health 2004;58:426-433*).

specialist services that include certain enhanced general practices. These providers are able to offer asymptomatic testing for STIs and provide some forms of long-acting reversible contraception. Level one services include settings such as pharmacies. These settings are able to provide basic STI testing and chlamydia screening, pregnancy testing, and emergency hormonal contraception[55].

Between 2016 and 2019, attendances at sexual health services increased by 22%, from 2.5 million to 3.1 million[56]. Although attendances to specialist services for contraceptive provision have displayed a slight decline in recent years, there is still significant demand, with 1.26 million attendances recorded during the 2019/20 financial year (a figure that is likely to be affected by the number of women accessing contraceptive services within a general practice setting).

1.4.2 Provision of abortion services

Termination of pregnancy in England, Wales and Scotland is regulated by the Abortion Act (1967). The Abortion Act creates an exception to the Offences Against the Person Act (1861), under which it is a crime for a woman to 'procure a miscarriage'. Under the Abortion Act, pregnancies terminated by a registered medical professional, on licensed premises, and authorised by two doctors acting in good faith, are no longer criminalised[57]. The authorising doctors are required to justify an abortion on one (or more) of the following grounds[53].

- Ground A: That the continuance of the pregnancy would involve risk to the life of the pregnant woman greater than if the pregnancy were terminated.

- Ground B: That the termination is necessary to prevent grave permanent injury to the physical or mental health of the pregnant woman.

- Ground C: That the pregnancy has NOT exceeded its 24th week and that the continuance of the pregnancy would involve risk, greater than if the pregnancy were terminated, of injury to the physical or mental health of the pregnant woman.

- Ground D: That the pregnancy has NOT exceeded its 24th week and that the continuance of the pregnancy would involve risk, greater than if the pregnancy were terminated, of injury to the physical or mental health of any existing child(ren) of the family of the pregnant woman.

- Ground E: That there is substantial risk that if the child were born it would suffer from such physical or mental abnormalities as to be seriously handicapped.

- Ground F: To save the life of the pregnant woman (in an emergency situation).

- Ground G: To prevent grave permanent injury to the physical or mental health of the pregnant woman (in an emergency situation).

In practice, these grounds leave a significant amount of discretion to the doctors authorising the abortion. Evidence from multiple countries has repeatedly shown that both the physical and psychological impact of carrying an unwanted pregnancy to term is significantly greater than that experienced by those who terminate an unwanted pregnancy, meaning that most abortions related to unplanned pregnancy are justified under Ground C[58].

The majority of abortions in England (74%) are performed by independent service providers (based outside of the NHS) that are commissioned to provide abortion services by clinical commissioning groups (CCGs)[59]. As with other services within SRH, there is significant demand within this sector: in 2021 there were 214869 abortions reported in England and Wales, 12.8% more than the 190406 that were reported in 2016[53].

1.4.3 Monitoring and evaluating service use

In 2013 the NHS underwent what has been described as 'the biggest upheaval…in its 63 year history'[60]. The Conservative-led coalition government enacted the Health and Social Care Act 2012, a piece of legislation that changed the nature and responsibilities of most of the organisations involved in health and social care within the United Kingdom. One of the many changes was an overhaul of both the commissioning and provision of SRH. Once predominantly part of the NHS, this area of healthcare is now largely commissioned within local authorities (UK organisations that are responsible for provision of services and facilities within a certain area), under the remit of public health teams. SRH services therefore display significant regional differences, largely due to wide variations in commissioning models[61]. As part of local public health, SRH services are funded using the public health grant that is available to local authorities. This grant has been cut significantly since the first enactment of the Health and Social Care Act – it was 22% lower per head in 2020/21 when compared to 2015/16[62]. As a result, SRH services funding in England has fallen by around 3.5%, with a quarter of local authorities reducing their budgets by more than 20%[63]. There is concern that this reduction in funding, particularly given the uneven geographical distribution, could lead to an inability to appropriately address demand for SRH services, which could result in poorer outcomes[64].

Against the backdrop of these changes, the necessity of accurate monitoring and evaluation of these services has become increasingly apparent. One of the organisations at the forefront of this endeavour in England is the UK Health Security Agency (UKHSA), an executive agency of the DHSC. Alongside other agencies within the DHSC, UKHSA carries out the majority of STI and reproductive outcome surveillance within England[65]. As part of this process, they have designed tools such as Fingertips, which facilitates mapping of a range of health and wellbeing indicators[66], and SPOT (spend and outcomes tool), which compares spend and outcome measures at the local authority (LA) level[67], to allow for analysis of trends and inequalities. Measuring unmet need, however, poses significant challenges. Changes in certain outcomes may not necessarily indicate a service need: for example, increases in STI incidence may indicate improved access to sexual health services, rather than an increase in the underlying infection rate. In addition, it is difficult to capture those who need services but who are not accessing them using surveillance data that are predominantly sourced from within the health service. It is, however, important to understand and monitor unmet need, particularly with regards to understanding inequalities within SRH. Population-based estimates of chlamydia prevalence have found that a large proportion of those who test positive for chlamydia during random sampling have not attended a sexual health clinic or had a chlamydia test in the past year[37]. Similarly, delays in contraceptive access have been identified as a risk factor for teenage pregnancy[68]. There are many who have SRH needs that are not being captured through current methods of monitoring and surveillance, and this is something that must be addressed in order to improve outcomes and tackle inequalities.

1.5 Research aims and objectives

1.5.1 Primary objective

There is a large burden of sexual and reproductive morbidity in England, a burden that disproportionately affects some of the country's most vulnerable groups. This pattern of illness and inequality is likely to be attributable, at least in part, to a combination of unmet needs within the population. It is, however, difficult to define, characterise or measure unmet need within healthcare, and there are currently very few systems in place nationally that identify needs within SRH, and monitor whether those needs are being met.

The primary objective of this project is the creation of an indicator that can be used to map unmet need within SRH among women aged 16-24. The conceptualisation of this indicator draws upon the work of numerous academics within the fields of both sexual and reproductive health, and unmet need. One of the earliest examples of outcome mapping as a method of identifying patterns of unmet need was introduced earlier in this chapter. In 1967, Helen Wallace, Victor Eisner and Samuel Dooley plotted a range of health indicators (including maternal mortality, neonatal mortality and 'venereal disease' incidence) and socioeconomic indicators (including unemployment, overcrowding and juvenile delinquency), in an attempt to identify high risk areas of San Francisco as an aid to community planners[13]. Although Wallace, Eisner and Dooley found this to be a potentially useful method for the identification of health-related needs at the population level, the absence of reliable datasets in the 1960s proved to be a significant obstacle in practice.

With the advent of increasingly accessible population-level data, numerous epidemiologists began to use outcome mapping to create geographical health-related indicators. In 2020, the Office of National Statistics released a provisional version of the Health Indicator for England, a composite index that aimed to provide a single numerical value that indicated levels of population health within a geographical region[69]. This indicator uses data on outcomes within three domains: Healthy People (outcomes include infant mortality, suicides and cardiovascular conditions), Healthy Lives (outcomes include obesity, smoking and vaccination coverage) and Healthy Places (outcomes include air pollution, household overcrowding and distance to GP services). The index compares the health status of the population at the UTLA level over time – the beta version of the Health Index uses 2015 scores as a baseline, with the score for subsequent years being expressed as a deviation from that baseline. A score of 100 indicates that health is at the same level as it was in 2015, a score below 100 indicates poorer health, and a score above 100 indicates better health.

This methodology has also been used to investigate unmet need within sexual health more specifically. In 2010, a team at the UK Health Protection Agency (now UKHSA), constructed an Index of Sexual Health Deprivation using a modified version of the methods used to create the IMD. Each primary care trust (PCT) was given a score related to thirteen outcomes that fell into four domains: teenage reproductive health, HIV and STIs, sexual and reproductive health complications and reproductive cancer (each of which was weighted using principal component analysis). This score was then used to rank each PCT from 1 (least deprived) to 152 (most deprived)[70].

Building on the existing work that has utilised spatial methods to investigate patterns of unmet need, I used routinely collected data to create an indicator of unmet need within SRH among women aged 16-24. This indicator combined multiple measures of sexual and reproductive outcomes, and was used to visualise geographic patterns of inequality in England within this population.

1.5.2 Research questions

This primary aim of this thesis was achieved via exploration of the following research questions:

What are the methods, outcomes and definitions that are currently being used to measure unmet need within SRH?

This question was investigated using a systematic review that examined the methods and definitions that have been used to outline and quantify unmet need within SRH over the past ten years.

How can we define and measure unmet need within SRH among women aged 16-24 in England?

To investigate this question, I used two analyses. The first was a qualitative Delphi exercise involving a range of SRH professionals that explored the conceptualisation of unmet need in SRH. The second was a quantitative analysis of data collected by PHE and DHSC, using six sexual and reproductive outcomes that have a significant impact on the population of interest (gonorrhoea diagnosis and testing, chlamydia diagnosis and testing, abortion and repeat abortion).

What were the patterns of unmet need within SRH between 2012 and 2019 among women between the ages of 16 and 24 years in England?

Investigation of this question involved the creation of an indicator of unmet need within SRH, using the results from the qualitative and quantitative analyses, and mapping of the newly-created indicator of unmet need, using geographic information system (GIS) software.

1.5.3 Structure of the thesis

- **Chapter 2: Literature review**

  This chapter will outline a review of the published literature that investigated the methods that have previously been used to measure unmet need within SRH. This chapter will end with a discussion of the links between the findings of the literature review and the objectives of the project.

- **Chapter 3: Delphi exercise**

  This chapter will outline the methods and results of a qualitative Delphi exercise that I used to collect the opinions of 19 SRH professionals on the topic of unmet need within SRH.

- **Chapter 4: Quantitative methods**

  This chapter will outline the methods used to analyse data on gonorrhoea testing/diagnosis, chlamydia testing/diagnosis and abortion/repeat abortion that was collected by PHE and DHSC between 2012 and 2019.

- **Chapter 5: Gonorrhoea analysis**

This chapter will discuss the results of the quantitative analyses that explored the relationship between ethnicity, deprivation and gonorrhoea testing/diagnosis among women in England aged 16-24 between 2012 and 2019.

- **Chapter 6: Chlamydia analysis**

  This chapter will discuss the results of the quantitative analyses that explored the relationship between ethnicity, deprivation and chlamydia testing/diagnosis among women in England aged 16-24 between 2012 and 2019.

- **Chapter 7: Abortion analysis**

  This chapter will discuss the results of the quantitative analyses that explored the relationship between ethnicity, deprivation and abortion/repeat abortion among women in England aged 16-24 between 2012 and 2019.

- **Chapter 8: Creating the IUSRH**

  This chapter will discuss the creation and mapping of my indicator of unmet need within SRH, and the implications of the subsequent spatial analyses.

- **Chapter 9: Summary and Discussion**

  This chapter will summarise the results of the thesis, and discuss the implications and avenues for future research.

2 REVIEW OF THE LITERATURE

2.1 Introduction

The concept of unmet need within healthcare is fraught with uncertainty. The aim of this thesis is to measure unmet need within SRH among women in England aged 16-24 – as such, it is important to gain an understanding of the methods that have been previously used to conduct similar analyses.

In this chapter, I will outline the discourse within the published literature surrounding unmet need in SRH over the past ten years. In particular, I will describe the methods that have been used to characterise and measure unmet need, the populations in which unmet need within reproductive and sexual health has been most frequently measured, and the definitions of unmet need that have been used within these analyses. This review will allow me to conceptualise the gaps within this area of study, thus informing the methodology of this thesis.

2.2 Methods

2.2.1 Search strategy

This review was undertaken according to the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines. To ensure a thorough review of the literature, a search of five databases was undertaken: PubMed, Web of Science, Scopus, The Cumulative Index to Nursing and Allied Health Literature (CINAHL) and the Health Management and Policy Database (HMIC). A Google search was also performed to find any white or grey literature that had been missed by the database search. In order to capture studies that involve measurement of unmet need but do not use that specific term, a deliberately broad set of search terms was utilised. These terms were (*need* OR *demand*) AND (*sexual health* OR *reproductive health* OR *contracept** OR *family planning* OR *sexually transmitted infection* OR *STI*).

Studies that described a quantitative method to elucidate levels of unmet need within sexual and/or reproductive health in a specific population were included in the literature review. Exclusion criteria were: studies that were not in English, systematic reviews, and studies that used entirely qualitative methods (although mixed methods studies were included). Provision of contraception, abortion services and cervical screening were included in the definition of reproductive health for the purposes of this review, while maternity care and assisted conception were excluded. STI testing and HIV prevention services (including PrEP provision) were included in the definition of sexual health. Analyses that were used to inform multiple publications were only included once, unless the method of measuring unmet need had changed between publications.

The search period was 2010 to 2021. This period was chosen in part for ease of analysis, due to the broad search strategy, and in part because methods described prior to 2010 were likely to be out of date, particularly if they had not been used again in subsequent, more recent, studies. Although this thesis will concentrate on populations within the UK, the scope of this search was international. Given that methods for calculating unmet need are likely to be applicable to a range of contexts, I felt that it was important not to eliminate any analyses that may inform this project, purely because they were conducted in a different geographical location.

2.2.2 Study selection

Three stages of study selection were used to identify papers for inclusion within this literature review. Two reviewers (DS and MC) used Covidence software to assign 20% of titles identified during the database search for inclusion or exclusion. The titles selected for this initial screening stage were chosen at random (also using Covidence software). I discussed any discrepancies with MC until there was 100% concordance, and then I assigned the remaining titles. This process was repeated for the abstracts of the papers that had been flagged for inclusion during the title round. Once all abstracts had been screened, I screened the full text of the papers that had been flagged for inclusion, and selected the papers that would proceed to data extraction.

2.2.3 Data extraction

A data extraction form was created in Microsoft Excel, and this was used to record relevant data from the remaining studies (Figure 2.1).

Figure 2.1: Form used to extract data from papers selected for literature review

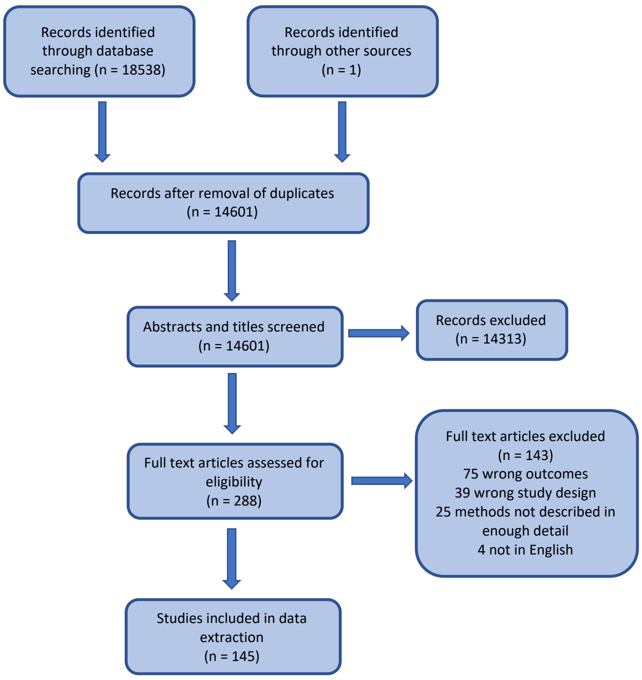
B	C	D	E	F	G	H	I	J	K	L	M	N
Study ID	**Publication type**	**Country**	**National/regional analysis**	**Country income status**	**Sexual or reproductive health**	**Sub-category**	**Sample size**	**Setting**	**Population**	**Type of study**	**Methods**	**Definition of unmet need**
Abdella 2013	Full paper	Ethiopia	National	Low income	Reproductive	Abortion	8911	Health facility	Women seeking treatment for abortion complications	Cross-sectional	Medical records review and interviews with healthcare providers	Inability of a health service to provide appropriate abortion services to women seeking treatment

The nature of the research question and the heterogeneity of the included studies meant that meta-analysis was an inappropriate methodology for analysis of the extracted data. A narrative synthesis of the themes within the literature was therefore carried out in accordance with the Synthesis without meta-analysis (SWiM) PRISMA extension guidance[71]. As the research question was entirely focused on the methods being used to measure unmet need within the published literature, this review did not consider the results of any of the studies, and I therefore decided not to include the quality appraisal step within the SWiM guidance.

2.3 Results

The database search yielded 18538 papers (Figure 2.2), and one paper was added after a search of the grey literature. There were 14601 papers remaining after removal of duplicates, and 288 remained after screening of abstracts and titles. The full text of these articles was subsequently screened: 75 were removed due to outcomes that did not relate to unmet need, 39 were removed due to study design (i.e. studies that did not attempt to calculate unmet need), 25 were removed as the methods were not described in enough detail, and 4 were removed as they were not in English. Data were then extracted from the remaining 145 papers. An overview of these papers can be found in Appendix 1.

Figure 2.2: PRISMA flow diagram outlining the screening process for the literature review exploring methods for calculating unmet need within SRH



2.3.1 Reproductive health

The majority of the studies found during this literature review (128 out of 145) were analyses of unmet need within reproductive health. Of these, 121 addressed unmet need for contraception, with three examining unmet need for cervical screening, two examining unmet need for abortion services, one evaluating unmet need for HPV vaccination and one evaluating reproductive morbidity (an outcome that was used as a proxy for unmet need for reproductive services).

Methods

The most commonly used method of data collection was the utilisation of questionnaire data. Nearly all of the studies collected information using questionnaires (124 out of 128) – the other four studies used reviews of medical records[72–75]. Almost all of the analyses (n=121) were cross-sectional, with the other seven being longitudinal. The high prevalence of certain methodologies was at least partially because a large proportion of the papers were secondary analyses of similar datasets. Thirty-seven of the 128 papers that focused on reproductive health used secondary analyses of data from the Demographic and Health Surveys (DHS) – a series of nationally representative household surveys that are conducted once every five years in 90 low and middle-income countries – while another 15 used data from other national health surveys with very similar methodology to the DHS.

Population

Most of the studies were analyses of trends among populations living in low or lower-middle income countries; these comprised 94 papers, compared to 33 that were based on populations from upper-middle and high income countries, and one paper that aimed to perform a global comparison. Over half of the papers (n = 68) drew conclusions at the national or multinational level, with the remainder (n = 60) concentrating on regional analyses.

Only four papers considered the contraceptive needs of men. Two cross-sectional questionnaire studies – one in West Africa [76] and one in India [77] – examined the concordance of male and female reporting of unmet need among established couples. The third, an analysis of the UK-based National Survey of Sexual Attitudes and Lifestyles (Natsal)[78], examined the disparity between actual and preferred source of contraceptives over the past year for heterosexual men and women. The fourth, an analysis of the US-based National Survey of Family Growth (NSFG)[79] quantified men who reported no contraceptive use during last sex despite wanting to delay or cease childbearing. The remaining 124 papers focused solely on unmet need among women, and of these, 50 analysed trends among married or in-union women of reproductive age (usually defined as 15-45 years), and another 39 assessed unmet need among women of reproductive age, regardless of marital status.

Definition of unmet need

Among the 121 analyses of unmet need for contraception, 113 used the same definition of unmet need: the Westoff and Bradley indicators that are used as part of the DHS. Although these indicators (created by Charles Westoff in 1978 and updated by Sarah Bradley in 2012) have undergone multiple revisions and are used differently in different populations, all utilisations rely on a similar framework[80]. Within this framework, women are considered to have unmet need if they report being fecund and sexually active, would like to stop or postpone childbearing, and are not currently using a modern contraceptive method.

Outside of these papers, definitions of unmet need were diverse (Table 2.1). Only one study - a household questionnaire study analysing unmet need for contraception among married women in Mali and Benin [81] - utilised a measure of perception. Women were defined as having perceived met need (compared to real met need) if they were using an ineffective method of contraception. Similarly, women who erroneously thought that they were not fertile were defined as having 'perceived no need' for contraception. Four other questionnaire-based studies defined unmet need for contraception as a discordance between desired method or source of contraceptives and the method that was currently being used [77,78,82,83]. Two papers used disparity between underserved groups and a defined baseline to define unmet need. A UK-based medical records review compared contraceptive use and abortion rates between women experiencing opioid addiction and the general population[74], and a Dutch medical records review analysed the disparity between contraceptive counselling and prescription among refugee women, other migrant women and native Dutch women. The outcomes used to measure unmet reproductive need outside of the need for contraception were equally varied. The three papers that analysed unmet need for cervical screening measured lack of uptake of routine cervical screening[73,84,85] and similarly, the analysis of unmet need for HPV vaccination measured women in the appropriate age group who had not received the vaccine during the Australian catch-up programme[86]. A cross-sectional analysis of unmet need for abortion services in Ghana defined any woman who reported an abortion outside of a facility as having unmet need[87]. Another paper analysed unmet need for abortion at the facility level, defining unmet need as the inability of a health service to provide appropriate abortion services to women seeking treatment[72]. An analysis of unmet need in India defined women as having an unmet need if they had suffered from a reproductive morbidity and either: sought care from a qualified medical practitioner but did not complete treatment, sought treatment from an unqualified practitioner, engaged in home remedy, or did not seek any treatment[88].

Table 2.1: Definitions of unmet need within reproductive health used between 2010 and 2021

Definition of unmet need	Number of papers
Women who report that they would like to stop or postpone childbearing, and are not currently using any contraception/a modern contraceptive method	113
Discordance between desired and actual method of contraception	4
Lack of uptake for cervical screening/HPV vaccination	4
Disparity between contraceptive use in baseline and underserved populations	2
Untreated reproductive morbidity/unsafe abortion	2
Inability of a service to provide abortion services	1
Real and perceived met and unmet need	1

2.3.2 Sexual health

Compared to those focusing on reproductive health, far fewer studies within this review analysed unmet need within sexual health. Of the twelve studies on this topic, seven examined general access to sexual health services, three examined access to sexual health services outside of healthcare settings, one examined chlamydia diagnosis and treatment and one examined HIV prevention services.

Methods

Methods of analysing unmet need within sexual health followed a similar pattern to analyses of unmet need within reproductive health: nine of the twelve papers used questionnaire data, and all twelve analyses were cross-sectional. The three papers that did not use questionnaire data used a range of methods – one paper used medical records review, one compared demand for sexual health services before and after an intervention, and the third used modelling techniques to estimate unmet need. Unlike the analyses of unmet need within reproductive health, no papers used secondary data analyses to estimate unmet need for sexual health. Instead, 11 papers used primary data collection, and one used routinely collected data from national datasets.

Population

Compared to analyses of unmet need within reproductive health, papers that examined unmet need within sexual health analysed a wider range of populations. Nine papers focused on high and upper-middle income populations, and four looked at populations from low and lower-middle income countries. The majority (n = 9) drew conclusions at the regional level, with three being national analyses and one being a multinational analysis. Only one used a nationally representative cohort[89], with the other papers concentrating on defined subgroups: patients attending GUM clinics, female sex workers (FSW), men who have sex with men (MSM), incarcerated women, adolescent psychiatric patients, foreign-born people living with HIV, men and women under the age of 25, university students, and women seeking care for gynaecological cancers.

Definition of unmet need

As the papers that focused on unmet need within sexual health involved analyses of a range of populations, the definitions of unmet need used within these analyses were equally diverse (Table 2.2). Four analyses – an analysis of Natsal data[89], a questionnaire study involving Cameroonian FSW and MSM[90], a questionnaire analysis of unmet need among Nepali female sex workers[91] and a questionnaire study involving Ugandan students[92] – defined unmet need as non-utilisation of sexual health services despite STI symptoms or history of unsafe sex. Another UK analysis measured unmet need by asking patients at seven genitourinary medicine (GUM) clinics whether they had been previously turned away[93], while two analyses of similar UK populations measured both provider delay (the gap between first contact with a health service and access to treatment) and patient delay (the gap between start of symptoms and access to treatment)[94,95].

The two analyses of access to sexual health services outside of the GUM setting (in an adolescent psychiatric unit[96] and a gynaecological oncology unit[97]) used lack of sexual health counselling within medical notes as an indicator of unmet need, and an analysis of foreign-born Europeans used a negative HIV test in the years prior to an HIV diagnosis as an indicator of unmet need for HIV prevention services[98]. A Canadian study used the change in demand for STI services after the implementation of a women's healthcare centre within a prison as an indicator of unmet need[99], and an Australian analysis of routinely collected data defined unmet need as the gap between estimated chlamydia incidence and actual chlamydia diagnoses[100].

Table 2.2: Definitions of unmet need within sexual health used between 2010 and 2021

Definition of unmet need	Number of papers
Non-utilisation of sexual health services despite STI symptoms or history of unsafe sex	4
Provider or patient delay in accessing services	3
Lack of sexual health counselling during contact with health services	2
Negative HIV test prior to subsequent HIV diagnosis	1
Post-intervention change in sexual health service use	1
Gap between modelled and actual chlamydia incidence	1

2.3.3 Sexual and reproductive health

Five of the studies found during this literature review examined unmet need for a combination of sexual and reproductive health services.

Methods

All five studies investigating unmet need in SRH used questionnaire data: four studies analysed primary data, and one was a secondary analysis of the NSFG. All five analyses were cross-sectional.

Population

All of the studies that examined unmet need in SRH were undertaken among populations from upper-middle or high income countries. Four of the five drew conclusions at the regional level. There was, once again, a focus on population subgroups, with only one study (a South African household study) collecting data from all eligible people over the age of 15. The other studies focused on a range of groups: women over the age of 50 living in Botswana, American women under the age of 25, Iranian men aged 20-60 and Chinese women aged 50-64.

Definition of unmet need

The definitions of unmet need for SRH care varied between papers (Table 2.3). The South African household questionnaire study combined a range of definitions: the previously outlined Westoff/Bradley definition of unmet need for contraception, all women who reported never having had a Pap smear, and men and women who reported symptoms consistent with STIs that had remained untreated[101]. A cross-sectional household questionnaire study conducted in China measured unmet need among older women by asking about untreated STI symptoms and intrauterine device (IUD) retention after the menopause[102]. The NSFG analysis compared SRH service use between women who reported similar sexual activity but differing levels of religious participation[103]. Two studies included measures of perceived need; a cross-sectional study of older women in Botswana reported declared need for SRH services[104], while a study of Iranian men differentiated between self-reported perceived needs (individual's desires for services on the basis of their own understanding), expressed needs (the felt needs which have turned to demands), and unmet needs (the felt needs which were not fulfilled)[105].

Table 2.3: Definitions of unmet need within SRH used between 2010 and 2021

Definition of unmet need	Number of papers
Non-utilisation of sexual health services despite STI symptoms or history of unsafe sex	2
Declared need for SRH services	2
Difference in SRH service use between two populations	1

2.4 Discussion

This literature review outlined 145 studies published over the past ten years that examined unmet need in a range of populations using a variety of methods. Despite this heterogeneity, a number of patterns emerged that gave insight into the way that unmet need within SRH is conceptualised, and revealed numerous gaps in the literature – some of which this thesis will aim to address.

2.4.1 Topic

Most of the studies within this literature review were on the subject of unmet need within reproductive health, and within these, the majority focused on unmet need for contraception. Some of the reasons for this are likely historical. Widespread discourse surrounding the concept of unmet need within SRH largely began in the 1960s within the 'family planning' space[106], meaning that the definitions and methodology used in this area have shaped the way that unmet need is conceptualised within both theoretical and implementation science, to the point where 'unmet need for family planning' is used as a key indicator by the United Nations without much discussion of unmet need in other areas of SRH[107]. Another reason for the prevalence of studies that measure unmet need for contraception is likely to be feasibility. Unmet need for contraception is easier to define and measure due to the presence of a defined endpoint (unplanned pregnancy) that has few other causes. Measuring unmet need in sexual health is far more challenging. Tying a specific need to an outcome within sexual health is made difficult by the lack of data from those who are not receiving care (identifying someone who has been infected with chlamydia but does not have access to treatment is much more challenging than identifying someone who is experiencing an unplanned pregnancy and does not have access to contraception, for example), and causal links between needs and outcomes are less clearly defined within sexual health. There remains, however, a large and under-treated global burden of morbidity within sexual health[108], indicating that the conceptualisation and measurement of unmet need within sexual health should also be a research priority.

2.4.2 Population

The majority of the studies within this review aimed to measure unmet need among women – this trend that was particularly apparent among studies that were on the topic of unmet need within reproductive health. Although the reproductive needs of women are often more immediately apparent, there was a paucity of discourse within the literature about the role of unmet need for contraception among men, something that is likely to become increasingly relevant as efforts to expand the range of male contraceptives continue[109]. A large proportion of studies concentrated on the needs of women of reproductive age (usually defined as 15-44 years), and among these papers, the majority limited analysis to women who were married or in a union similar to marriage. This was in part due to the high prevalence of data from household studies, particularly those carried out via the DHS, that often specifically ask questions regarding reproductive health to women within this age group. Most studies that limited analyses to married or in-union women explained this as a method of confirming that respondents are sexually active. This assumption, however, may be somewhat archaic – as marriage rates decrease[110] and the age of first marriage increase globally[111] while age of sexual debut remains relatively steady [112], the needs of an increasing number of women are not being measured. In addition, these methods overlook the needs of groups such as sex workers and those who have same-sex partners, who are likely to have unmet sexual and reproductive needs that lie outside of the bounds of a monogamous heterosexual relationship[113]. In addition, the focus on women of childbearing age leaves a gap in the understanding of the SRH needs of those who are younger than 15 years or older than 45 years, two groups who have been demonstrated to experience unique patterns of sexual and reproductive morbidity[114,115].

Among studies that analysed unmet need within reproductive health, the majority investigated populations in low and lower-middle income areas. This trend was reversed among papers that investigated sexual health and SRH, the majority of which analysed populations within upper-middle and high income countries. There appear to be two resultant gaps in the literature. There is little investigation of unmet need within reproductive health in high income countries, despite the inequalities in reproductive outcomes that have been identified in these settings[116,117]. Similarly, there is little investigation of unmet need within sexual health in low-income countries, despite the recognised lack of appropriate sexual health services in many such settings[118].

2.4.3 Methods

Questionnaire studies were particularly prevalent within this literature review and were used to examine unmet need within both reproductive and sexual health. Although such methods are often useful, the fact that questionnaires are the primary method used for the assessment of unmet need within SRH inherently leaves some areas of enquiry neglected. Questionnaires, particularly those centred around potentially sensitive topics, are susceptible to recall bias (in which one group is systematically more likely to remember certain events), selection bias (in which those with unmet need are systematically less likely to respond), and social desirability bias (in which respondents are systematically more likely to report behaviours or opinions that they think will be viewed favourably)[119]. In addition, the interpretation of a concept as complex as unmet need can be dependent on the perspective of the researcher. A 2017 mixed-methods study found that the perceptions of stakeholders did not at all mirror the responses of the local population when both were asked about the drivers of unmet need for contraception[120]. Despite this, very few studies directly asked respondents about their perception of need, or about demand.

A large proportion of the studies in this review were secondary analyses of large household studies, such as the NSFG, the District Level Household Surveys and the DHS. Only one of these studies — the National Survey of Sexual Attitudes and Lifestyles – was specifically designed to investigate SRH at the population level. The other surveys are focused on health more generally, and therefore may not be the most useful tools for investigating unmet need within SRH. In addition, the DHS is designed for monitoring and evaluation of national program goals[106], and the fact that it is one of the main sources of information regarding global unmet need within reproductive health means that there is little understanding within the published literature of the drivers of unmet need or the differences between regions or subgroups. In addition, the fact that these household surveys are conducted every five years means that most data surrounding unmet need within reproductive health is somewhat out of date by publication, particularly as much of the data collection is cross-sectional.

When compared to investigation of unmet need within reproductive health, investigations of unmet need within sexual health were much more likely to involve demographic subgroups, and much more likely to use primary data collection. There was still however, a paucity of longitudinal data, meaning that there is little investigation of trends within unmet need or causal factors. Overall, there is a requirement within the literature for mixed-methods data and dynamic methods of data collection that can be responsive to nuanced changes and help us to gain an understanding of the complexity of unmet need.

2.5 Impact on this thesis

This literature review revealed multiple gaps in our understanding of unmet need within SRH. The vast majority focus on unmet need for contraception among in-union women in low-income countries, leaving a significant need for investigation of unmet need within sexual health, unmet reproductive health need in high income settings and unmet need among women who are not of reproductive age. Additionally, there is a need for data collected using a range of methods that can reflect regional patterns and sub-group trends and begin to elicit the causes of unmet need. If these gaps are not addressed, we run the risk of repeatedly measuring unmet need within SRH but not having the tools to make significant change.

Although many of the gaps in the literature are beyond the scope of this thesis, this project does sit within an under investigated area of enquiry that has been highlighted by this literature review. The quantitative analyses within this project (discussed in Chapters 4-7) focused on unmet need within SRH in a high-income setting, an area which is under-investigated within the published literature. The qualitative analyses (discussed in Chapter 3) shed light on the perspectives of SRH professionals on the concept of unmet need, something which is also rarely discussed within the literature. Overall, the indicator of unmet need that I created as part of this project (discussed in Chapter 8) aims to facilitate a type of analysis that is largely missing from the literature surrounding unmet need within SRH: a dynamic, longitudinal investigation of unmet need that is able to support conclusions at the regional level.

3 INVESTIGATING THE CONCEPT OF UNMET NEED: A QUALITATIVE DELPHI EXERCISE

In this chapter I will discuss the methods and results of my qualitative Delphi exercise that examined the concept of unmet need within SRH through analyses of responses from a range of SRH professionals in England. This analysis was used to shape the creation of my indicator of unmet need within SRH.

3.1 Background

The field of health and healthcare comprises a range of complex concepts which are challenging to define and measure. The published literature is full of discourse surrounding the definition of concepts such as inequality[121], risk[122] and even health[123] itself. An understanding of these challenging concepts is not merely a thought experiment – being able to measure and define these aspects of health is key to effective policy design and implementation, and has a significant impact on the provision of healthcare.

As outlined in my background and literature review (Chapters 1 and 2), unmet need is one of these many 'hard-to-define' concepts within health. My literature review found that the definition of unmet need within SRH has varied considerably within the published literature over the past ten years. The most prevalent definition of unmet need within SRH is the Westoff and Bradley definition of unmet need for contraception that is used within the DHS[124]. Although this definition is particularly effective as an outcome measure (and lends itself to forms of measurement that are feasible at a population level), it is not as useful as a springboard for changes in policy, nor is it useful at the individual level. The overarching aim of this project was the creation of an indicator of unmet need within SRH that has direct utility for those who are working to address unmet need within England. This Delphi exercise was therefore designed to collect the opinions of people working within SRH, to gain a better understanding of how SRH professionals conceptualise unmet need, in order to help create an indicator of unmet need that is fit for purpose.

3.2 Methods

3.2.1 Theoretical framework

The literature review in the previous chapter was built around the idea of positivism – the concept of an objective truth that can be observed via scientific endeavour[125]. I chose to concentrate on quantitative literature within that review, as my indicator of unmet need was going to be created using quantitative data, and it was therefore important for me to understand the quantitative measurements of unmet need within SRH that had been used previously. This decision positioned unmet need as an objective concept that could be measured and observed. In contrast, this Delphi exercise was designed to take a more holistic look at the concept of unmet need, framing it instead as something subjective, a construct that is created by those who are experiencing and interacting with it. As a result, the theoretical framework that I used for my Delphi exercise was the theory of social constructionism.

Social constructionism is the idea that certain aspects of reality are perceived as a result of consensus, rather than direct observation[126]. Although the idea of a constructed reality stretches far back over hundreds of years through a number of cultures and disciplines, the introduction of the field of social constructionism to the study of the social sciences is usually attributed to sociologists Peter L. Berger and Thomas Luckmann[127]. In their 1966 book '*The Social Construction of Reality: A Treatise in the Sociology of Knowledge*', they argued that society is largely formed through a range of collective experiences, and that much of the knowledge that is often thought of as being objective is shaped by socialisation[128]. Numerous social, scientific and political theorists built on this work to create our current understanding of social constructionism[129].

An example of a widely recognised social construct is money; it is commonly accepted that money does not have objective value, and that it is instead a construct that relies (at least in part) on societal recognition[130]. There are many constructs that have a much more controversial history within the sciences – many academics previously chafed against constructionist approaches to concepts such as ethnicity and gender, for example, preferring a more positivist framework for approaching these topics[127]. As a result of my literature review, I gained a constructionist understanding of need (whether met or otherwise). Much of the discourse surrounding SRH-related unmet need within the published literature makes certain necessary assumptions about rights and health, about the duty of providers, policy makers and government entities, and about the importance of personal wishes surrounding fertility and sexuality. All of these assumptions vary by medical setting and cultural context, and all of these assumptions shape the overall definition of unmet need within SRH used by the authors. It therefore became clear, while reading the literature on this topic, that the creation of a new way of measuring unmet need would require analyses from social constructivist perspective, allowing me to explore the frameworks that people working in SRH in England use to construct their understanding of unmet need.

3.2.2 The Delphi Method

Overview

The Delphi method was developed in 1959 as a way of facilitating group communication and establishing consensus. The RAND corporation, an American policy think tank, created the Delphi method in response to the challenges posed by traditional methods of quantitative forecasting (such as mathematical modelling or trend extrapolation)[131]. Although techniques such as modelling have significant utility, the RAND foundation found that they were less appropriate in response to policy questions that had not yet been fully investigated within the published literature[132]. The first Delphi exercise involved multiple rounds in which experts were asked to give, anonymously, their professional opinion on the likelihood and frequency of military attacks during the Cold War. This group of experts was then asked to give anonymous feedback on each other's responses, which were changed accordingly until the group had reached consensus[133]. Since then, the Delphi method has been developed and modified in order to facilitate its use within a range of fields. Although there are numerous versions of the Delphi method, most Delphi exercises fall into one of four categories[134].

- **Classic Delphi**

  The aim of the classic Delphi exercise is to establish consensus between a group of experts. It is conducted using a multiple round format. In the first round, experts give anonymous qualitative responses to open ended questions. In the second round, experts give anonymous quantitative responses (usually in the Likert format) to statements created from the first-round responses. In subsequent rounds, participants are given feedback on the responses from previous rounds and asked if they would like to change their answers. Rounds continue until responses have reached a predetermined marker of consensus (e.g. 70% of respondents have responded 'Agree' or 'Strongly agree' to all statements).

- **Decision Delphi**

  The decision Delphi uses similar methods to the classic Delphi, with the aim of making a decision as a group (rather than establishing a consensus on a specific topic).

- **Policy Delphi**

  The aim of the policy Delphi, rather than establishing consensus, is to outline the breadth of opinion among experts on a certain topic. A policy Delphi has multiple rounds, however each round has the potential to be qualitative or quantitative, and the exercise is terminated at a point determined by the moderator.

- **Real-time Delphi**

  Rather than using rounds, the real time Delphi comprises a single questionnaire, in which respondents can see the aggregated results (quantitative and/or qualitative) of all other responses as soon as they have answered a question, and have the opportunity to revise their answers in real time.

Qualitative Delphi methods

The Delphi method that I used within this project was the qualitative Delphi method – an entirely qualitative version of the policy Delphi. The framework that was used for this exercise was developed by sociologist Dr Dia Sekayi in 2017, in recognition of the fact that although the Delphi method lends itself to qualitative work, the majority of published Delphi frameworks use quantitative methods[135]. The Sekayi method comprises three rounds. In the first round, respondents are given open ended prompts and asked to respond narratively. These responses are then coded and used to create a series of statements. In the second round, participants are presented with the statements created using the responses from the first round, and are once again asked to respond to these statements narratively. Responses from the second round are coded, and the analyses from this coding exercise are used to amend the statements used in round 2 and add new statements if necessary. In the third round, respondents are presented with the updated statements, and are asked to indicate their level of agreement with each statement using a Likert scale. Although the Sekayi method predominantly uses qualitative methods, the final results from this form of Delphi exercise are both qualitative and quantitative, as this method involves a quantitative measure of consensus in the final round. When performing qualitative Delphi exercises where a measure of consensus is not appropriate, researchers often omit the third round of this Delphi structure, and instead perform two rounds that are entirely qualitative[136–138].

Benefits of the Delphi method

There were many aspects of the Delphi method that made it particularly appropriate for this project.

- **Collection of responses over a period of time**

  The Delphi method allows participants to take part at their own convenience, something that would not be possible using a method such as a focus group. For my research, this facilitated the participation of professionals from across the UK, and also allowed a virtual method of qualitative data collection, something that was particularly useful in the wake of the Covid-19 pandemic.

- **Creating discourse in the absence of published literature**

  As outlined in my literature review, despite the term 'unmet need' being a key part of the discourse within SRH policy and practice, there are several gaps in the literature surrounding unmet need within SRH in high income countries. The Delphi technique has been identified as a method that lends itself to topics where the balance of experiential knowledge far outweighs the knowledge present within the published literature[139], making it an appropriate method for further exploration of the concept of unmet need within SRH.

- **Anonymity of participants**

  One of the benefits of the Delphi technique is the anonymity that it affords participants, particularly compared to many qualitative methods that involve face to face discussion. As unmet need is a poorly defined concept, a discussion surrounding unmet need within SRH is one that would be particularly susceptible to being dominated by more prominent voices in a setting such as a focus group.

- **Geographic spread of participants**

  When compared to other qualitative methods, such as focus groups, the Delphi method allows for a much wider geographical spread, with regards to sampling of participants. As I wanted to include the perspectives of professionals working across England, a Delphi exercise was a particularly effective way to facilitate discussion among people who were separated by distance.

Challenges of the Delphi method

The Delphi method has received significant criticism since its inception, particularly with regards to its utility for academic research. The predominant concern within the published literature is the rigour of the Delphi method, with critics often focusing on three main challenges:

- **Choice of participants**

  Purposive sampling is often used to recruit experts for participation in Delphi exercises, and the definition of 'expert' is not systematic (and often poorly justified). This type of sampling can lead to bias, by allowing those who are conducting the exercise to select participants who they know are likely to give a certain answer[140].

- **Participant retention**

  Unlike questionnaire methods that only have one arm, the Delphi technique is particularly susceptible to loss of participants across the various rounds, which can have an impact on the validity of the results[141]. In at least one example, a published Delphi exercise was only able to complete a single round, due to significant attrition of participants between rounds one and two[142].

- **Validity of responses**

  Responses to each round in a Delphi exercise are usually anonymous, which can reduce the likelihood that participants will give considered answers[143]. In addition, the fact that many Delphi methods are not completed until consensus is reached, there is a risk that respondents may be tempted (consciously or subconsciously) to endorse the existing consensus, whether or not this aligns with their own opinions, in order to complete the exercise[144].

Many of the criticisms of the Delphi method come from a positivist perspective, largely because it was originally designed using a positivist framework. When used as an alternative to methods such as statistical modelling, or when attempting to use the Delphi as a forecasting method, it is important to challenge the reliability of the technique[145,146]. Over time, however, it has been recognised that one of the predominant strengths of the Delphi method is its more constructionist aspects – in particular, the iterative nature of the technique which allows the process of collaboration between participants to shape the concepts that are being discussed. Many experts therefore feel that the positivist concerns surrounding the Delphi method are not necessarily appropriate[143,147]. As with many qualitative studies, my Delphi exercise was not created within a positivist framework. I did, however, design the study aiming to address some of the challenges posed by the use of the Delphi method:

- **Choice of participants:**

Unlike many Delphi studies, this exercise did not pool expertise in order to answer a specific question, and instead aimed to characterise the breadth of opinion on a topic in order to better define a concept. As such, I recruited participants who had a certain type of relevant experience. This relevant experience was more easily defined than a more nebulous concept such as 'expertise', and having a firm definition meant that I was unable to manipulate the choice of respondents.

In addition, the sampling method (which I will discuss in more detail later in this chapter) meant that I only found out the identity of participants once they had agreed to take part in the study, which reduced the potential for bias with regards to participant selection.

- **Participant retention:**

All participants were fully informed of the purpose of this piece of work and the commitment required from the outset, to ensure that they understood the importance of full participation. In addition, participants were kept apprised of the progress of the research, to ensure that they felt directly involved.

- **Validity of responses:**

This exercise was not aiming to generate consensus (or give a specific answer to a given question), which meant that, although respondents shaped the statements that were provided in the second round, the only person who was aware of the strength of consensus as the Delphi was taking place was me, as the person doing the analysis. In addition, I aimed to increase the quality of responses by using entirely qualitative methodology. Providing text-based answers to prompts, rather than giving a quantitative ranking to a series of statements (as would have occurred in a traditional Delphi study), required more investment in the process and consideration of the concepts being discussed.

3.2.3 Research process

Recruitment of participants

The criteria for participation in this Delphi exercise was that participants should have experience working within sexual and/or reproductive health within England. Although the wider project focuses on women aged 16-24, I did not include experience with this group as a criterion for participation, as I intended the Delphi exercise to investigate unmet need within SRH more broadly. There is no particular framework for calculating the recommended sample size for a Delphi exercise; while a group of experts that is too small may not present a large enough breadth of opinion[147], a group of experts that is too large may lead to higher probability of participants dropping out between rounds[148]. A typical Delphi panel comprises 15 participants[149]. I aimed to recruit 15-25 participants, to allow for ease of analysis while preserving breath of opinion and allowing for loss of participants between the first and second rounds.

Sampling of participants for this Delphi exercise was carried out using a purposive snowball method. Participants were initially recruited from among the membership of the British Association for Sexual Health and HIV (BASHH), an organisation that promotes and facilitates the study and practice of diagnosing, treating and managing STIs, HIV and other sexual health problems, from a perspective of clinical medicine, public health and academia[150]. An email was sent to the entire membership of BASHH, explaining the nature of the Delphi exercise and asking interested participants to sign up. A participant information sheet was attached (Appendix 2). The email also asked participants to circulate information about the Delphi to their networks. Multiple participants were recruited via networks external to BASHH.

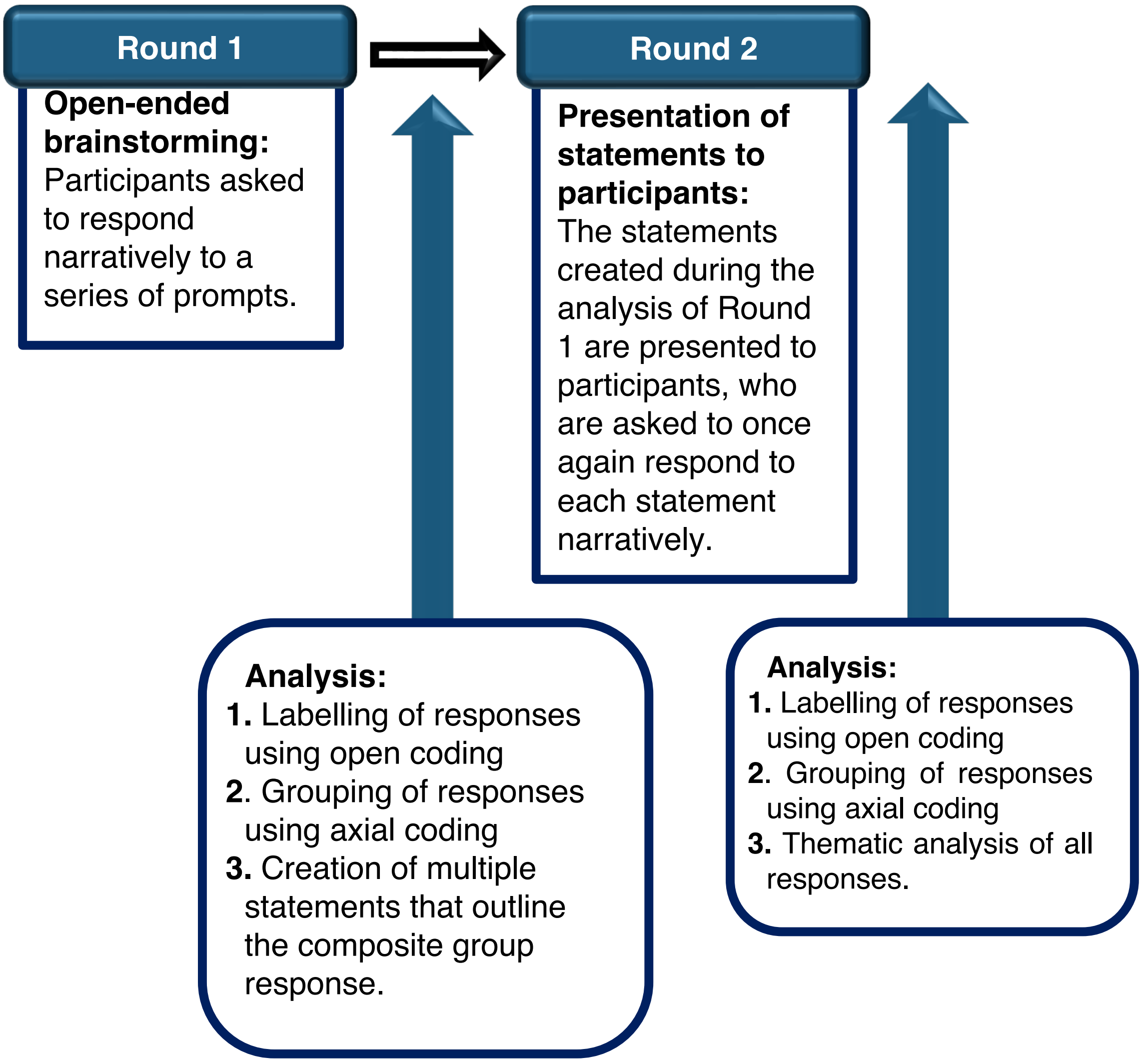
To preserve anonymity and limit bias, those who were interested were able to sign up to participate in the study by submitting their email address via a webform created using Opinio. I was unable to access any further personal details about the participants.

Delphi rounds

The framework for the rounds of this Delphi exercise are outlined in Figure 3.1.

Although I originally intended to follow the Sekayi method for a qualitative Delphi exercise, I was aware from the inception of this study that the iterative nature of the exercise meant that the results of one round may change the methodology of the next. During analysis of the results from the second round of the Delphi exercise, I found that the responses were so detailed and diverse that they would be unlikely to be enhanced by a third round that established levels of consensus, and that a third round would likely reduce the utility of the exercise with regards to exploring the concept of unmet need within SRH. I therefore decided to omit the third round, and instead completed the exercise as a two round, entirely qualitative, Delphi exercise.

Figure 3.1: Structure of rounds and analyses used within the qualitative Delphi exercise



Round 1

The questionnaire for the first round of the Delphi exercise comprised six questions (Appendix 2): three multiple choice questions about the respondent's professional background, and three open-ended prompts exploring the concept of unmet need within SRH.

Although Opinio software was used to collect the email addresses of participants, the first-round questionnaire was administered via Surveymonkey®, due to ease of use. To ensure security, twenty individual URLs (one for each participant) were created for the survey, and I emailed each link to a single participant, allowing me to track responses and send reminders without adding contact details of participants to Surveymonkey®. To ensure anonymity, responses were neither connected to URLs or IP addresses, ensuring that, although I was able to see who had completed the questionnaire, I was not able to see which individual had given which responses. Respondents were given two weeks to complete the questionnaire, and one reminder was sent ten days after the first link.

The first-round questionnaire was piloted using a panel comprising five public health professionals and one lay person.

Round 2

The questionnaire for the second round of the Delphi exercise comprised 18 statements (Appendix 2) that had been created through analysis of the responses to the prompts in Round 1. This questionnaire was also administered via Surveymonkey®, using a similar method to that used for the Round 1 questionnaire.

Analysis

Thematic analyses of the responses from each round were carried out using NVivo software. I used the Braun and Clarke framework for thematic analysis[151], which outlines the following steps:

1. Familiarisation with the data
2. Coding

The responses to each round of the Delphi exercise were coded twice; I began with open coding, which involved the assignment of descriptive labels to short sections of each response, and then proceeded to axial coding, which involved combining and refining the open codes in an analytical way.

3. Searching for themes

When searching for themes, I used an inductive approach, allowing themes to arise from the data, rather than starting with a pre-determined coding frame.

4. Reviewing themes

5. Defining and naming themes

Ethical approval

This study was approved by the UCL Research Ethics Committee (Approval ID Number: 19369/002).

3.3 Results

3.3.1 Study participants

Twenty participants originally volunteered to participate in this Delphi exercise. One participant withdrew (due to lack of expertise) prior to the commencement of Round 1. Sixteen participants responded to the Round 1 questionnaire, and twelve of those participants responded to the Round 2 questionnaire.

Respondents were asked to indicate their professional background via three multiple choice questions asked at the beginning of the Round 1 questionnaire. To preserve anonymity, there were no narrative answers to the demographic questions. Participants were able to select multiple answers (as many had professional responsibilities that meant that more than one answer would be appropriate).

The majority of respondents (n = 10) indicated that they worked in public health within sexual health (e.g. commissioning or policy making), while four respondents worked in public health within reproductive health. Five respondents worked in patient-facing roles, three within sexual health, and two within reproductive health. Two participants were academics within reproductive health (Table 3.1).

Respondents worked across England; the majority (n = 8) worked in the South West of England, and/or indicated that populations that they worked with were based there (n = 9). Each other region of England was represented by between 1 and 4 respondents (Table 3.1), with one participant working within the UK but outside of England (and two indicating that they worked with populations within the UK but outside of England), and one participant working outside of the UK (with populations outside of the UK).

Table 3.1: Responses to demographic questions within the Delphi exercise

Which area of sexual and reproductive health do you work in?	
	Number of responses
Patient-facing sexual health	3
Patient-facing reproductive health	2
Public health within sexual health	10
Public health within reproductive health	4
Academic within sexual health	0
Academic within reproductive health	2
Which region of England do you work in?	
	Number of responses
North East England	1
North West England	2
Yorkshire	1
East Midlands	3
West Midlands	2
East of England	2
South East England	3
South West England	8
London	2
Outside England, but within the UK	1
Outside of the UK	1
In which region are the patients, service users or populations that you work with predominantly based?	
	Number of responses
North East England	2
North West England	3
Yorkshire	2
East Midlands	4
West Midlands	1
East of England	3
South East England	4
South West England	9
London	3
Outside England, but within the UK	2
Outside of the UK	1

3.3.2 Round 1

For the Round 1 questionnaire, participants were asked to respond to three prompts:

- Within the context of sexual and reproductive health (SRH), how would you describe the concept of unmet need?
- Is an understanding of unmet need useful within SRH, and if so, how?
- How would you measure unmet need within sexual and reproductive health?

The responses to these prompts fell into three thematic areas: service users, service provision and vulnerable populations.

Service users

Barriers to service use

Many respondents felt that there were geographical barriers to service access that were contributing to unmet need within SRH. Respondents referenced both transport issues and the differences between service availability in rural and urban areas as drivers of unmet need among certain populations.

"Rurality also limits access due to transport infrastructure."
- **Respondent 10**

"…we work in a largely rural county with some urban areas, and access and reach to services has presented some challenges."
- **Respondent 11**

"The inability to access SRH information and services due to… geographical/transport boundaries"
- **Respondent 12**

Two respondents also mentioned people who were seeking services only to be turned away – both felt that this was also a marker of unmet need.

"Clinic turnaways / delays in accessing care [are markers of unmet need]."
- **Respondent 2**

" *[Investigating unmet need]* would require adequately funded research to identify patients who try to contact SH services and are turned away."
- **Respondent 4**

Measuring unmet need

Analysis of data on service use was the most commonly suggested method for the measurement of unmet need within SRH. Several respondents suggested comparing known levels of service use with modelled estimates of expected service use.

"…measure the number of people who are accessing the available services and compare observed vs expected numbers"
- **Respondent 1**

"The proportion of the population likely to be at risk of a poor outcome minus the sub proportion of that population group that are represented in services."
- **Respondent 9**

"I think there would first have to be a denominator of the potentially sexually active population and/or specific target group. Then perhaps the number of attendances of individuals at services, monitored against this denominator."
- **Respondent 11**

Many respondents felt that discussions with both current and would-be service users should also be part of any investigation into unmet need within SRH. There were several suggestions that qualitative or mixed methods would give further insight into the needs of populations.

"*[Unmet need can be measured using]* pt surveys."

- **Respondent 2**

"*[We need to understand]* the reasons why they are not accessing the service"

- **Respondent 5**

"Engaging with and interviewing people to hear their thoughts, particularly those thought to be most in need of services"

- **Respondent 12**

A particular challenge that was identified was the difficulty in separating need from demand – both in terms of identifying those who would benefit from services but are not aware that they have unmet needs, and in terms of those who have chosen not to access services.

"There are also those individuals who are happy and confident to manage their own sexual health (less so with contraception perhaps), independently of sexual health professionals"

- **Respondent 11**

"…*[those who are]* unwilling to access services…"

- **Respondent 14**

"…this is NOT just looking at expressed demand…"

- **Respondent 15**

Service provision

Impact of unmet need on service design

The links between an understanding of unmet need and improved service design were a common theme among respondents. Most felt that measurement of unmet need was a key aspect of ensuring that services are fit for purpose.

"Without an understanding of what is unmet we cannot create targeted interventions that will address needs in the real world."

- **Respondent 13**

"…to ensure we don't become complacent and just keep providing the same SRH service"

- **Respondent 14**

"It is fundamental to know our unmet need (and to be updated with this regularly) to understand priorities…this might be re quality improvements, partnerships needed, operational or strategic, and resources required"

- **Respondent 15**

Unmet need among health professionals

Several respondents felt that those working in service provision had unmet needs of their own, which contributed to unmet need among service users.

"There are other concerns now in terms of the wider system and pressures that increase because of backlogs in the system."

- **Respondent 14**

"This may be for the professionals unmet need, the residents unmet need, and even the commissioners *[sic]* needs."

- **Respondent 15**

There were also several references to the challenges posed by the Covid-19 pandemic and its aftermath, with one respondent expressing the opinion that these challenges may have provided a learning experience with regards to understanding and addressing unmet need within SRH.

"The intra-Covid period and post-Covid period has provided us with a great deal of additional insight. The sudden requirement to move away from face to face to a more online offer was not without challenge. However, it has highlighted processes that we were working on pre-Covid, in terms of creating a much stronger user self-management platform."

- **Respondent 11**

Vulnerable populations

The majority of respondents felt that there were certain populations who were more likely to have unmet needs within SRH. There was particular concern among respondents that significant structural barriers were preventing these groups from accessing services.

"…access need*[s]* to be improved for marginalised group *[sic]*"

- **Respondent 1**

"…particularly vulnerable groups and individuals may find that services delivered locally remain inaccessible to them."

- **Respondent 10**

"…inability to access SRH information and services due to structural barriers including experiencing racism/discrimination… unmet need can also result from individual-level factors such as not speaking or reading English well, being a newly arrived migrant who doesn't understand how to access services, or not recognising that you need services in the first place."

- **Respondent 12**

There was also recognition of the fact that those most likely to experience unmet need within SRH are often particularly difficult to identify, which has an impact on assessing needs within these populations.

"…informs social marketing approaches to reach those who are harder to find e.g. exclusion groups."
- **Respondent 11**

"But those whose sexual health needs are unmet do not tend to shout about it so remain unheard."
- **Respondent 14**

3.3.3 Round 2

The thematic analysis of the response to the prompts within the Round 1 questionnaire led to the creation of 19 statements, which were divided into four themes. These themes and statements are outlined in Table 3.2.

To avoid bias, I ensured that the statements were almost all paraphrased or clarified versions of statements that had been made by respondents during Round 1. In addition, neutral phrasing that did not indicate the direction of consensus was used as much as possible (for example, *'Healthcare funding has had an impact on unmet need within sexual and reproductive health'* and '*Rural and urban areas have different patterns of unmet need within sexual and reproductive health*'.)

The responses to these prompts fell into three thematic areas: challenges in service provision, challenges in measuring unmet need, and stakeholder involvement.

Table 3.2: Statements presented to respondents in Round 2 of the Delphi exercise

Theme	Statements
Causes of unmet need	The Covid-19 pandemic had an impact on unmet need within sexual and reproductive health. Unmet need within sexual and reproductive healthcare is most prevalent among specific groups within the population. Rural and urban areas have different patterns of unmet need within sexual and reproductive health. Healthcare funding has had an impact on unmet need within sexual and reproductive health. Service providers and service users both have unmet needs within sexual and reproductive health. The Covid-19 pandemic had an impact on unmet need within sexual and reproductive health.
Markers of unmet need	If one population group has worse health outcomes than another population group, this is a marker of unmet need. Certain health outcomes are a marker of upstream unmet need.
Methods for measuring unmet need	Measuring unmet need is challenging. Questionnaires are a useful tool for measuring unmet need within sexual and reproductive health Service evaluation is a useful tool for measuring unmet need within sexual and reproductive health. Qualitative interviews are a useful tool for measuring unmet need within sexual and reproductive health. The Covid-19 pandemic created new insights into unmet need within sexual and reproductive health. Unmet need for sexual and reproductive health can be measured by looking at factors outside of healthcare. Finding and measuring an 'at-risk' section of the population is part of measuring unmet need within sexual and reproductive health. Monitoring outcomes within SRH is a useful tool for measuring unmet need within sexual and reproductive health. Monitoring service use is a useful tool for measuring unmet need within sexual and reproductive health.
Mitigating unmet need	Resolving unmet need has the potential to improve sexual and reproductive outcomes. Measuring unmet need could lead to a change in service design. Measuring unmet need could have an impact on service commissioning

Challenges in service provision

Many respondents felt that it was difficult to deliver services that appropriately addressed unmet need within SRH. There were several references to decreasing service availability, which respondents felt was leading to increasing levels of unmet need.

"We still do not have drop in availability at our local sexual health service which is an important route for chaotic patients who may not be able to assert themselves on the phone and often miss pre-booked appointments."
- **Respondent 2**

In terms of potential unmet need, there is still a challenge in restoring capacity to pre-pandemic levels, and that is without factoring in what unmet need may have already existed.
- **Respondent 9**

Several responses discussed the potential unmet need for services that are targeted towards specific population groups.

"Young people may have seen worse impacts due to lockdowns, through the associated contextual factors such as reduction in open clinics, stigma/real or perceived inability to raise with parents/carers for transport for an appointment in any clinics remaining open (which may be further away than in non-Covid times)"
- **Respondent 4**

"What is more challenging however is targeting specific services (e.g. HIV) to BAME groups (and women), in areas of the country where the BAME demographic is less that 1% of the population."
- **Respondent 9**

Two main drivers of reduced service availability were mentioned by several respondents: funding, and lack of staffing.

"It is cheaper and more convenient for a service to rely on patients self care and accessing digital solutions"

- **Respondent 2**

"Services may be challenged to recruit to clinically qualified staff"

- **Respondent 3**

"Primary care options for contraception have diminished due to lack of funding to cover GP costs"

- **Respondent 7**

"In terms of potential unmet need, there is still a challenge in restoring capacity to pre-pandemic levels, and that is without factoring in what unmet need may have already existed."

- **Respondent 9**

Challenges in measuring unmet need

The difficulties inherent in measuring unmet need were mentioned by multiple respondents during the first round, and many respondents took the opportunity to expand upon this in Round 2. One challenge that was mentioned by several participants was the issue of the inverse care law. The inverse care law, first described by general practitioner Julian Tudor Hart in 1971, is the observation that those who are most in need of health services are least likely to access them[152]. Many respondents noted that there is therefore an inherent challenge when measuring unmet need using service use data, as those captured within these datasets are least likely to have unmet needs.

“Often those with high levels of unmet need we *[sic]* have poor data on their health outcomes”

- **Respondent 2**

“…service use is reflective of met or expressed need”

- **Respondent 4**

“…evaluation has to be carefully designed as you are trying to gather information from people who aren't accessing the service. It is much easier to pull information together on people who do successfully access care”

- **Respondent 5**

“I think this will help to determine unmet amongst service users currently engaged in services, but won't address need amongst those not in services”

- **Respondent 9**

Several respondents also discussed the challenges posed by the fact that there isn’t a recognised definition of unmet need, something which can also hinder attempts to measure and address unmet need.

“National publications on use of services…have previously included "key points" such as intimating need is highest in those under 25 years (for example), when in fact this may simply be a result of Sexual Health policy specifically targeting the under 25 cohort for some time”

- **Respondent 4**

“…unmet need is a phrase becoming over-used and can lead to service responses being generalised when they should be targeted”

- **Respondent 7**

“Is unmet need for example more about the inability to access appropriate services in a particular location or does unmet need arise from the individual not being aware that it is a good thing to be proactive about SRH & wellbeing?”

- **Respondent 9**

Stakeholder involvement

As with Round 1, there was significant discourse surrounding the needs of specific communities. Many respondents went into more detail than they had previously, outlining the specific communities that they felt needed to be centred as part of the discourse surrounding unmet need.

"Lesbians are invisible across most systems. We do better with MSM"

- **Respondent 4**

"This is not necessarily a cumulative situation either, e.g. *[mental health]* + *[drug and alcohol use]* + risky *[sexual health]* behaviours does not= 3x worsening of outcomes. It can be a much more exponential and potentially devastating set of circumstances that create a worsening situation for individuals, families and communities if left unrecognised."

- **Respondent 7**

"Many people who are not able to access services will be unlikely to want to fill out a questionnaire or may be unable to e.g. English as a second language, fear of authority, lack of trust in reason for questionnaire"

- **Respondent 11**

Many respondents also emphasised the necessity of community involvement when investigating unmet need within SRH.

"Involving those affected is one key part of this"

- **Respondent 1**

"…participants should be recruited via charities and trusted organisations in local communities."

- **Respondent 11**

There was also discourse surrounding the need for involvement of stakeholders outside of SRH and even outside of healthcare; many respondents felt that understanding the needs of more vulnerable communities required a holistic approach.

"…collaborative work *[is]* needed to draw information from local public health indicators and related data sources that are held outside the sexual health clinic"

- **Respondent 5**

"Assessment processes need to recognise this potential syndemic relationship within a person's life and use this to inform treatment pathways that can respond effectively to multiple co-existing problems."

- **Respondent 7**

"…local infrastructure and transport could have a negative impact on access to services for example"

- **Respondent 11**

3.4 Discussion

3.4.1 Key findings

The responses to both rounds of this Delphi exercise gave significant insight into the areas that respondents prioritised when considering unmet need within SRH. Although the formalised consensus round was removed from this Delphi exercise (in part due to the breadth of responses in the first two rounds, which I felt would be lost if respondents were asked to form a consensus), there was significant agreement among the narrative responses to prompts and statements.

All participants felt that an understanding of unmet need is an important part of SRH service design and provision, and believed that there were multiple barriers to accurate measurement of unmet need within a population. A common theme was the concern that certain vulnerable populations were particularly likely to experience unmet need within SRH, and that these populations were often underrepresented within the datasets that are used to assess unmet need. There was also discussion surrounding the structural determinants of unmet need, both from the perspective of gaps in service provision, and the perspective of factors outside of healthcare that have an impact on service access. Many respondents felt that a full understanding of these structural factors would only come from involvement of relevant stakeholders in the process of investigating unmet need, and that qualitative methods may also have a role to play in gaining a more holistic understanding of unmet need within SRH.

3.4.2 Strengths and limitations

Limitations

One limitation of this exercise (a limitation that it shares with most qualitative research) is the lack of broad generalisability. The sampling method and the relatively small sample size means that the opinions expressed by participants may not be shared by the wider population of health professionals, and certainly cannot be used to draw conclusions about the concerns of SRH professionals outside of the UK. There is, however, a school of thought among qualitative experts that rejects a need for widespread generalisability within qualitative research, seeking instead the potential for findings to give more depth to our understanding of a specific research context[153]. The range of respondents (both with regards to geographical location and professional background) and their ability to provide narrative responses served to illuminate the topic of unmet need within SRH in a way that would be difficult to achieve using other methods.

Another limitation was the attrition of participants before the commencement of the Delphi and between Rounds 1 and 2. This is, unfortunately, a challenge that is commonly faced when undertaking a Delphi exercise. I did, however, aim to mitigate this through recruitment of 20 original participants, which meant that the number of participants who responded to the second questionnaire was still large enough to attain a breadth of opinion.

There was also potential for me, as the researcher, to influence the responses of the participants, particularly through the creation of the prompts for the Round 1 questionnaire and the statements for the Round 2 questionnaire. In an attempt to avoid this, I aimed to keep the Round 1 prompts as open as possible, and I used direct quotes from respondents as the starting point for all of the statements in the Round 2 questionnaire.

Strengths

This Delphi exercise allowed for a unique type of discussion, involving SRH professionals from across the country. The questionnaire methodology meant that participants could complete their responses in their own time, which removed the challenge of finding a suitable time for a discussion that would have been posed by other qualitative methods such as focus groups. The two round structure gave respondents the opportunity to contemplate the topic during the time between the two questionnaires, which resulted in more nuanced and considered responses in the second round. The iterative nature of the Delphi exercise also gave me the opportunity to evaluate the methods after each round, leading to refinement of the methodology during the Delphi exercise to better suit the research aims.

3.4.3 Implications for the development of an indicator of unmet need within SRH

The purpose of this Delphi exercise was to outline the perspectives of professionals working within SRH on the topic of unmet need. As the concept of unmet need is both complex and poorly defined, I believed that it was inappropriate for me to create an indicator of unmet need that was purely based on my perceptions, definitions, and beliefs. The responses to the prompts and statements within the exercise had an exceptional level of depth and breadth, and therefore helped me to outline priorities for the creation of the indicator that took into account the concerns of a range of SRH professionals. These priorities were:

- **Health inequalities**

  The responses to the Delphi exercise made it clear that SRH professionals consider health inequalities and the needs of at-risk populations to be a key aspect of unmet need within SRH. Health inequalities were therefore a primary consideration when I was creating my indicator of unmet need.

- **Service provision and design**

  Most respondents felt that service delivery was having a direct impact on unmet need within SRH, and believed that an understanding of unmet need had the potential to directly improve service design. I therefore created an indicator that was designed to be used by professionals who have a direct impact on service design (such as commissioners).

- **Qualitative and mixed methods**

  Several responses outlined the benefit of qualitative and mixed methods as part of any enquiry into unmet need within SRH. Many respondents believed that stakeholder and community involvement was key to understanding unmet need, particularly among vulnerable and hard-to reach communities. I therefore created an indicator that had the potential to be used alongside other methods of measuring and understanding unmet need, including qualitative and participatory methods.

4 QUANTITATIVE METHODS

In this chapter, I will describe the datasets that I used to carry out the quantitative analyses within this thesis. This chapter will give an overview of the data collection and management process, and will also outline the methods that were used for the analyses of patterns of inequality within SRH (Chapters 5-7).

4.1 Datasets

As outlined in Chapter 1, women under the age of 25 are particularly vulnerable to both sexual and reproductive morbidity. The quantitative analyses within this thesis aim to examine the outcomes within SRH that particularly impact women aged 16-24, to identify parameters that are likely to have utility as part of a composite indicator of unmet need. Three datasets were used for these analyses: a dataset outlining gonorrhoea testing and diagnoses between 2012 and 2019 (created using data collected by PHE), a dataset outlining chlamydia testing and diagnoses between 2012 and 2019 (created using data collected by PHE) and a dataset outlining terminations of pregnancy between 2012 and 2019 (created using data collected by DHSC). The details of these datasets are described in Section 4.1.1.

4.1.1 Data sources

GUMCAD

The Genitourinary Medicine Clinic Activity Dataset (GUMCAD) was introduced by the Department of Health in 2009 as a tool to aid national STI surveillance[154]. GUMCAD comprises data that have been collected from mandatory quarterly reports submitted to UKHSA by every level two and three sexual health service in England[155]. Self-sampling results, both from physical sexual health services that offer an online self-sampling service, and sexual health services that are entirely online, are included within GUMCAD reports, as long as the tests were provided by a service that was commissioned by the NHS or a local authority[156]. Each report outlines the details of every episode of care that occurred during the previous quarter. An episode of care is defined as follows:

"A Sexual Health and HIV Episode is an episode of care, under one Health Care Provider, comprising of one or more attendances, where a consultant has overall responsibility for the patient who attends for screening, diagnosis and management of sexually transmissible infections and related conditions. The patient may be seen by other care professionals, during the same care episode, who are working on behalf of the consultant. The episode starts on the date the patient first sees or is in contact with a care professional in respect of a referral request from either a Health Care Provider or a self-referral. The episode ends when either the patient is formally discharged or has not had face-to-face contact with the service for at least 6 weeks.'[157]

There have been multiple versions of GUMCAD since its inception – the data within this project was collected using GUMCAD version 2. The variables within the GUMCAD v2 dataset are outlined in Table 4.1.

Table 4.1: Variables within the GUMCAD v2 dataset

Patient demographics			
Clinic ID	Clinic specific ID number	Alphanumeric	
Patient ID	Unique patient ID number	Alphanumeric	
Gender	Patient's stated gender	Categorical	Male Female Not specified Not stated
Age	Completed years between the DOB and consultation date	Continuous	
Sexual orientation	Sexual orientation	Categorical	Heterosexual Gay/Lesbian Bisexual Not known
Ethnicity	Patient's stated ethnicity	Categorical	White – British White – Irish White - Any other background Mixed - White and Black Caribbean Mixed - White and Black African Mixed - White and Asian Mixed - Any other mixed background Asian/Asian British - Indian Asian/Asian British - Pakistani Asian/Asian British – Bangladeshi Asian/Asian British - Any other Asian background Black/Black British - Caribbean Black/Black British - African Black/Black British - Any other black background Other ethnic groups - Chinese Other ethnic groups - Any other ethnic group Not stated
Country of birth	Country of birth	Categorical	
LSOA	LSOA of residence - derived from postcode	Categorical	ONS LSOA Geographic Area Code Not applicable (outside UK) Not Known
Episode activity			
KC60/READ	Code outlining diagnosis given and/or procedure performed during attendance	Alphanumeric	
Consultation date	Date of attendance	Continuous	
First attendance	Whether this is a first or follow-up appointment	Categorical	First attendance face to face Follow-up attendance face to face First telephone or telemedicine consultation Follow up telephone or telemedicine consultation

CTAD

The Chlamydia Testing Activity Dataset (CTAD) was established in 2012 as a tool for monitoring chlamydia diagnoses in England. CTAD comprises data from all chlamydia tests carried out using nucleic acid amplification testing (NAAT) in England – including testing performed in GUM clinics, general practices, online and as part of the NCSP – which is reported quarterly to UKHSA[158]. As CTAD extracts contain data that have been reported by GUM clinics, there is significant overlap between the chlamydia data held within GUMCAD and the data reported within CTAD. The chlamydia data used within this project have therefore been de-duplicated prior to analysis.

The variables within the CTAD dataset are outlined in Table 4.2.

Table 4.2: Variables within the CTAD dataset

Variable	Description	Data type	Subcategories
Lab ID	Laboratory ID number	Alphanumeric	
Test ID	Test specific ID number	Alphanumeric	
Patient ID	Unique patient ID number	Alphanumeric	
NHS Number	Unique patient ID assigned by NHS	Alphanumeric	
NHS Number status	Status of NHS number	Categorical	Number present and verified Number present but not traced Trace required Trace attempted – no match/multiple match Trace needs to be resolved Trace in progress Number not present and trace not required
Gender	Patient's stated gender	Categorical	Male Female Intermediate
DOB	Birth date	Continuous	
Postcode	Postcode of patient	Alphanumeric	
Postcode GP	Postcode of patient's GP	Alphanumeric	
Postcode testing service	Postcode of testing service	Alphanumeric	
Venue code	Code of testing site	Alphanumeric	
Specimen type	Specimen type	Categorical	Urine Genital Rectal Pharyngeal

Variable	Description	Data type	Subcategories
Testing service type	Type of testing service	Categorical	Community Sexual Health Services Genitourinary Medicine Services Pharmacy premises TOP services Other
NCSP Clinic code	NCSP Clinic code	Alphanumeric	
Ethnicity	Patient's stated ethnicity	Categorical	**White** British Irish Any other White background **Mixed** White/Black Caribbean White/Black African White/Asian Any other Mixed background **Asian or Asian British** Indian Pakistani Bangladeshi Any other Asian background **Black or Black British** Caribbean African Any other Black background **Other** Chinese Any other ethnic group Not stated
Specimen date	Sample collection date	Continuous	
Receipt date	Date specimen received by lab	Continuous	
Date specimen authorised	Date specimen authorised by lab	Continuous	
Chlamydia test result	Result of test	Categorical	Positive Negative Equivocal Insufficient specimen Inhibitory result Other

Abortion dataset

Within England and Wales, it is mandatory to report all terminations of pregnancy to DHSC. These reports are carried out by the doctors authorising the abortion, through submission of the HSA4 form. A dataset that contains information on these reported terminations is used to monitor abortion trends, and this dataset is available for analysis with approval from the Chief Medical Officer. The information reported within the HSA4 can be seen in Table 4.3.

Table 4.3: Data collected using the HSA4 form

Variable	Data type	Subcategories
NHS number	Alphanumeric	
Date of birth	Continuous	
Postcode	Alphanumeric	
Ethnicity	Categorical	**White** British Irish Any other White background **Mixed** White/Black Caribbean White/Black African White/Asian Any other Mixed background **Asian or Asian British** Indian Pakistani Bangladeshi Any other Asian background **Black or Black British** Caribbean African Any other Black background **Other** Chinese Any other ethnic group Not stated
Marital status	Categorical	Single (no partner) Single (with partner) Single (partner status unknown) Married Widowed Civil partnership Divorced Separated Not known
Parity	Categorical	Number of previous pregnancies resulting in: - Livebirths and stillbirths over 24 weeks - Spontaneous miscarriages and ectopic pregnancies - Legal terminations
Hospital clinic code	Alphanumeric	
Funding method	Categorical	NHS funded abortion Privately funded abortion

Variable	Data type	Subcategories
Date of feticide (if applicable)	Continuous	
Method of feticide (if applicable)	Alphanumeric	
Surgical terminations:		
Date of surgical termination	Continuous	
Date of admission	Continuous	
Date of discharge	Continuous	
Method used	Categorical	Vacuum aspiration Dilatation and evacuation Other surgical
Medical terminations:		
Date of treatment with antiprogesterone	Continuous	
Date of treatment with prostaglandin	Continuous	
Date termination confirmed	Continuous	
Gestation	Continuous	
Grounds for termination	Categorical	A – G (fully outlined in chapter 1)
Selective termination		
Original number of fetuses	Continuous	
Number of fetuses reduced to	Continuous	
Chlamydia screening	Categorical	Yes No
Complications	Categorical	None Uterine perforation Sepsis Other
Death of woman (if applicable)		
Date of death	Continuous	

4.1.2 Timescale

The timescale for these analyses was chosen to maximise comparability between years. Each data extract used within this project begins in January 2012, as the structure of the datasets used by PHE prior to this would have made direct comparison of outcomes difficult[155]. Each data extract ends in December 2019, as the Covid-19 pandemic had a significant impact on recorded sexual and reproductive outcomes, making comparisons between data collected from 2020 onwards and data collected prior to 2020 particularly complex[159].

4.1.3 Gender

This analysis was limited to women who were assigned female at birth who also identified as female at the time of testing or termination of pregnancy. It is well documented that trans people have different experiences of SRH when compared to cisgender people, both with regards to outcomes[160] and access to services[161]. As a result, it is likely that patterns of unmet need within the trans population differ from those seen in the cisgender population. I therefore decided that the inclusion of this much smaller population in a larger analysis may mask important trends and have therefore limited the analysis to cisgender women.

4.1.4 Age

The datasets used in this project used data collected from women aged between 16 and 24 during the study period. Although the age range of both the GUMCAD and CTAD datasets begins at thirteen years of age, I have decided to omit data pertaining to teenagers aged 13 to 15. The number of tests and diagnoses within this age group is small (a few hundred per year)[162], and omission is unlikely to affect the overall conclusions of the project. As with gender, however, there is a potential for the patterns of inequality within this much smaller population to be eclipsed by their inclusion in a larger analysis. Given that the SRH needs of adolescents under the age of 16 have been found to differ significantly from those of older people[163,164], I therefore decided that it would be appropriate to exclude this age group.

4.1.5 Ethnicity

The social and political construction of race and ethnicity can often make analysis of race-related health disparities challenging – in particular, the potentially subjective nature of racial identity can complicate the creation of race-based categories[165]. While most data collected on ethnicity is created by asking people to select the racial or ethnic group with which they identify, this may lead to challenges when attempting to assess inequalities that arise from the categories in which people are placed by others[166]. In addition, ethnic groups that have small populations within a dataset are often grouped together for ease of analysis, something which can mask the differences in outcomes between different ethnic groups (for example, when people of Chinese, Bangladeshi, Indian and Pakistani origin are grouped together as Asian)[167].

Both the dataset that I received from PHE and the dataset that I received from DHSC contained data that were broken down by ethnicity. Although both organisations usually publish their data using collapsed ethnicity groupings, I requested that both datasets for this analysis report ethnicity as it was originally recorded (using relatively small subgroups) to allow for the creation of ethnicity classifications that would be most appropriate in this context. The categories used to define ethnicity within the data extracts that I used in these analyses are outlined in Table 4.4.

Table 4.4: Ethnicity categories used by PHE and DHSC

Asian	Bangladeshi
	Chinese
	Indian
	Pakistani
	Any other Asian background
Black	Black African
	Black Caribbean
	Any other Black background
Mixed	White and Asian
	White and Black African
	White and Black Caribbean
	Any other mixed background
White	White British
	White Irish
	Any other white background
Any other ethnic group	
Not known/stated	

To fully investigate the disparities between outcomes in different ethnic groups, I maintained the distinction between subgroups in the Asian, Black and White Ethnic categories within this quantitative analysis. Given the previously established differences in sexual and reproductive outcomes when comparing, for example, Black African and Black Caribbean populations, or Asian

Bangladeshi, Asian Indian and Asian Pakistani populations[168,169], it seemed likely that merging these subgroups (into larger Black or Asian categories) may mask patterns of inequality that would be important to this analysis. With regards to 'mixed' categories of ethnicity, I incorporated mixed ethnicities into the relevant minoritised subgroup (White and Asian was incorporated into Asian other, while both White and Black Caribbean and White and Black African were incorporated into Black other). This was an attempt to address the complexity of mixed identity – although people of mixed ethnicity have often been found to have different health outcomes to their monoracial counterparts[170,171], the divergent experiences of people of different mixed ethnicities[172] made combining data into a single 'Mixed' subgroup inappropriate for this analysis.

4.2 Data management

4.2.1 Data cleaning and manipulation

Gonorrhoea and chlamydia datasets

For the analysis of trends in gonorrhoea and chlamydia diagnosis and testing among women aged 16-24, I was provided with a data extract that was created by the GUMCAD and CTAD teams at PHE specifically for this analysis. The raw data extract was generated as an Excel spreadsheet. For the purposes of data cleaning, this spreadsheet was imported into STATA 17 (StataCorp. 2021. Stata Statistical Software: Release 17. College Station, TX: StataCorp LLC.). This initial STATA dataset contained 1,051,427 rows of data. Each row contained seven variables: year, geographical area, ethnicity, number of gonorrhoea tests, number of positive gonorrhoea tests, number of chlamydia tests and number of positive chlamydia tests. An example of the layout of the original dataset is shown in Figure 4.1 (populated with dummy data). All data provided were year-end data. I subsequently divided this dataset into two separate datasets; one containing gonorrhoea testing and diagnosis, and one containing chlamydia testing and diagnosis.

Figure 4.1 Example layout – GUMCAD and CTAD dataset

	year	lsoa_code	nameoflsoa	ethnic_category_name	test_chlam~a	test_gonor~a	diag_chlam~a	diag_gonor~a
1	2012	E01000001	City of London 001A	Any other ethnic group	1	1	0	0
2	2012	E01000001	City of London 001A	Any other white background	1	1	0	0
3	2012	E01000001	City of London 001A	British	1	1	0	0
4	2012	E01000001	City of London 001A	Indian	1	1	0	0

On first examination of the PHE dataset, a small discrepancy was discovered. For both gonorrhoea and chlamydia, there were rows of data in which the number of positive tests was higher than the number of tests. This was observed within 753 rows of data within the gonorrhoea dataset, and 53 rows of data within the chlamydia dataset. There are two explanations for this discrepancy.

First, the deduplication system within GUMCAD means that there can be a time lag between reporting of tests and diagnoses. Within the dataset being used for this analysis, this time lag could introduce two types of discrepancy. One consequence of the time lag is the potential for test and diagnosis to be reported in different years, (e.g. a person who had a test in Dec 2017 and received their diagnosis in Jan 2018 may have had their test and diagnosis included in different rows of the dataset). Another potential consequence is that an individual who had a birthday between the date of their test and the date of their diagnosis (i.e. someone who was tested at age 15, and diagnosed at age 16) could have their test omitted from the dataset.

Second, there are reporting codes available in GUMCAD for ‘Chlamydia diagnosed elsewhere’ and ‘Gonorrhoea diagnosed elsewhere’. The nature of the

CTAD reporting process (collection of all testing data, including tests performed outside of the GUM setting), allows for ‘Chlamydia diagnosed elsewhere’ diagnoses to be removed from GUMCAD, as these will most likely be included in the CTAD data. However, this is not the case for gonorrhoea, and these diagnoses are counted within GUMCAD. The tests linked to these diagnoses, however, are not counted within GUMCAD, as they are essentially confirmatory. In cases where the initial gonorrhoea test was performed outside of a Level 2 or Level 3 GUM setting (e.g. when a person is tested at a pharmacy, receives a positive result, and then has this result confirmed within a sexual health clinic) this could lead to reporting of more diagnoses than tests.

After a period of consideration, I decided to omit these rows of data from the analysis – they represented a small portion of the dataset, and I had no reason to believe that this discrepancy would be systematic.

Abortion dataset

For the analysis of trends in abortion among women aged 16-24, I was provided with a data extract that was created by the abortion statistics team at DHSC specifically for this analysis. The raw data extract was provided as an Excel spreadsheet. For the purposes of data cleaning, this spreadsheet was imported into STATA 17. This initial STATA dataset contained 331,954 rows of data. Each row contained five variables: year, geographical area, ethnicity, number of abortions, and number of repeat abortions. An example of the layout of the original dataset is shown in Figure 4.2 (populated with dummy data).

Figure 4.2: Example layout – Abortion dataset

	year	ethnicity	lsoacode2011	abortions	repeat_abortions
1	2015	White - British	E01000001	1	0
2	2017	White - British	E01000001	1	0
3	2019	White - Any other white background	E01000002	1	0
4	2017	Chinese or other ethnic - Chinese	E01000002	1	0

Additional datasets

To aid in the analysis of demographic trends, two other datasets were also created:

Geography and population

Output areas

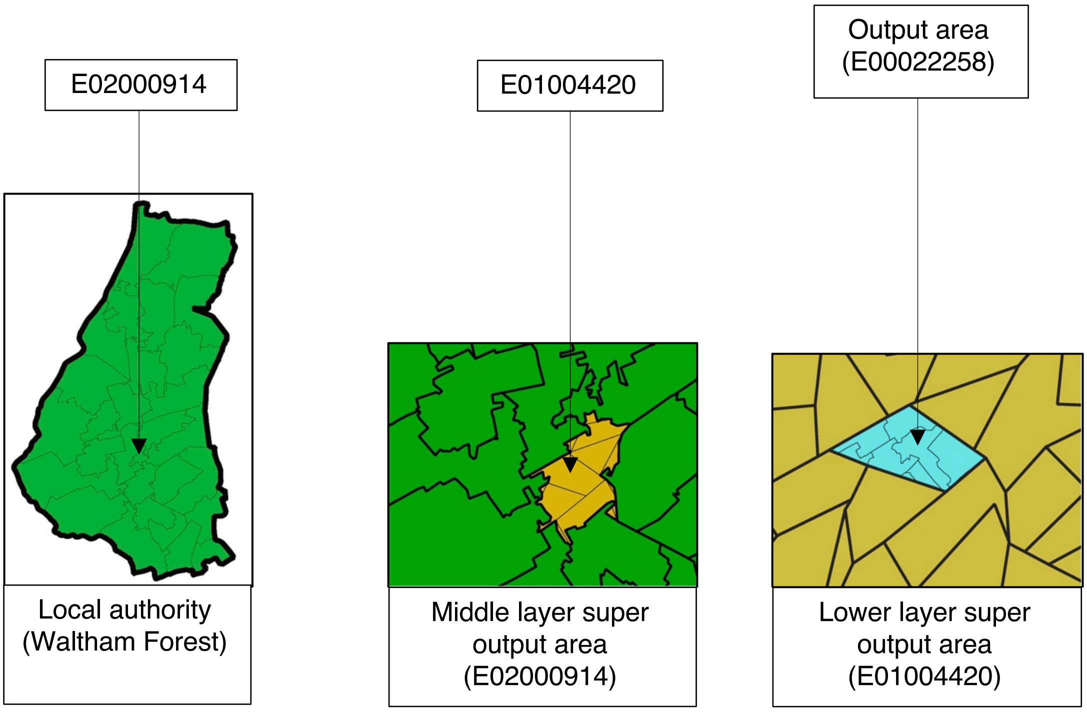
Output areas (OA) are units that were created for the purposes of statistical geography. They were introduced as a tool for reporting and analysing the results of the 1981 Scottish census, and a modified version of the OA was then adopted for use in all UK countries during the 2001 census[173]. OAs are designed to be directly comparable (unlike geographical units such as wards or boroughs, which often have very different population sizes and display significant internal social heterogeneity). They have similar population sizes, are created to fit within existing LA boundaries, and are independently assessed to ensure a level of social homogeneity with regards to characteristics such as dwelling type, tenure of household and rurality[174]. As OAs are determined by population, their size and shape can vary dramatically depending on population density.

OAs are the smallest geographical unit at which census data are published (mean population of around 300 residents), however the size of these units make them challenging to use when trying to maintain anonymity. Groups of OAs are therefore combined into Super Output Areas (SOAs) for most analyses. Lower layer Super Output Areas (LSOAs) comprise an aggregated group of neighbouring OAs and have a mean population of around 1500 residents. Middle layer Super Output areas (MSOAs) comprise an aggregated group of LSOAs, and have a mean population of around 7200 residents (Figure 4.3). Although

Upper Layer Super Output Areas (which would be a combination of MSOAs) exist conceptually, they have not been created for England due to lack of demand[175].

Each geographical unit is named according to the Government Statistical Service Coding and Naming Policy. This policy gives each unit a nine-character code; the first character is a letter that indicates the country (E = England, S = Scotland, W = Wales, N = Northern Ireland), the next two digits indicate the area type (OA, LSOA or MSOA), and the remaining 6 digits are a unique identifier.

Figure 4.3: Relationship between local authorities, MSOAs, LSOAs and OAs



Population estimates

Estimates of the resident population of England and Wales are produced annually by the ONS. The most robust estimates are created using the census data that are collected every ten years and made publicly available a year later (for the purposes of this analysis, the most recent census was carried out in 2011, as the datasets used were compiled between 2012 and 2019). These estimates are then updated every year using a cohort component method, a demographic technique that uses a range of data sources to calculate the major components of population change: natural change (births, deaths and ageing), migration, and special populations who may not be captured by other metrics of migration (such as incarcerated people and those in the armed forces)[176]. These population estimates are published broken down by LSOA, gender and age (year).

The geography and population dataset outlined each LSOA in England, the LA that it belongs to, and the estimated size of the population of women between the ages 16 and 24 who lived in the LSOA each year between 2012 and 2019. To create this dataset, two datasets (a geography dataset and a population dataset) were linked using LSOA codes. The geography dataset was published by the ONS Open Geography portal and outlined LSOA codes, LSOA names and corresponding LAs[177]. I created the population dataset (outlining the annual population of women between the ages of 16 and 24 in each LSOA between 2012 and 2019) using population estimates provided by the ONS[178]. These annual estimates are published broken down by gender and year of age, meaning that I was able to calculate the population of interest by adding together the number of women aged from 16-24 in each LSOA. Ethnicity was not added to this dataset, as ONS does not publish ethnicity data at the LSOA level.

Index of Multiple Deprivation

The English Index of Multiple Deprivation (IMD) is an area-level measure that is used to calculate the relative deprivation of each LSOA in England. The aim of this index is to conceptualise deprivation in a way that goes beyond financial poverty. As a result, IMD consists of seven domains of deprivation, each of which is measured separately[179](Figure 4.4). Data on each of these domains is then collated into a raw score for each LSOA. These scores are created by measuring pre-determined indicators which relate to the proportion of the population within that LSOA who are experiencing a certain marker of deprivation. For example, if 24% of the population within an LSOA are claiming Jobseekers Allowance, this would result in a score of 0.24 for this indicator within the Employment Deprivation domain of the IMD. The scores for each indicator are then added together to create an overall score for each domain, and the scores for the seven domains are then weighted (as indicated in Figure 4.4) and added together to create a total IMD score for each LSOA. These scores are then ranked in order, with the most deprived LSOA (the area with the highest score) being ranked as 1. In the published data, these rankings are also presented as deciles.

The current iteration of the IMD (specifically examining deprivation at the small area level) was originally developed in 2004, and was subsequently updated in 2007, 2010, 2015 and 2019. As the aim of the IMD is to create a snapshot of relative deprivation during a certain period of time, the methodology used to create IMD prioritises accuracy and internal consistency over the facility to compare rankings over time[180]. For example, the introduction and ongoing rollout of Universal Credit led to its inclusion as an indicator of employment deprivation during the 2019 update (even though the overarching methodology has not changed since 2004). As a result, the scores that an individual LSOA has received in previous calculations of IMD cannot be directly compared to its current score; an increase in ranking between 2015 and 2019 does not necessarily indicate that an LSOA has become less deprived. In addition, the datasets used to calculate IMD were not all produced at the same time, as the scores were based on the most recently available data (which varied between indicators). As a result, the data used to calculate the 2015 IMD was largely collected between 2012 and 2013, and the data used to calculate the 2019 IMD was largely collected between 2015 and 2017.

To create the IMD dataset, two datasets were linked using LSOA codes: the previously described geography dataset that is published by the ONS Open Geography portal[177], and a deprivation dataset that I created using the IMD rankings and deciles that were published by the Ministry of Housing, Communities and Local Government in 2015 and 2019[181,182]. Due to the aforementioned timescales for data collection, the 2015 IMD scores were used for any analyses that used outcomes that had occurred between 2012 and 2015, and the 2019 IMD scores were used for any analyses that used outcomes that had occurred between 2016 and 2019.

Figure 4.4: Domains and indicators for the Indices of Deprivation 2019[1]

Income deprivation
(22.5% of total score)

- Percentage of population living in families who receive Income Support
- Percentage of population living in families who receive income-based Jobseeker's Allowance families
- Percentage of population living in families who receive income-based Employment and Support Allowance
- Percentage of population living in families who receive Pension Credit (Guarantee)
- Percentage of population living in families who receive Working Tax Credit/Child Tax Credit families, and who earn below 60% median income (if not already counted)
- Percentage of population who are asylum seekers in receipt of subsistence support, accommodation support, or both
- Percentage of population living in families who receive Universal Credit where no adult is in the 'Working – no requirements' conditionality regime

Employment deprivation
(22.5% of total score)

- Percentage of population who are claimants of Jobseeker's Allowance
- Percentage of population who are claimants of Employment and Support Allowance
- Percentage of population who are claimants of Incapacity Benefit
- Percentage of population who are claimants of severe disablement allowance
- Percentage of population who are claimants of Carer's Allowance, aged 18-59/64
- Percentage of population who are claimants of Universal Credit in the 'Searching for work' and 'No work requirements' conditionality groups

Health Deprivation and Disability
(13.5% of total score)

- Years of potential life lost
- Comparative illness and disability ratio
- Rate of acute morbidity
- Rate of mood and anxiety disorders

Education, Skills and Training Deprivation
(13.5% of total score)

- Key Stage 2 attainment: scaled scores
- Key Stage 4 attainment: average capped points score
- Secondary school absence rate
- Percentage of eligible population staying on in education post 16
- Percentage of population continuing to higher education
- Percentage of adults with no or low qualifications, aged 25-59/64
- Percentage of adults who cannot speak English/speak English well, aged 25-59/64

Barriers to Housing and Services
(9.3% of total score)

- Road distance to a:
  - Post office
  - Primary school
  - General store/supermarket
  - GP surgery
- Household overcrowding rate
- Homelessness rate
- Housing affordability

Crime
(9.3% of total score)

- Recorded crime rates for:
  - Violence
  - Burglary
  - Theft
  - Criminal damage

Living Environment Deprivation
(9.3% of total score)

- Proportion of houses without central heating
- Proportion of houses in poor condition
- Air quality
- Rate of road traffic accidents

[1]Adapted from the ONS English Indices of Deprivation 2019 – Technical Report

4.3 Analysis

4.3.1 Ethical approval

The quantitative analyses within this project were approved by the GUMCAD and CTAD teams at PHE, the abortion data team at DHSC and the UCL Research Ethics Committee (Approval ID Number: 19369/002).

4.3.2 Variables

Eight outcome variables were used within the gonorrhoea, chlamydia and abortion analyses. These variables are outlined in Table 4.5.

Test positivity

Within this project, I have used test positivity (number of diagnoses per 1000 tests) as a marker of diagnosis rate, rather than diagnoses per 1000 population (the measure that is more commonly used to report diagnosis rates)[159].

The first reason for this choice was to facilitate comparisons between the deprivation and ethnicity analyses. Within this thesis, there is no measure of tests, diagnoses or abortions per 1000 population in the descriptive analyses related to ethnicity, and I was unable to perform regression analyses examining the relationship between ethnicity and gonorrhoea testing rates, chlamydia testing rates or abortion rates. This was largely due to the absence of reliable information on the breakdown of the population by ethnicity. Although the ONS publishes mid-year population estimates that are broken down by age and sex at the LSOA level, they do not provide these estimates after further stratification by ethnicity (largely due to concerns about confidentiality). As a result, I was unable to create a dataset that outlined the number of women between the ages of 16 and 24 within each ethnic group, and could not, therefore, estimate the rate of various outcomes per 1000 population stratified by ethnicity. Using the number of tests within a population as the denominator for the measure for diagnosis rates allowed me to perform comparable analyses using deprivation and ethnicity as independent variables.

The second reason for this choice was to reduce the impact of testing rate as a confounder within the analyses of diagnosis rates. When comparing tests per capita and diagnoses per capita among different populations, it is plausible that diagnosis rates would be higher among populations that have higher testing rates, purely because people in the population with the higher testing rate are more likely to get tested. Using test positivity as a measure of diagnosis rate attenuates the effect of this confounder, as the number of tests in the population is used as the denominator. Instead, differences in test positivity between populations are more likely to imply differences in the underlying prevalence within in each group[183], which gives this measure more utility within an investigation of unmet need.

4.3.3 Quantitative analyses

Three large quantitative analyses were carried out to investigate patterns of unmet need in SRH: one examining patterns of gonorrhoea testing and diagnosis, one examining patterns of chlamydia testing and diagnosis, and one examining patterns of abortion. All three analyses had a similar structure, allowing me to combine the results to create an indicator of unmet need.

Descriptive analyses of each dataset were carried out, to investigate the patterns of certain outcomes and the trends that are apparent over time.

Regression analyses were then performed on each of the variables of interest, to assess the correlation between each dependent variable (as outlined above) and two independent variables: deprivation and ethnicity.

There are multiple methods that have been used within epidemiological analyses to assess the relationship between demographic factors and health outcomes. These can largely be divided into three categories[184]:

- Regression-based analysis assessing the correlation between the entire range of a demographic factor (described using an interval scale) and outcomes across a population (e.g. Slope Index of Inequality, Relative Index of Inequality)
- Direct comparison of outcomes between two groups, or direct comparison between a single group and the rest of the population (e.g. rate ratio, population attributable risk)
- Use of specific coefficients that estimate the level of outcome inequality between groups (Pseudo-Gini coefficient, Concentration Index)

For this project, I have used the second method to assess both the relationship between sexual and reproductive outcomes and deprivation, and the relationship between sexual and reproductive outcomes and ethnicity.

Poisson regression

All of the outcomes within this project – number of gonorrhoea tests and diagnoses, number of chlamydia tests and diagnoses, number of abortions and number of repeat abortions – are reported using count data. As a result, these outcomes are most likely to follow a Poisson distribution, and a Poisson regression analysis was therefore judged as the most appropriate method of analysing the relationship between the outcome variables and the demographic variables (ethnicity and deprivation). These analyses were carried out after the data was tested for independence and over- or under-dispersion.

Although the reported outcomes within the datasets are counts, the outcomes of interest for the investigation of unmet need are rates (e.g. tests per capita, diagnosis rates). Each Poisson regression therefore incorporated an offset variable – a variable that allows count data to be weighted by the size of a population when modelling rates within a regression analysis. The offset variables for each regression analysis are outlined in Table 4.6. The result of each Poisson regression was then reported as a rate ratio.

Table 4.5: Outcome variables used to conduct the quantitative analyses within this project

Variable	Description
Number of tests	The number of gonorrhoea or chlamydia tests performed on women aged 16 – 24 within an LSOA in a certain year
Number of diagnoses	The number of gonorrhoea or chlamydia tests performed on women aged 16 – 24 within an LSOA in a certain year that received a positive result
Tests per 1000 population	$\left(\frac{a}{n}\right) \times 1000$ a = The number of tests performed on women aged 16 – 24 within an LSOA in a certain year n = number of women aged 16 — 24 living in the LSOA during that year
Diagnoses per 1000 tests	$\left(\frac{b}{a}\right) \times 1000$ a = The number of tests performed on women aged 16 – 24 within an LSOA in a certain year b = The number of tests performed on women aged 16 – 24 within an LSOA in a certain year that received a positive result
Number of abortions	The number of abortions undergone by women aged 16 – 24 within an LSOA in a certain year
Number of repeat abortions	The number of abortions undergone by women aged 16 – 24 who had already undergone at least one abortion within an LSOA in a certain year
Abortions per 1000 population	$\left(\frac{x}{n}\right) \times 1000$ x = The number of abortions undergone by women aged 16 – 24 within an LSOA in a certain year n = number of women aged 16 to 24 living in the LSOA during that year
Repeat abortions per 1000 abortions	$\left(\frac{y}{x}\right) \times 1000$ x = The number of abortions undergone by women aged 16 – 24 within an LSOA in a certain year y = The number of abortions undergone by women aged 16 – 24 who had already undergone at least one abortion within an LSOA in a certain year

Table 4.6: Outline of Poisson regression analyses within this project

Analysis	Predictor variables	Outcome variable	Offset variable
Gonorrhoea tests per 1000 population	IMD decile	Number of gonorrhoea tests	(Population of women aged 16 – 24 within IMD decile/1000)
Gonorrhoea positivity rate	IMD decile or Ethnicity	Number of gonorrhoea diagnoses	Number of gonorrhoea tests
Chlamydia tests per 1000 population	IMD decile	Number of chlamydia tests	(Population of women aged 16 – 24 within IMD decile/1000)
Chlamydia positivity rate	IMD decile or Ethnicity	Number of chlamydia diagnoses	Number of chlamydia tests
Abortions per 1000 population	IMD decile	Number of abortions	(Population of women aged 16 – 24 within IMD decile/1000)
Repeat abortions	IMD decile or Ethnicity	Number of repeat abortions	Number of abortions

Ethnicity

To examine the effect of ethnicity on the outcomes of interest, the ratio between the rate of the outcomes of interest in the White British population and that of other ethnic groups was calculated at the LSOA level for each year. White British was chosen as the reference category for ethnicity for two reasons. The primary reason involved the underlying context: an important consideration when assessing health inequalities. Previously investigated patterns of SRH and ethnicity indicate that being from a racially minoritised community (i.e. reporting ethnicity as something other than White British) is associated with an increased likelihood of poorer outcomes[168,185]. As such, it seems most appropriate to investigate inequalities in this area by comparing the outcomes in minoritised communities with those seen in White British people. In addition, the increased impact of chance on the estimates relating to the smaller sub-populations within this dataset meant that a more stable baseline was likely to be achieved by using the group with the largest population (White British) as the reference population.

Multivariable analyses

A key part of understanding the patterns of each outcome and their correlation with ethnicity and deprivation is an understanding of how these factors interact. At a population level, the effects of ethnicity and deprivation are likely to overlap, as racially minoritised people are more likely to live in more deprived areas (and deprived areas are, therefore, more likely to have higher proportions of minoritised people within their populations)[186]. As an example, within this analysis, if it observed that Black Caribbean women and women who live in more deprived areas are more likely to be diagnosed with chlamydia, it is important to understand how much of the relationship between chlamydia diagnosis and ethnicity is a result of the fact that Black Caribbean women are more likely to live in deprived areas. Similarly, it is important to understand how much of the relationship between chlamydia diagnosis and deprivation is a result of the fact that deprived areas have greater racially minoritised populations.

To help address these questions, three multivariable analyses were performed, as outlined in Table 4.7. Once again, I was unable to perform multivariable analyses that required a measure of population size, due to the lack of national population data stratified by ethnicity (as outlined earlier in this chapter).

Table 4.7: Variables used for multivariable Poisson regression analyses

Multivariable analysis	Predictor variables	Outcome variable	Offset variable
Gonorrhoea positivity rate	IMD decile and Ethnicity	Number of gonorrhoea diagnoses	Number of gonorrhoea tests
Chlamydia positivity rate	IMD decile and Ethnicity	Number of chlamydia diagnoses	Number of chlamydia tests
Repeat abortions	IMD decile and Ethnicity	Number of repeat abortions	Number of abortions

4.4 Summary

Three datasets were used to carry out nine quantitative analyses within this project, to identify parameters that would be combined to create an indicator of unmet need within SRH. These analyses were:

GUMCAD gonorrhoea dataset:

- A Poisson regression analysis of the relationship between gonorrhoea testing and deprivation among women aged 16-24 in England.
- A Poisson regression analysis of the relationship between gonorrhoea diagnosis and deprivation among women aged 16-24 in England.
- A Poisson regression analysis of the relationship between gonorrhoea testing and ethnicity among women aged 16-24 in England.

GUMCAD and CTAD chlamydia dataset:

- A Poisson regression analysis of the relationship between chlamydia testing and deprivation among women aged 16-24 in England.
- A Poisson regression analysis of the relationship between chlamydia diagnosis and deprivation among women aged 16-24 in England.
- A Poisson regression analysis of the relationship between chlamydia testing and ethnicity among women aged 16-24 in England.

DHSC abortion dataset:

- A Poisson regression analysis of the relationship between abortion and deprivation among women aged 16-24 in England.
- A Poisson regression analysis of the relationship between repeat abortion and deprivation among women aged 16-24 in England.
- A Poisson regression analysis of the relationship between repeat abortion and ethnicity among women aged 16-24 in England.

5 Inequalities in gonorrhoea outcomes between 2012 and 2019

In this chapter, I will discuss the results of my analyses of the patterns of inequality within gonorrhoea-related outcomes among women aged 16-24 in England between 2012 and 2019. These analyses informed the sexual health indicators that I chose for use as part of my index of unmet need within SRH. The analysis of chlamydia trends will be discussed in Chapter 6, and the analysis of abortion trends in Chapter 7.

5.1 Results: Gonorrhoea

5.1.1 Descriptive analyses

Baseline

Between 2012 and 2019, 3,220,976 gonorrhoea tests were recorded within the target population, 51,308 of which were positive. The majority of tests (68.3% of the total) and diagnoses (62.1% of the total) were linked to women who reported their ethnicity as White British (Table 5.1), which is in line with the population distribution of ethnicity in England[187]. Overall, 12.3% of the tests in this dataset were among women living in LSOAs that fell into the most deprived IMD decile, compared to 7.0% in the LSOAs that fell into the least deprived decile, while 19.3% of the diagnoses in this dataset were in LSOAs that fell into the most deprived decile, compared to 3.8% in the LSOAs that fell into the least deprived decile (Table 5.1). There was a significant correlation between ethnicity and deprivation ($p<0.001$), with tests among women of White British ethnicity being more likely to be linked to a less deprived LSOA than tests among racially minoritised women. For example, 25.5% of tests among Asian Bangladeshi women were taken by women who lived in IMD decile 1 (the most deprived decile), compared to 11.1% of tests among White British women. In comparison, 1.3% of tests among Asian Bangladeshi women were taken by women who lived in IMD decile 10 (the least deprived decile), compared to 8.6% of tests among White British women (Table 5.2).

Table 5.1: Overall characteristics of women whose gonorrhoea tests and diagnoses were included in this dataset

		Gonorrhoea tests		Gonorrhoea diagnoses	
		N	%	N	%
Total		3220976	100	51308	100
IMD (2015)					
(most deprived)	1	395176	12.3	9908	19.3
	2	444622	13.8	9618	18.7
	3	416148	12.9	7622	14.9
	4	377717	11.7	5901	11.5
	5	320608	10.0	4655	9.1
	6	281422	8.7	3482	6.8
	7	267518	8.3	2954	5.8
	8	253766	7.9	2733	5.3
	9	239040	7.4	2501	4.9
	10	224939	7.0	1934	3.8
Ethnicity					
	White British	2200043	68.3	31867	62.1
	Bangladeshi	10412	0.3	134	0.3
	Indian	31610	1.0	346	0.7
	Pakistani	17595	0.5	223	0.4
	Chinese	16534	0.5	144	0.3
	Any other Asian background	27251	0.8	307	0.6
	African	121162	3.8	2449	4.8
	Caribbean	118263	3.7	3867	7.5
	Any other Black background	43290	1.3	1233	2.4
	Mixed White and Asian	24297	0.8	325	0.6
	Mixed White and Black African	23786	0.7	557	1.1
	Mixed White and Black Caribbean	77790	2.4	2505	4.9
	Mixed other	52135	1.6	1073	2.1
	White Irish	20621	0.6	250	0.5
	White other	218598	6.8	2884	5.6
	Any other ethnicity	39346	1.2	677	1.3
	Not known/not stated	178243	5.5	2467	4.8

Table 5.2: Number of gonorrhoea tests among women living in IMD deciles 1 and 10 within each ethnic group

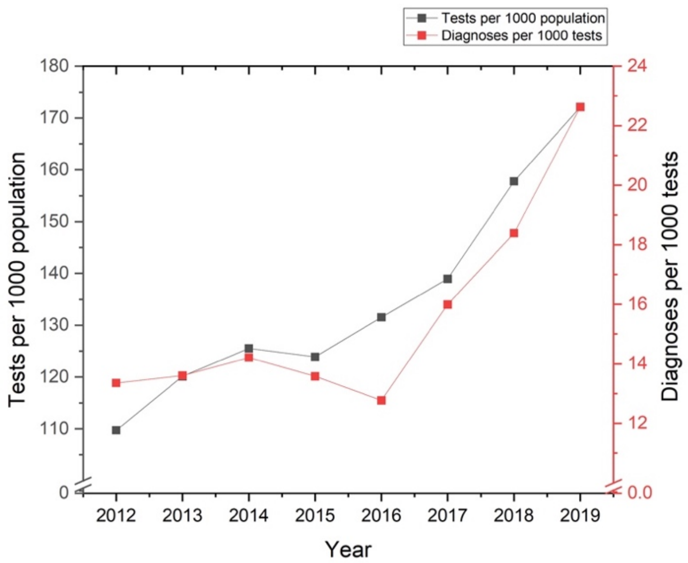
Ethnicity	Tests among women living in IMD decile 1		Tests among women living in IMD decile 10	
	N	% (of gonorrhoea tests within ethnic group)	N	% (of gonorrhoea tests within ethnic group)
White British	244343	11.1	189587	8.6
Bangladeshi	2659	25.5	132	1.3
Indian	2734	8.6	1778	5.6
Pakistani	4240	24.1	384	2.2
Chinese	1373	8.3	784	4.7
Any other Asian background	2827	10.4	1075	3.9
African	21795	18.0	1414	1.2
Caribbean	22936	19.4	890	0.8
Any other Black background	7089	16.4	493	1.1
Mixed White and Asian	2701	11.1	1655	6.8
Mixed White and Black African	3439	14.5	689	2.9
Mixed White and Black Caribbean	14882	19.1	1843	2.4
Mixed other	7135	13.7	1889	3.6
White Irish	2034	9.9	998	4.8
White other	26216	12.0	7941	3.6
Any other ethnicity	5939	15.1	1140	2.9
Not known/not stated	22834	12.8	12247	6.9

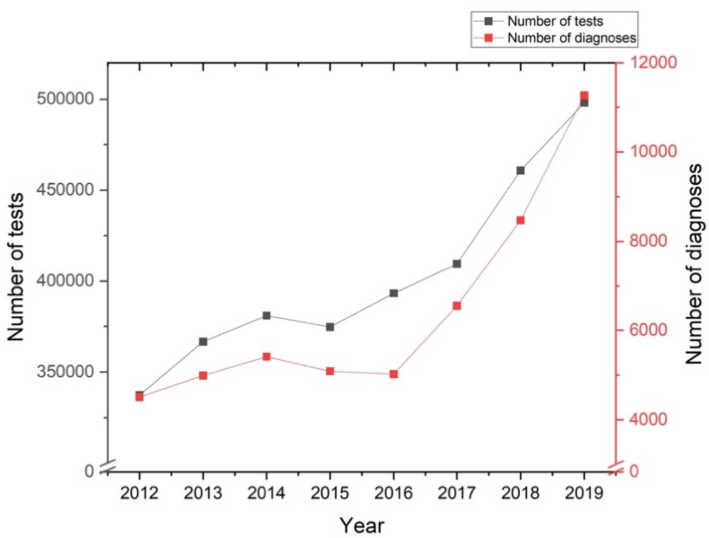
The overall number of both diagnoses and tests increased between 2012 and 2019: the annual number of tests increased from 337,332 in 2012 to 497,923 in 2019, and the annual number of positive tests increased from 4,508 in 2012 to 11,270 in 2019 (Table 5.3). The number of tests per 1000 women increased from 109.74 in 2012 to 172.10 in 2019. The number of gonorrhoea diagnoses per 1000 tests among this population (hereafter referred to as the gonorrhoea positivity rate, or GPR) also increased during this period, rising from 13.36 in 2012 to 22.63 in 2019. (Table 5.3 and Figure 5.1).

Table 5.3: Gonorrhoea testing and diagnosis rates in England among women between the ages of 16 and 24 (2012 - 2019)

Year	Population	Gonorrhoea tests	Tests per 1000 population	Gonorrhoea diagnoses	Gonorrhoea positivity rate
2012	3073993	337332	109.74	4508	13.36
2013	3050979	366608	120.16	4989	13.61
2014	3035522	380967	125.50	5413	14.21
2015	3024178	374614	123.87	5086	13.58
2016	2989586	393243	131.54	5021	12.77
2017	2947698	409534	138.93	6550	15.99
2018	2919889	460755	157.80	8471	18.39
2019	2893203	497923	172.10	11270	22.63
Total		**3220976**		**51308**	**15.93**

Figure 5.1: Gonorrhoea testing and diagnosis rates in England among women between the ages of 16 and 24 (2012 - 2019)

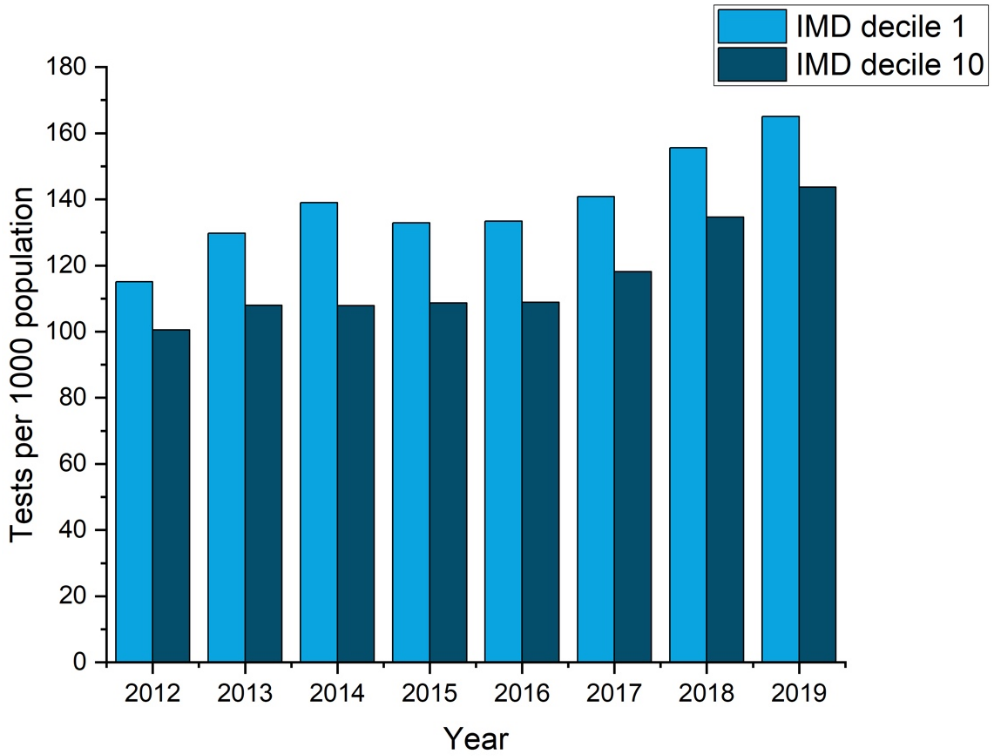


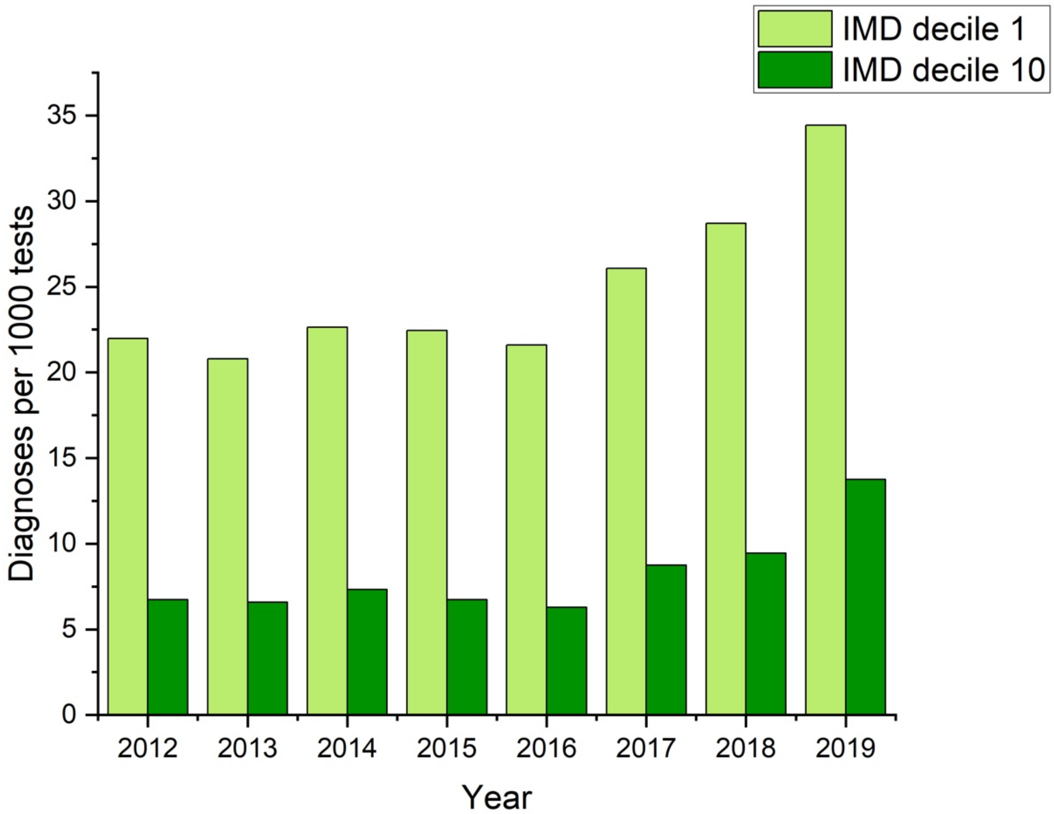


Deprivation

Between 2012 and 2019, there was an inverse relationship between both gonorrhoea testing and diagnosis and IMD – indicating that more gonorrhoea tests were performed on women who lived in more deprived areas during this period of time, and that an increased proportion of the tests performed in more deprived areas were positive for gonorrhoea (Table 5.1). This pattern persisted when the dataset was broken down by year; annual gonorrhoea testing and diagnosis rates in the most deprived LSOAs were higher than the rates seen in the least deprived LSOAs. In decile 1 (the most deprived IMD decile), there were 115 gonorrhoea tests per 1000 population in 2012, compared to 101 tests per 1000 population in decile 10 (the least deprived IMD decile). With regards to diagnosis, the GPR in IMD decile 1 was 21.98 in 2012, while the GPR in decile 10 was 6.74. This pattern persisted over time. In 2019, there were 165 gonorrhoea tests per 1000 population in decile 1, compared to 144 tests per 1000 population in decile 10. Meanwhile, the GPR in decile 1 was 34.44 in 2019, while the GPR in decile 10 was 13.75 (Figure 5.2). A table outlining the annual gonorrhoea testing and diagnosis rates in each IMD decile between 2012 and 2019 can be found in Appendix 3.

Figure 5.2: Rates of gonorrhoea testing and diagnosis among women between the ages of 16 and 24 in IMD decile 1 and IMD decile 10 (2012 - 2019)





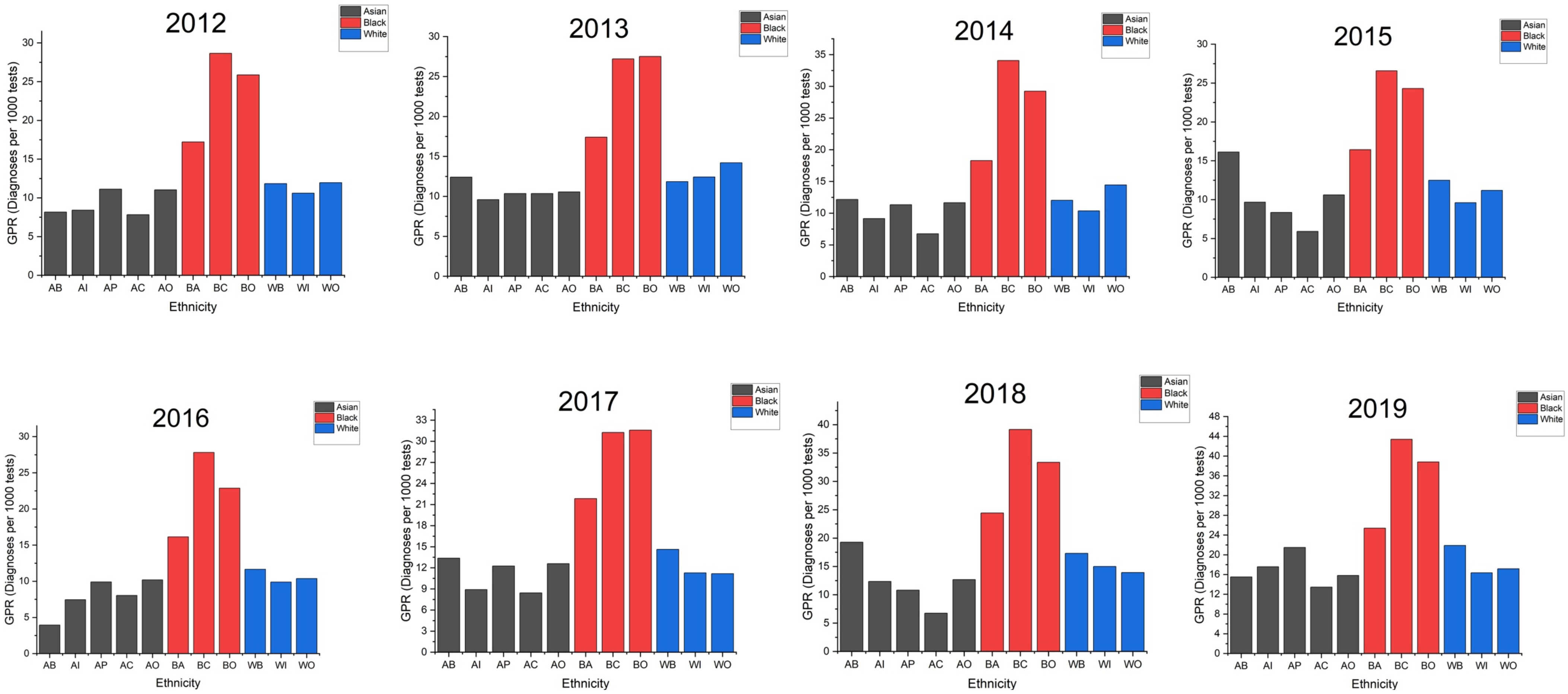
Ethnicity

Between 2012 and 2019, 2,951,252 gonorrhoea tests were taken by women aged 16-24 who identified their ethnicity as Asian (Bangladeshi, Indian, Pakistani, Chinese or Other), Black (African, Caribbean or Other) or White (British, Irish or Other), and 47,091 of these tests were positive. There were 269,724 tests (8.4% of the total) and 4,217 diagnoses (8.2% of the total) excluded from this analysis, as they were undergone by women who reported another ethnicity or who did not report any ethnicity at all (Table 5.1).

Women of Black ethnicity had the highest annual rates of gonorrhoea diagnosis, with women who had reported their ethnicity as Black Caribbean most commonly displaying the highest annual rate of gonorrhoea diagnosis. Women of Asian ethnicity had the lowest annual rates of gonorrhoea diagnosis, with women who had reported their ethnicity as Asian Chinese most commonly displaying the lowest annual rate of gonorrhoea diagnosis. In 2012, GPR among Black Caribbean women was 28.7, compared to 11.8 among White British women and 7.8 among Asian Chinese women. In 2019, GPR among Black Caribbean women was 43.4, compared to 21.9 among White British women and 13.4 among Asian Chinese women (Figure 5.3).

A table outlining the annual gonorrhoea testing and diagnosis rates for each ethnic group between 2012 and 2019 can be found in Appendix 3.

Figure 5.3: GPR in England by ethnicity among women between the ages of 16 and 24 (2012 - 2019)



AB: Asian Bangladeshi AI: Asian Indian AP: Asian Pakistani AC: Asian Chinese AO: Asian other	BA: Black African BC: Black Caribbean BO: Black other WB: White British WI: White Irish WO: White other

5.1.2 Regression analyses

Deprivation

Tests per 1000 population

The deprivation regression analyses revealed a negative correlation between IMD and tests per 1000 population during each year of the study period, indicating that there were fewer tests per 1000 population among women aged 16-24 living in less deprived areas when compared to those living in more deprived areas. Between 2012 and 2019, the test per 1000 population rate in the least deprived decile was consistently between 80% and 90% of that seen in the most deprived decile. In 2012, the rate ratio for this relationship was 0.87 (0.86 – 0.89) in 2012, and in 2019 the rate ratio for this relationship was 0.87 (0.86 – 0.88) (Figure 5.4). Annual rate ratios for the relationship between testing rates in IMD decile 1 and all other IMD deciles can be found in Appendix 3.

GPR

The deprivation regression analyses also revealed a negative correlation between IMD and GPR during each year of the study period, indicating that the diagnosis rate was lower among women living in less deprived areas when compared to those living in more deprived areas. The gap between diagnosis rates in the most deprived and least deprived areas was much wider than the gap between testing rates in the most and least deprived areas. In 2012, the rate ratio for the relationship between diagnosis rates in IMD decile 1 and IMD decile 10 was 0.31 (0.26 – 0.36), which rose to 0.40 (0.36 – 0.44) by 2019 (Figure 5.5). Annual rate ratios for the relationship between diagnosis rates in IMD decile 1 and all other IMD deciles can be found in Appendix 3.

Ethnicity

GPR

Between 2012 and 2019, GPR varied significantly by ethnic group ($p<0.001$).

When compared to tests performed on women who identified as White British, tests performed on women who identified as Black were consistently more likely to be positive for gonorrhoea, although the gap between diagnosis rates among White British women and diagnosis rates among Black women decreased over time. Between 2012 and 2019, diagnosis rates among Black Caribbean women were approximately 2-3 times higher than those seen among White British women: the rate ratio in 2012 was 2.42 (2.19 – 2.68), falling to 1.98 (1.84 – 2.14) by 2019. The rate ratio for women of other Black ethnicities displayed a similar pattern, falling from 2.19 (1.97 – 2.42) in 2012 to 1.77 (1.65 – 1.90) in 2019. The rate ratio for Black African women fell from 1.45 (1.26 – 1.68) in 2012 to 1.16 (1.06 – 1.26) in 2019 (Figure 5.6).

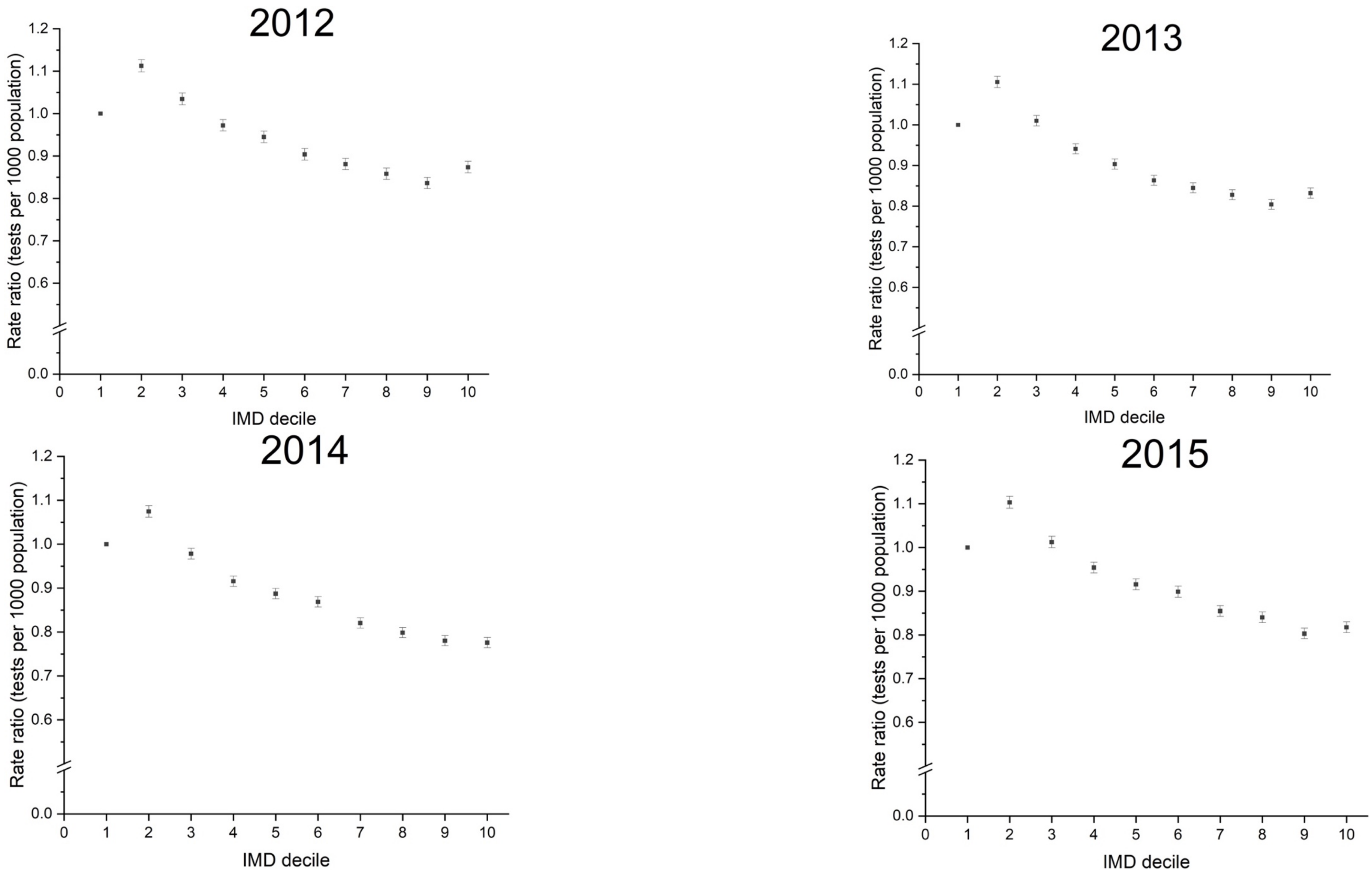
Tests among women who identified their ethnicity as Indian or Chinese and women of other Asian ethnicities were consistently less likely to be positive than those performed on women who identified as White British. The rate ratio for the relationship between GPR among White British women and GPR among Asian Indian women was 0.71 (0.48 – 1.05) in 2012 and 0.80 (0.66 – 0.99) in 2019. The rate ratio for Asian Chinese women was 0.66 (0.37 – 1.19) in 2012 and 0.61 (0.45 – 0.83) in 2019. The rate ratio for other women of Asian ethnicity was 0.93 (0.70 – 1.24) in 2012 and 0.72 (0.61 – 0.85) in 2019. Diagnosis rates among women who identified as Pakistani were similar to those seen among White British women: the rate ratio for Asian Pakistani women was 0.94 (0.58 –

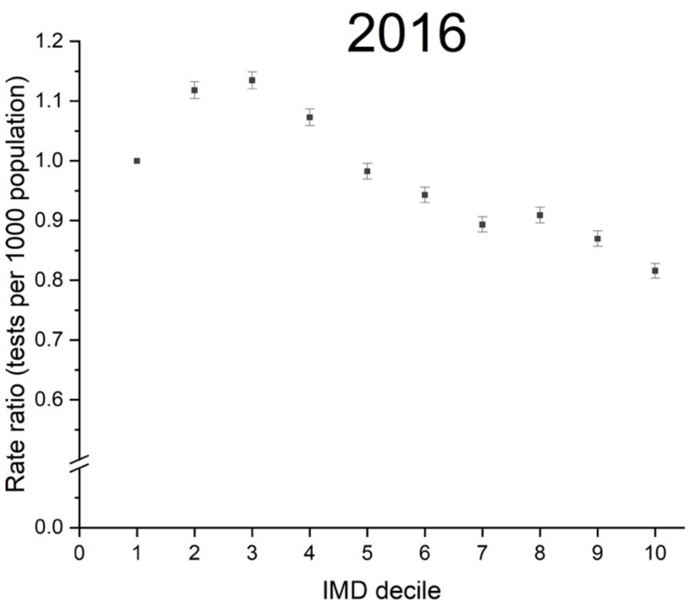
1.51) in 2012, and 0.98 (0.77 – 1.24) in 2019. Diagnoses among women who identified as Asian Bangladeshi did not display a consistent pattern over time (when compared to diagnoses among those who identified as White British), with rate ratios ranging between 0.34 (0.14 – 0.81) in 2016 and 1.29 (0.84 – 1.98) in 2015 (Figure 5.6). Many rate ratios for the relationship between diagnosis rates among women of Asian ethnicity and diagnosis rates among women of White British ethnicity did not reach statistical significance.

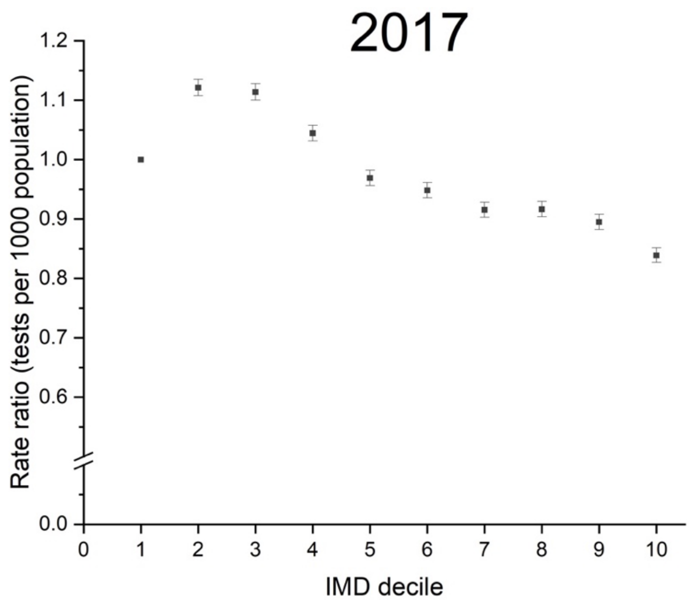
Among women who reported White ethnicities other than White British, diagnosis rates were similar to, or slightly lower than, those seen among White British women. The rate ratio for the relationship between GPR among White British women and GPR among White Irish women was 0.90 (0.60 – 1.34) in 2012 and 0.74 (0.57 – 0.98) in 2019, while the rate ratio for other women of White ethnicity was 1.01 (0.89 – 1.14) in 2012 and 0.78 (0.72 – 0.85) in 2019. Many rate ratios for the relationship between diagnosis rates among women of White British ethnicity and women of other White ethnicity did not reach statistical significance.

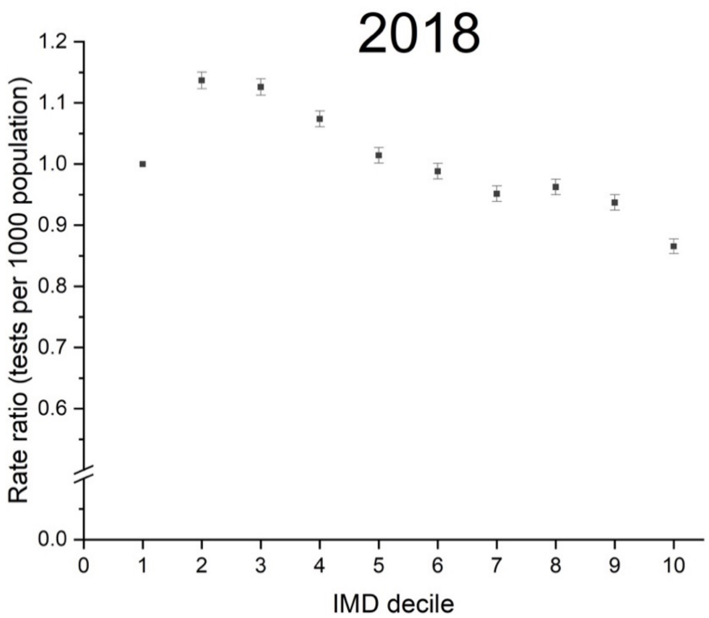
Annual rate ratios for the relationship between diagnosis rates among White British women and women of Asian, Black and other White ethnicities can be found in Appendix 3.

Figure 5.4: Rate ratios for relationship between the gonorrhoea testing rate in IMD deciles 2 – 9 and the gonorrhoea testing rate in decile 1 stratified by calendar year




2016
Rate ratio (tests per 1000 population)
1.2
1.1
1.0
0.9
0.8
0.7
0.6
0.0
0 1 2 3 4 5 6 7 8 9 10
IMD decile


2017
Rate ratio (tests per 1000 population)
1.2
1.1
1.0
0.9
0.8
0.7
0.6
0.0
0 1 2 3 4 5 6 7 8 9 10
IMD decile


2018
Rate ratio (tests per 1000 population)
1.2
1.1
1.0
0.9
0.8
0.7
0.6
0.0
0 1 2 3 4 5 6 7 8 9 10
IMD decile

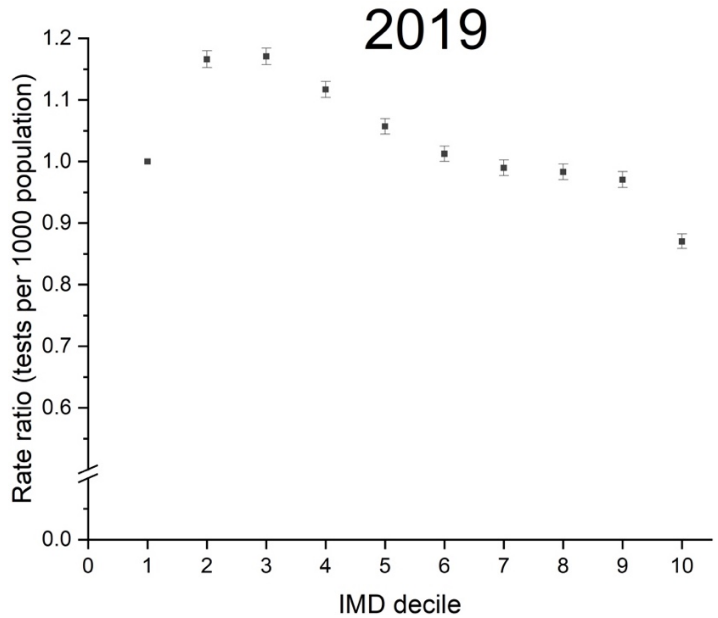
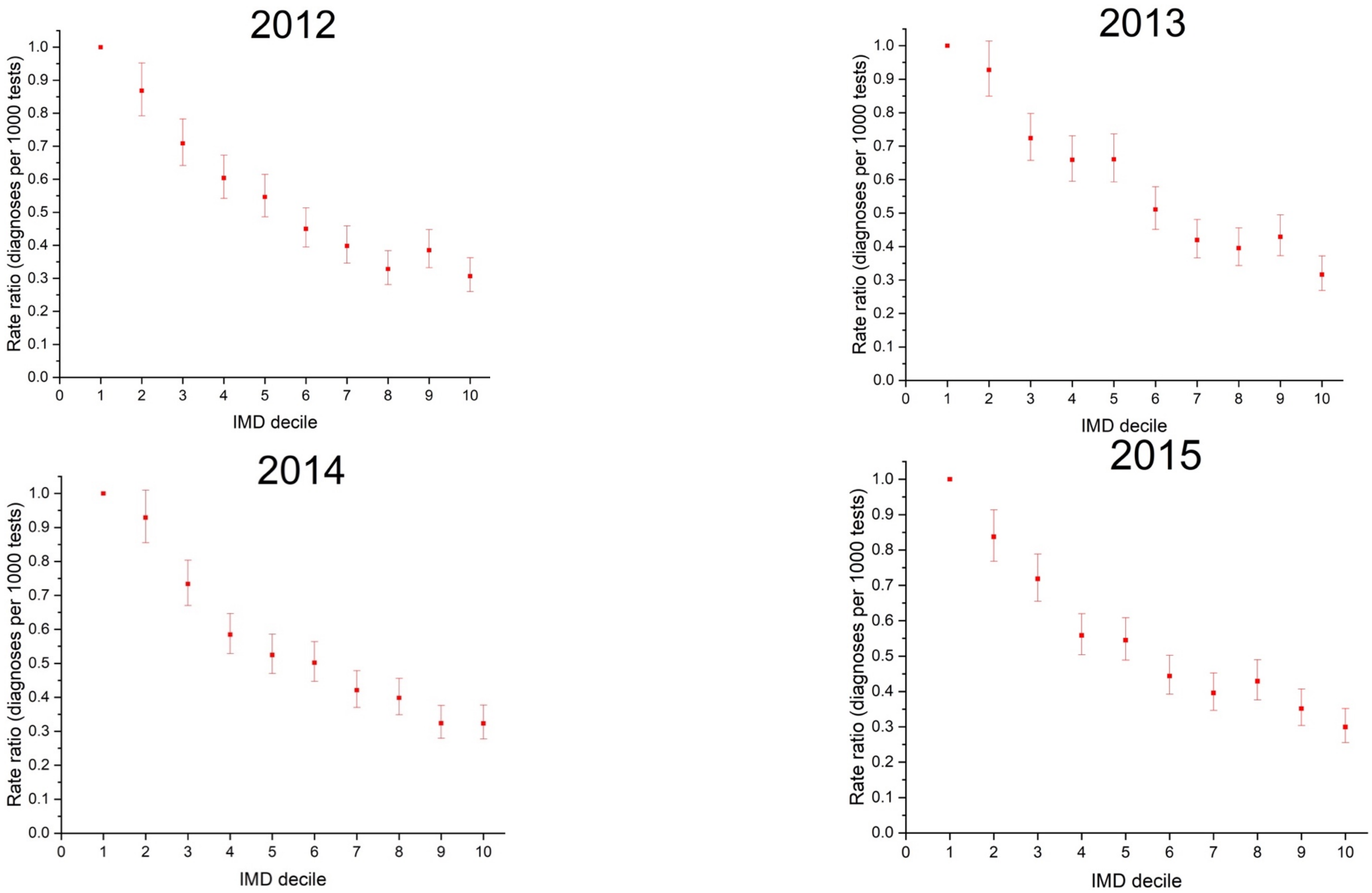
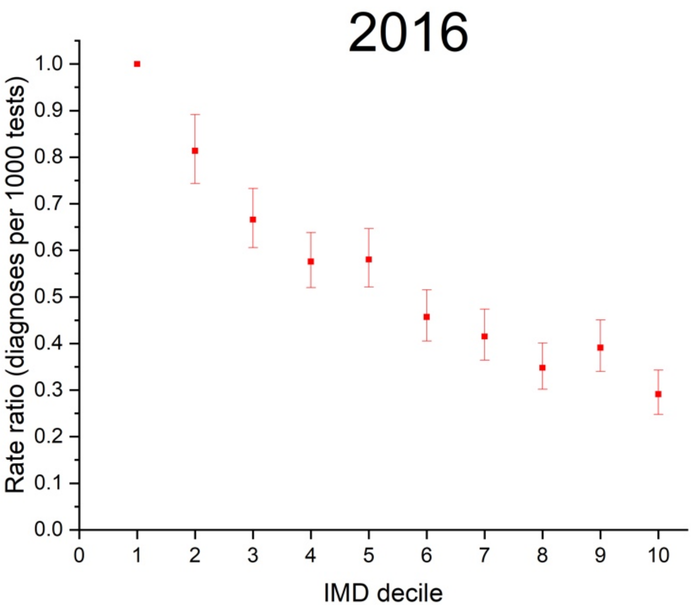
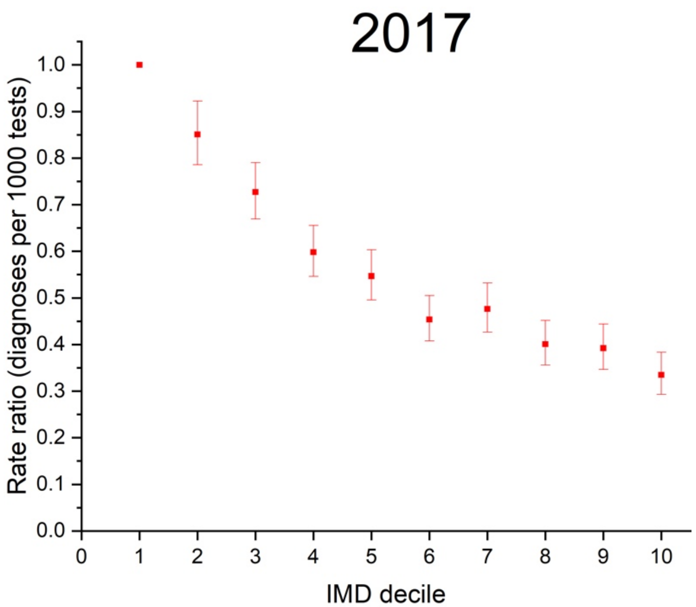

2019
Rate ratio (tests per 1000 population)
1.2
1.1
1.0
0.9
0.8
0.7
0.6
0.0
0 1 2 3 4 5 6 7 8 9 10
IMD decile

Figure 5.5: Rate ratios for relationship between the GPR in IMD deciles 2 – 9 and the GPR in decile 1, stratified by calendar year




2016
Rate ratio (diagnoses per 1000 tests)
1.0
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0.0
0
1
2
3
4
5
6
7
8
9
10
IMD decile


2017
Rate ratio (diagnoses per 1000 tests)
1.0
0.9
0.8
0.7
0.6
0.5
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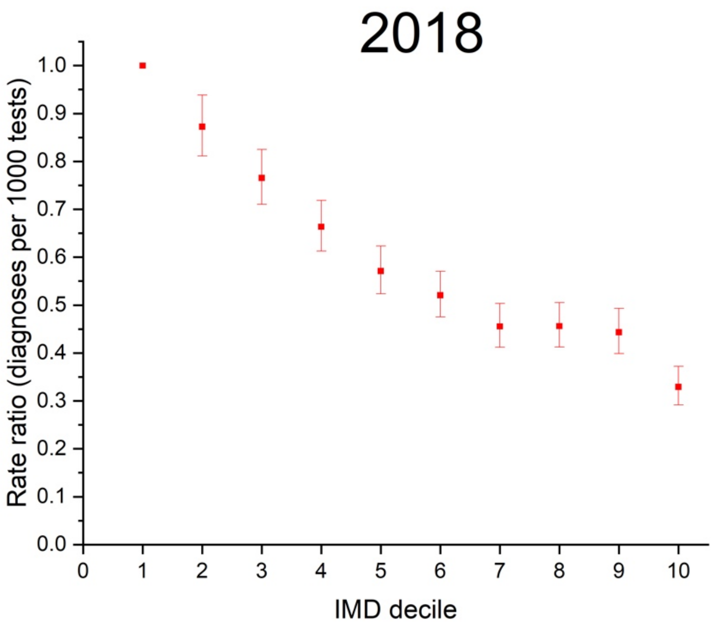
IMD decile


2018
Rate ratio (diagnoses per 1000 tests)
1.0
0.9
0.8
0.7
0.6
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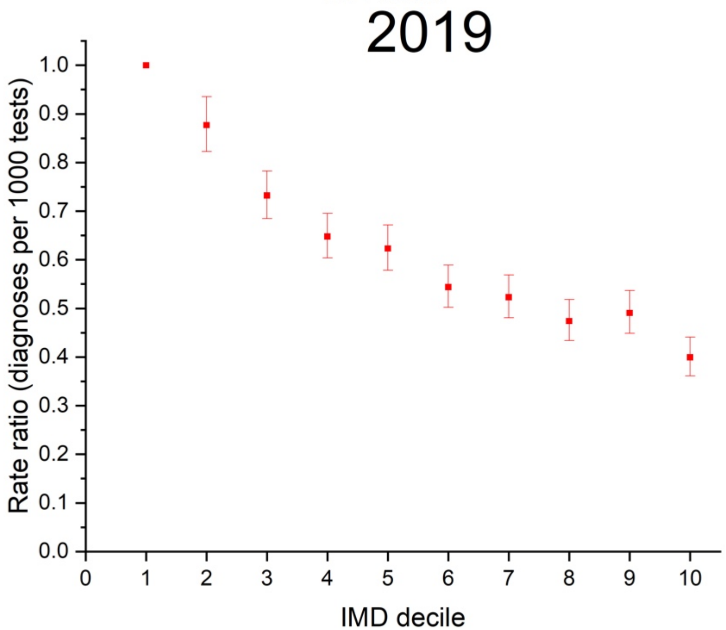
IMD decile


2019
Rate ratio (diagnoses per 1000 tests)
1.0
0.9
0.8
0.7
0.6
0.5
0.4
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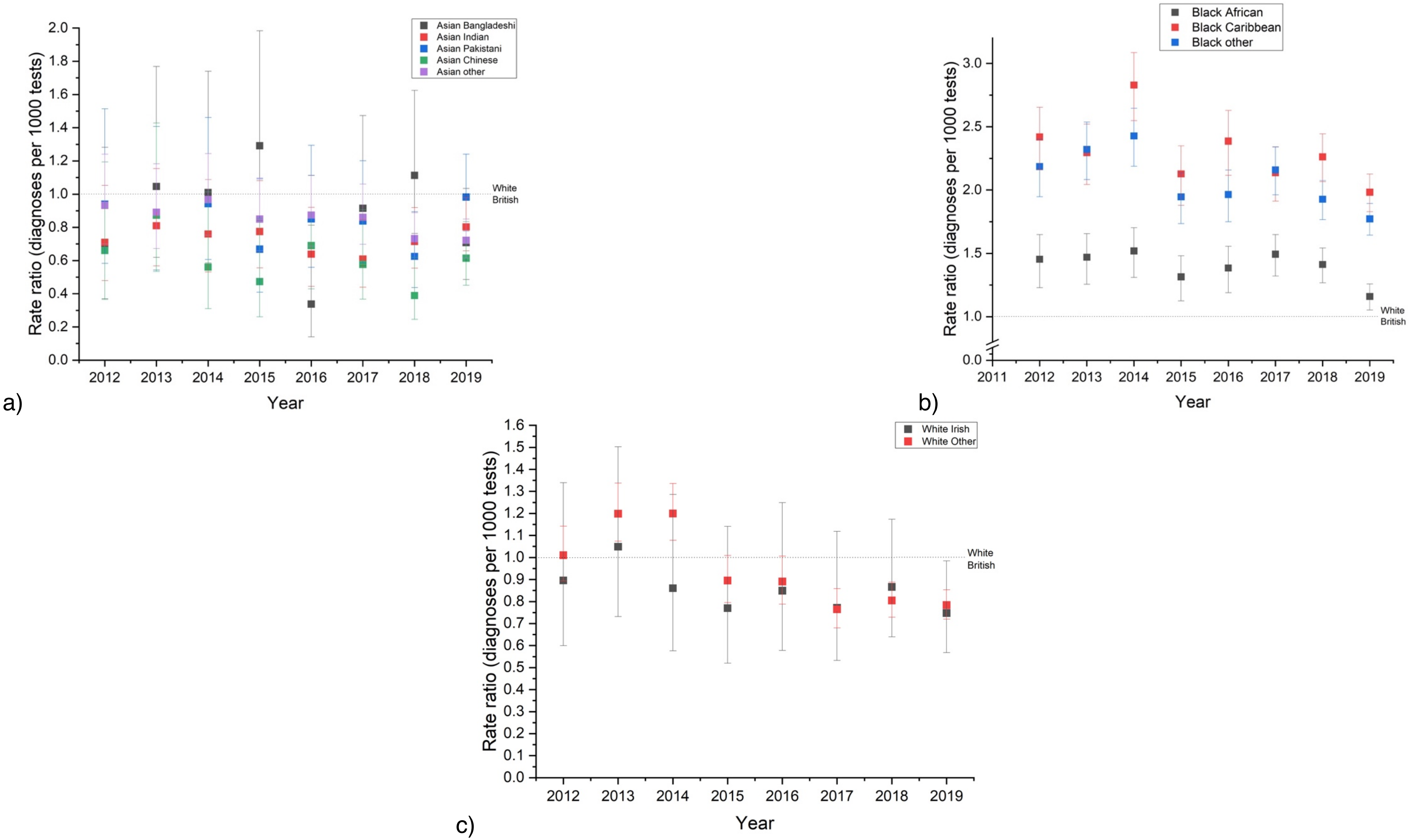
IMD decile

Figure 5.6:

a) **Rate ratios for relationship between the GPR among women of Asian ethnicity and the GPR among women of White British ethnicity**
b) **Rate ratios for relationship between the GPR among women of Black ethnicity and the GPR among women of White British ethnicity**
c) **Rate ratios for relationship between the GPR among women of other White ethnicities and the GPR among women of White British ethnicity**

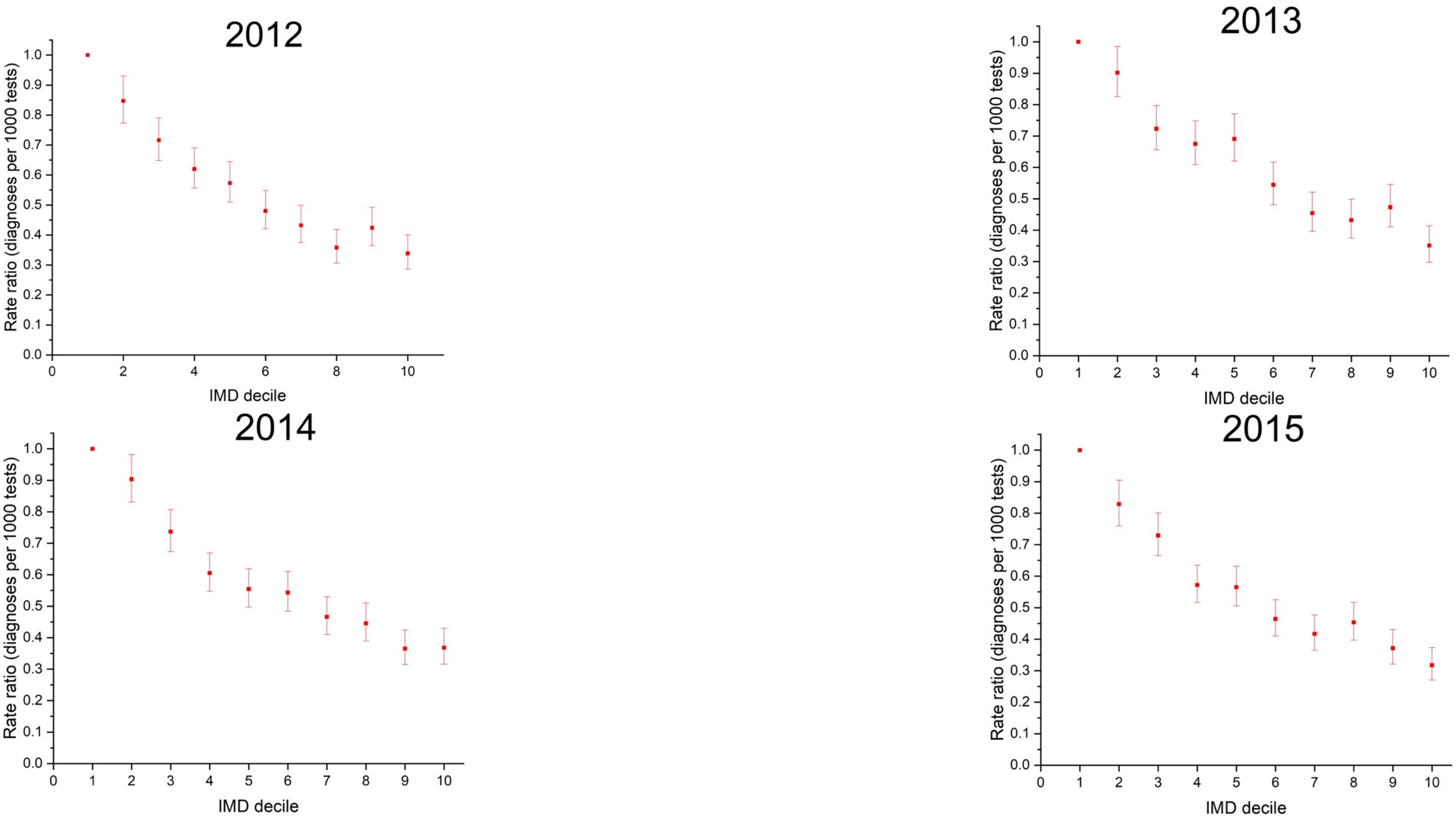


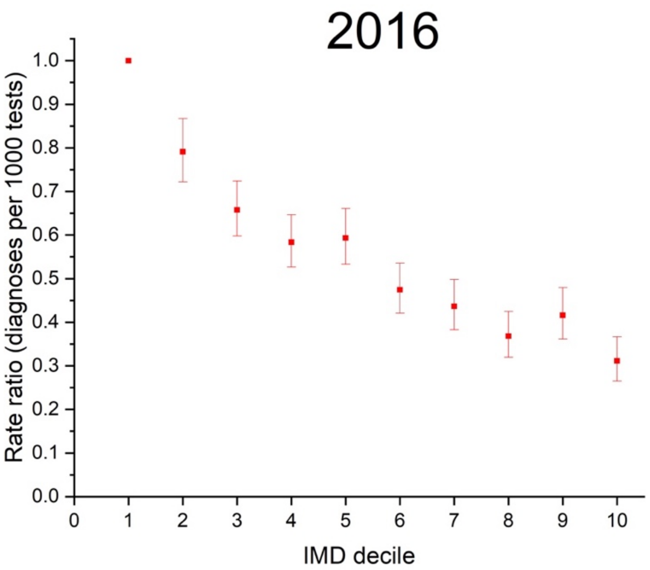
Multivariable analyses

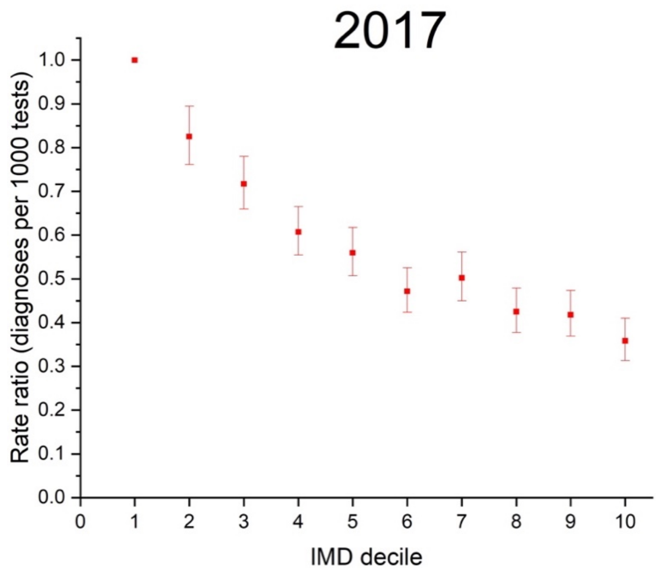
Controlling the deprivation analysis for ethnicity did not have a large impact on the overall relationship between deprivation and gonorrhoea diagnosis rates among women aged 16-24 in England. The multivariable analysis continued to display a negative correlation between IMD decile and diagnoses per 1000 tests. When controlled for ethnicity, the adjusted rate ratio (ARR) for the relationship between gonorrhoea diagnosis rates in IMD decile 1 and IMD decile 10 was 0.34 (0.29 – 0.40) in 2012, increasing to 0.42 (0.38 – 0.47) by 2019 (Figure 5.7).

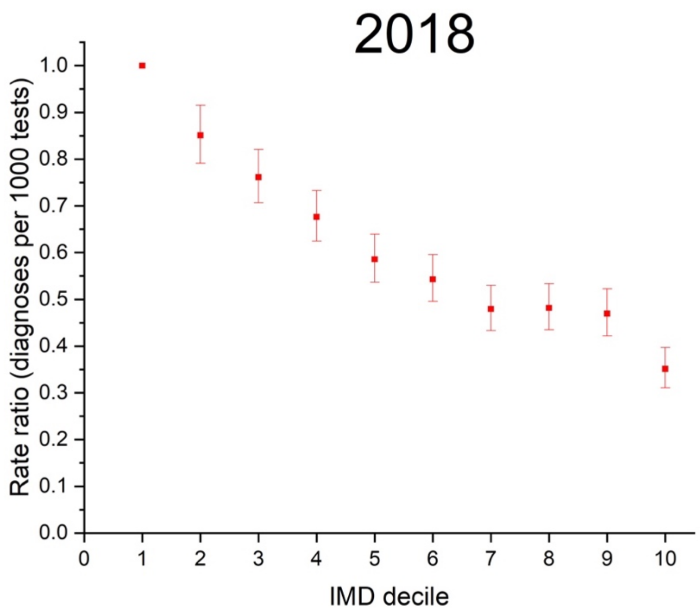
While the overarching relationship between ethnicity and diagnosis rates also did not change when adjusted for deprivation, the relationships between diagnosis rates among White British women and certain ethnicities were impacted by the addition of deprivation to the multivariable model. Among Asian populations, tests among women who identified their ethnicity as Chinese, Indian and other Asian ethnicities continued to be less likely to be positive than those performed on women who identified as White British. The ARR for the relationship between diagnosis rates among Pakistani women and White British women, having been close to 1 when calculated using the univariate model, indicated a lower diagnosis rate among Pakistani women when controlled for deprivation: this ARR was 0.78 (0.47 – 1.22) in 2012, and 0.85 (0.67 – 1.06) in 2019. The relationship between diagnosis rates among White British women and Bangladeshi women once again did not follow a strict pattern within the multivariable analysis. While tests among most women of Black ethnicity continued to be more likely to be positive than those among women of White British ethnicity, the gap between diagnosis rates among Black women and diagnosis rates among White British women narrowed once adjusted for deprivation. The ARR for the relationship between diagnosis rates among Black African women and white British women was 1.18 (1.02 – 1.36) in 2012 and 1.02 (0.93 – 1.11) in 2019. The ARR for Black Caribbean women was 1.93 (1.74 – 2.14) in 2012 and 1.72 (1.60 – 1.86) in 2019, and the ARR for other women of Black ethnicity was 1.80 (1.62 – 2.00) in 2012 and 1.59 (1.48 – 1.71) in 2019 (Figure 5.8).

Figure 5.7: Rate ratios for relationship between the GPR in IMD deciles 2 – 9 and the GPR in IMD decile 1 (controlled for ethnicity and stratified by year)




2016
Rate ratio (diagnoses per 1000 tests)
IMD decile


2017
Rate ratio (diagnoses per 1000 tests)
IMD decile


2018
Rate ratio (diagnoses per 1000 tests)
IMD decile

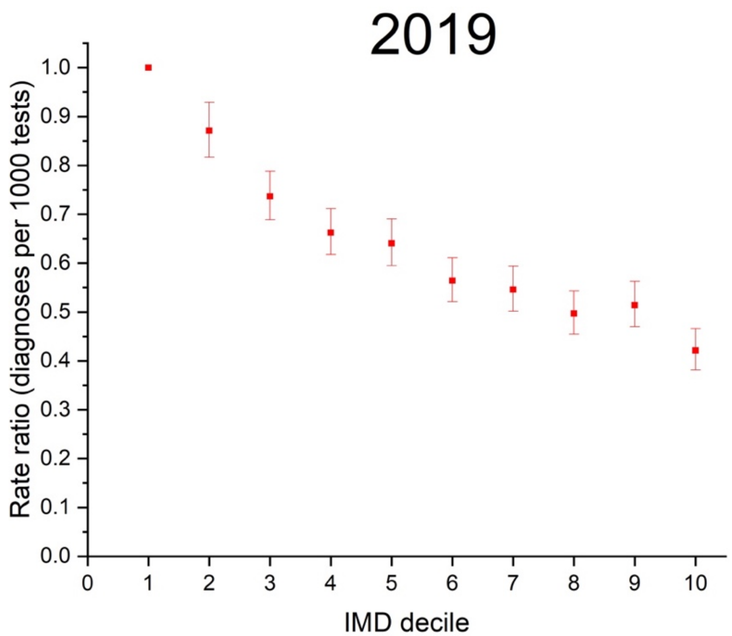
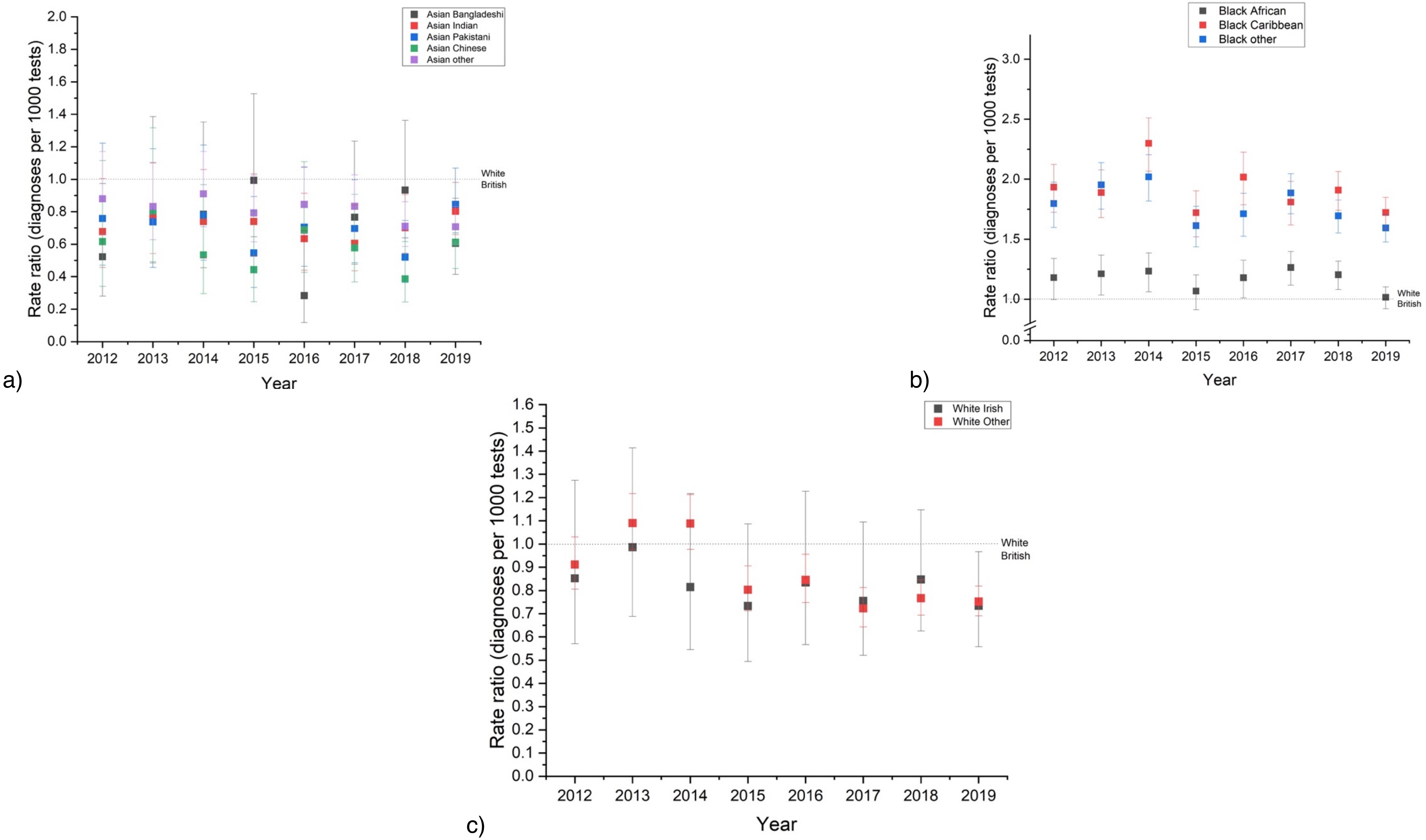

2019
Rate ratio (diagnoses per 1000 tests)
IMD decile

Figure 5.8:

a) **Rate ratios for relationship between the GPR among women of Asian ethnicity and the GPR among women of White British ethnicity (controlled for deprivation and stratified by year)**
b) **Rate ratios for relationship between the GPR among women of Black ethnicity and the GPR among women of White British ethnicity (controlled for deprivation and stratified by year)**
c) **Rate ratios for relationship between the GPR among women of other White ethnicities and the GPR among women of White British ethnicity (controlled for deprivation and stratified by year)**



5.2 Discussion

5.2.1 Key findings

Between 2012 and 2019, the number of gonorrhoea tests and diagnoses recorded in England among women aged 16-24 increased. The number of tests per 1000 population, and the rate of positivity (GPR), also increased, indicating that the changes in test and diagnosis numbers over time were not an artefact of changes in population size. The increase in both testing demand and test positivity correlates with the patterns within this population that were previously reported by PHE[188].

When examining the impact of deprivation on testing and diagnosis, there was an inverse relationship between IMD and both testing rate and positivity rate, indicating that more testing occurred in more deprived areas, and that tests in these areas were more likely to be positive.

There was also a relationship between ethnicity and diagnosis. During the study period, gonorrhoea tests taken by women whose ethnicity was classified as either Black Caribbean or Black Other were around two to three times more likely to be positive than those taken by women whose ethnicity was classified as White British.

Multivariable regression analysis of these relationships (using a model that incorporated both deprivation and ethnicity) indicated that controlling for each of these demographic variables has little impact on the overall pattern observed.

As the implications of these findings were similar to those found when analysing chlamydia-related outcomes, there will be a full discussion of these results at the end of the next chapter (Chapter 6), which outlines the findings of the chlamydia analysis.

6 INEQUALITIES IN CHLAMYDIA OUTCOMES BETWEEN 2012 AND 2019

In this chapter, I will discuss the results of my analyses of the patterns of inequality in relation to chlamydia-related outcomes among women aged 16-24 between 2012 and 2019. These analyses informed the creation of the sexual health indicators that I used to generate an index of unmet need within SRH.

6.1 Level 3 analysis

When examining the chlamydia dataset, the analysis of patterns of unmet need was potentially affected by the nature of chlamydia testing within England. In particular, it was necessary to investigate the impact of the National Chlamydia Screening Programme (NCSP). The NCSP is a national programme of opportunistic chlamydia screening that has been operating in the UK since 2003, which aims to prevent the morbidity associated with untreated chlamydia infection. Within the NCSP, sexually active women under the age of 25 are offered screening in multiple settings, including many outside of specialist sexual health services (particularly general practice and pharmacy)[189]. When thinking about unmet need, it is possible that the strategic direction of the NCSP could affect the interpretation of the results – for example, higher diagnosis rates in historically underserved groups could be a result of deliberately targeted screening, rather than higher prevalence. As part of this analysis, a secondary analysis for chlamydia testing and diagnosis was performed using only data collected from Level 3 sexual health clinics, which, as this dataset is derived from testing performed in specialist sexual health centres, should be more resistant to the impact of screening. The aim of this analysis is to assess whether trends of inequality persisted when using a dataset that was less directly linked to the NCSP; similar results within the full analysis and the secondary analysis would more robustly support the conclusion that a disparity in these outcomes is an indicator of unmet need in certain groups.

6.2 Results: Chlamydia

6.2.1 Descriptive analyses (all levels of sexual health service)

Baseline

Between 2012 and 2019, 8,103,547 chlamydia tests were recorded within the target population, 664,040 (8.2%) of which were positive. With regards to deprivation, 13.5% of the tests in this dataset among women living in the most deprived IMD decile, compared to 6.3% in the least deprived decile. Similarly, 16.0% of the diagnoses fell into the most deprived decile, compared to 5.2% in the least deprived decile (Table 6.1). As with gonorrhoea, there was a correlation between ethnicity and deprivation ($p<0.001$), with tests among White British women being more likely to be linked to less deprived LSOAs. For example, 24.5% of tests among Asian Pakistani women were taken by women who lived in IMD decile 1, compared to 11.3% of tests among White British women, while 1.9% of tests among Asian Bangladeshi women were taken by women who lived in IMD decile 10, compared to 8.2% of tests among White British women (Table 6.2).

Table 6.1: Overall characteristics of women whose chlamydia tests and diagnoses were included in this dataset

		Chlamydia tests		Chlamydia diagnoses	
		N	%	N	%
Total		8103547	100	664040	100
IMD (2015)					
(most deprived)	1	1097103	13.5	106496	16.0
	2	1095938	13.5	99645	15.0
	3	1042653	12.9	89642	13.5
	4	949156	11.7	77857	11.7
	5	786691	9.7	62355	9.4
	6	707830	8.7	53881	8.1
	7	672837	8.3	49456	7.4
	8	645367	8.0	47271	7.1
	9	597192	7.4	42623	6.4
	10	508780	6.3	34814	5.2
Ethnicity					
	White British	3213596	39.7	293609	44.2
	Bangladeshi	15690	0.2	947	0.1
	Indian	51613	0.6	2765	0.4
	Pakistani	29242	0.4	1639	0.2
	Chinese	22302	0.3	2097	0.3
	Any other Asian background	41309	0.5	3035	0.5
	African	153788	1.9	16024	2.4
	Caribbean	161217	2.0	18677	2.8
	Any other Black background	57738	0.7	6536	1.0
	Mixed White and Asian	31784	0.4	2587	0.4
	Mixed White and Black African	30031	0.4	3227	0.5
	Mixed White and Black Caribbean	101291	1.2	11762	1.8
	Mixed other	72187	0.9	6861	1.0
	White Irish	24577	0.3	2143	0.3
	White other	521936	6.4	42576	6.4
	Any other ethnicity	53130	0.7	4633	0.7
	Not known/not stated	3522116	43.5	244922	36.9

Table 6.2: Number of chlamydia tests among women living in IMD deciles 1 and 10 within each ethnic group

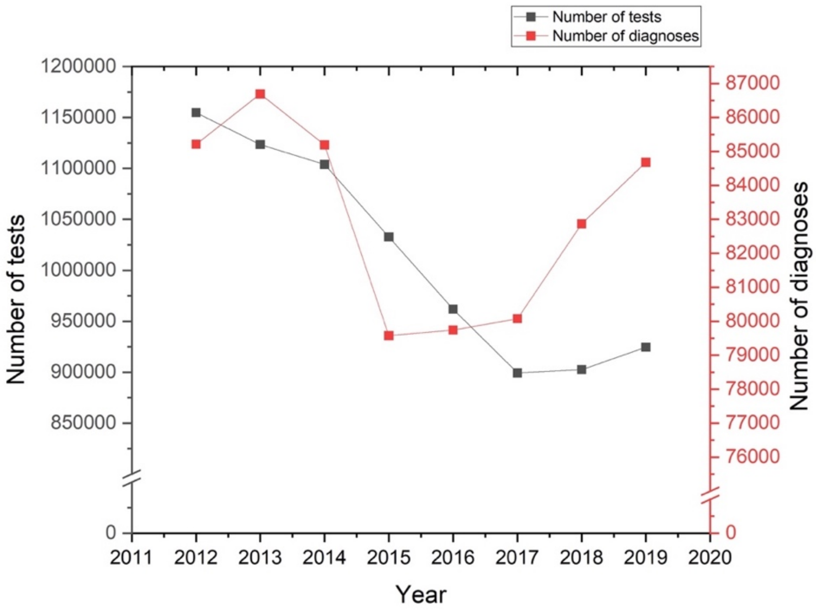
Ethnicity	Tests performed on women living in IMD decile 1		Tests performed on women living in IMD decile 10	
	N	% (of chlamydia tests within ethnic group)	N	% (of chlamydia tests within ethnic group)
White British	364308	11.3	263852	8.2
Bangladeshi	3684	23.5	203	1.3
Indian	4355	8.4	2538	4.9
Pakistani	7151	24.5	544	1.9
Chinese	1876	8.4	1103	4.9
Any other Asian background	4328	10.5	1553	3.8
African	26794	17.4	2005	1.3
Caribbean	28689	17.8	1352	0.8
Any other Black background	9283	16.1	621	1.1
Mixed White and Asian	3469	10.9	2287	7.2
Mixed White and Black African	4482	14.9	916	3.1
Mixed White and Black Caribbean	18248	18.0	2708	2.7
Mixed other	9523	13.2	2846	3.9
White Irish	2356	9.6	1218	5.0
White other	58056	11.1	29907	5.7
Any other ethnicity	8391	15.8	1670	3.1
Not known/not stated	542110	12.4	193457	4.4

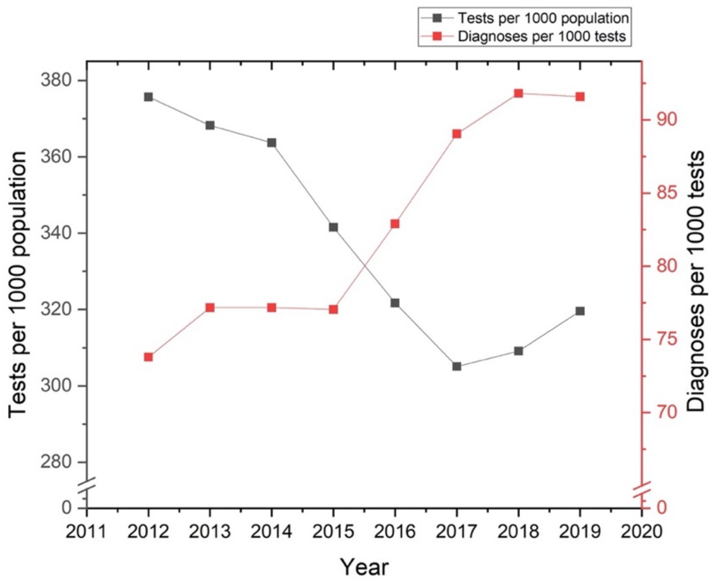
The overall number of diagnoses declined between 2012 and 2015 (falling from 85,211 to 79,576) and then rose again, reaching 84,680 in 2019. The number of tests per 1000 women aged 16-24 fell from 375.7 in 2012 to 319.6 in 2019. The number of chlamydia diagnoses per 1000 tests among this population (hereafter referred to as the chlamydia positivity rate, or CPR) also increased during this period, rising from 73.8 in 2012 to 91.6 in 2019. (Table 6.3 and Figure 6.1).

Table 6.3: Chlamydia testing and diagnosis rates in England among women between the ages of 16 and 24 (2012 - 2019)

Year	Population	Chlamydia tests	Tests per 1000 population	Chlamydia diagnoses	Chlamydia positivity rate
2012	3073993	1154804	375.7	85211	73.8
2013	3050979	1123440	368.2	86691	77.2
2014	3035522	1103984	363.7	85192	77.2
2015	3024178	1032882	341.5	79576	77.0
2016	2989586	961863	321.7	79741	82.9
2017	2947698	899342	305.1	80078	89.0
2018	2919889	902605	309.1	82871	91.8
2019	2893203	924627	319. 6	84680	91.6
Total		**8103547**		**664040**	**81.9**

Figure 6.1: Chlamydia testing and diagnosis in England among women between the ages of 16 and 24 (2012 - 2019)



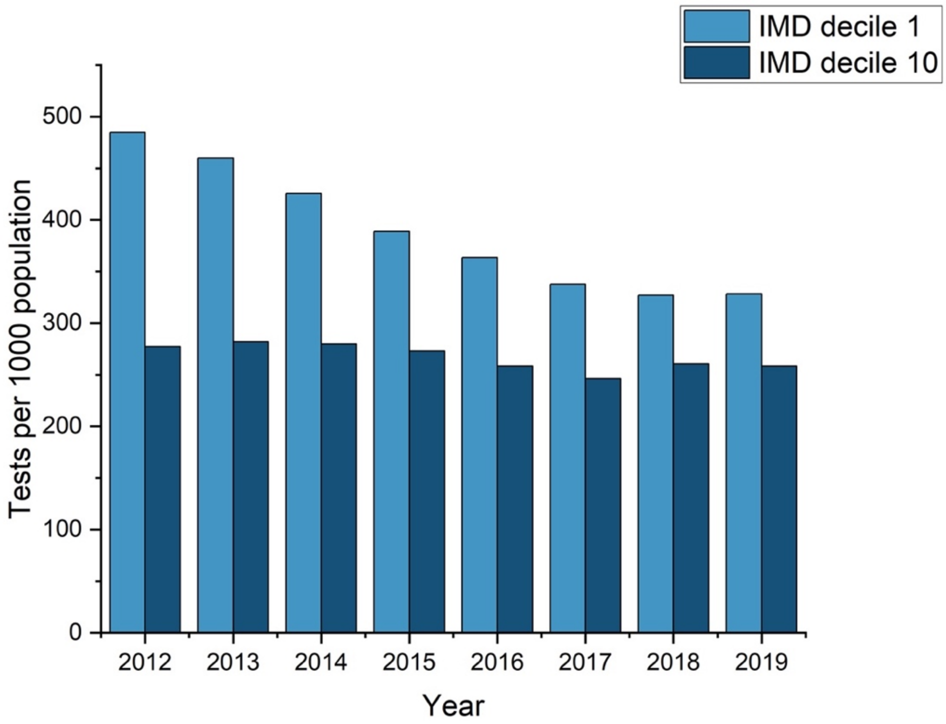


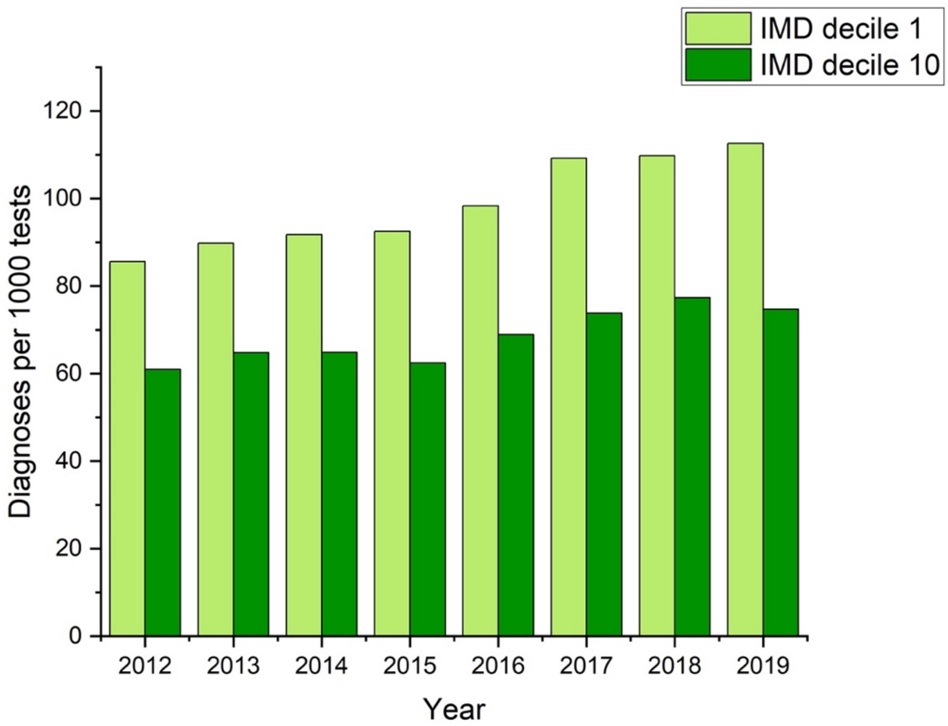
Deprivation

As with gonorrhoea, there was an inverse relationship between both chlamydia testing and diagnosis and IMD. In addition, while there was not much change in the rate of chlamydia testing in the least deprived LSOAs between 2012 and 2019, there was a fall in the rate of chlamydia test in the most deprived LSOAs during this period. In IMD decile 1, there were 485 chlamydia tests per 1000 population in 2012, and 328 chlamydia tests per 1000 population in 2019. In IMD decile 10, there were 277 chlamydia tests per 1000 population in 2012, and 258 chlamydia tests per 1000 population in 2019. With regards to diagnosis, the CPR in the lowest IMD decile was 85.6 in 2012, and 112.6 in 2019. In comparison, the CPR in the highest IMD decile was 70.0 in 2012, and 74.8 in 2019 (Figure 6.2).

A table outlining the annual number of chlamydia tests and diagnosis in each IMD decile between 2012 and 2019 can be found in Appendix 4.

Figure 6.2: Rates of chlamydia testing and diagnosis among women between the ages of 16 and 24 in IMD decile 1 and IMD decile 10 (2012 - 2019)



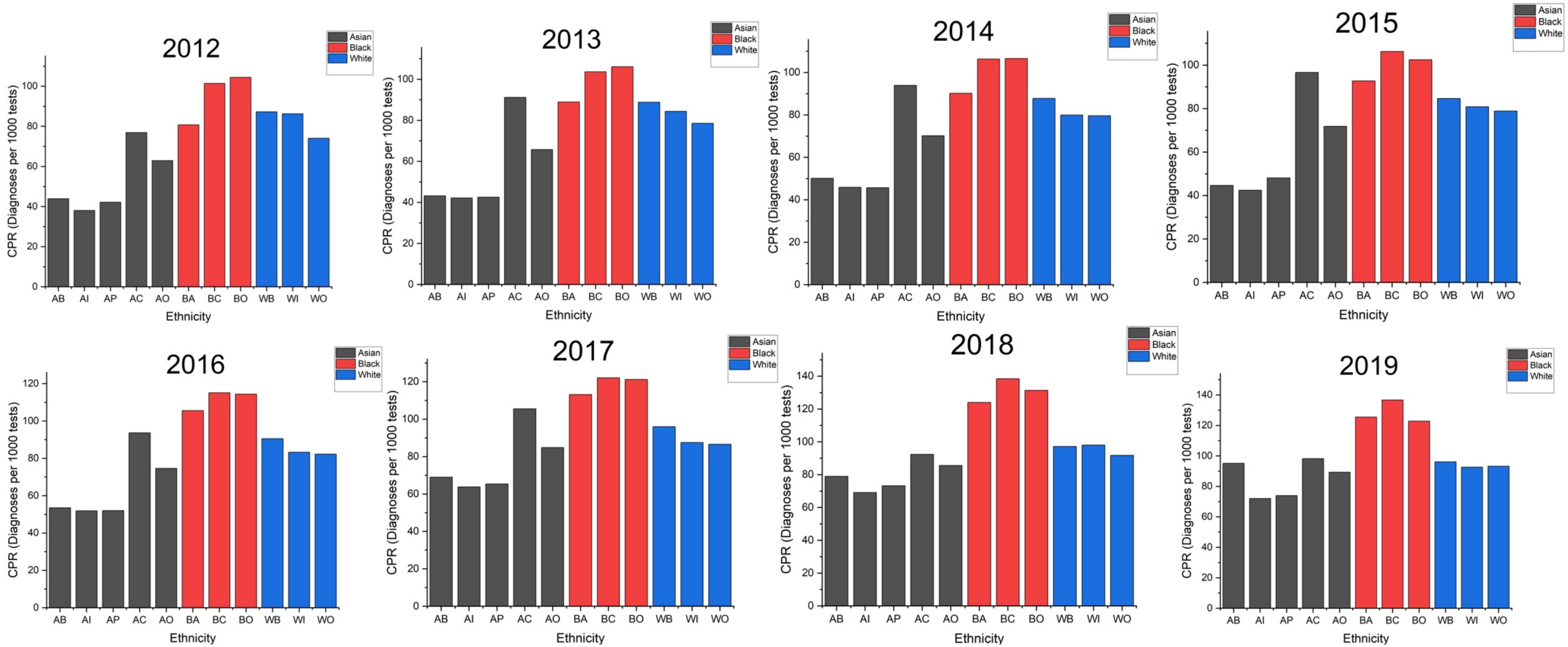


Ethnicity

Between 2012 and 2019, 3,909,601 chlamydia tests were performed on women aged 16-24 who identified their ethnicity as Asian, Black or White, and 362,905 of these tests were positive. There were 3,647,433 tests (45.0% of the total) and 256416 diagnoses (38.6% of the total) excluded from this analysis, as they were undergone by women who reported another ethnicity or who did not report any ethnicity at all (Table 6.1).

Women of Black ethnicity had the highest annual rates of chlamydia diagnosis, with women who had reported their ethnicity as Black Caribbean most commonly displaying the highest annual rate of chlamydia diagnosis. Women of Asian ethnicity had the lowest annual rates of chlamydia diagnosis, with women who had reported their ethnicity as Asian Indian most commonly displaying the lowest annual rate of chlamydia diagnosis. In 2012, CPR among Black Caribbean women was 101.4, compared to 87.2 among White British women and 38.1 among Asian Indian women. In 2019, CPR among Black Caribbean women was 136.7, compared to 96.1 among White British women and 72.0 among Asian Indian women (Figure 6.3).

Figure 6.3: CPR in England by ethnicity among women between the ages of 16 and 24 (2012 - 2019)



AB: Asian Bangladeshi AI: Asian Indian AP: Asian Pakistani AC: Asian Chinese AO: Asian other	BA: Black African BC: Black Caribbean BO: Black other WB: White British WI: White Irish WO: White other

6.2.2 Regression analyses (all levels of sexual health service)

Deprivation

Tests per 1000 population

The deprivation regression analyses displayed a negative correlation between IMD and tests per 1000 population during each year of the study period. Between 2012 and 2019, the testing rate in the least deprived decile was consistently lower than that seen in the most deprived decile, although the gap between testing rates in the most and least deprived deciles narrowed over time. In 2012, the rate ratio for this relationship was 0.57 (0.57 – 0.58), rising to 0.79 (0.78 – 0.79) by 2019 (Figure 6.4). Annual rate ratios for the relationship between testing rates in IMD decile 1 and all other IMD deciles can be found in Appendix 4.

CPR

The deprivation regression analyses also displayed a negative correlation between IMD and CPR during each year of the study period. In contrast to the pattern seen when analysing testing rates, the gap between diagnosis rates in the most deprived and least deprived areas widened over time. In 2012, the rate ratio for the relationship between diagnosis rates in IMD decile 1 and IMD decile 10 was 0.71 (0.69 – 0.74) in 2012, falling to 0.66 (0.64 – 0.69) by 2019 (Figure 6.5). Annual rate ratios for the relationship between diagnosis rates in IMD decile 1 and all other IMD deciles can be found in Appendix 4.

Ethnicity

CPR

Between 2012 and 2019, CPR varied significantly by ethnic group ($p<0.001$).

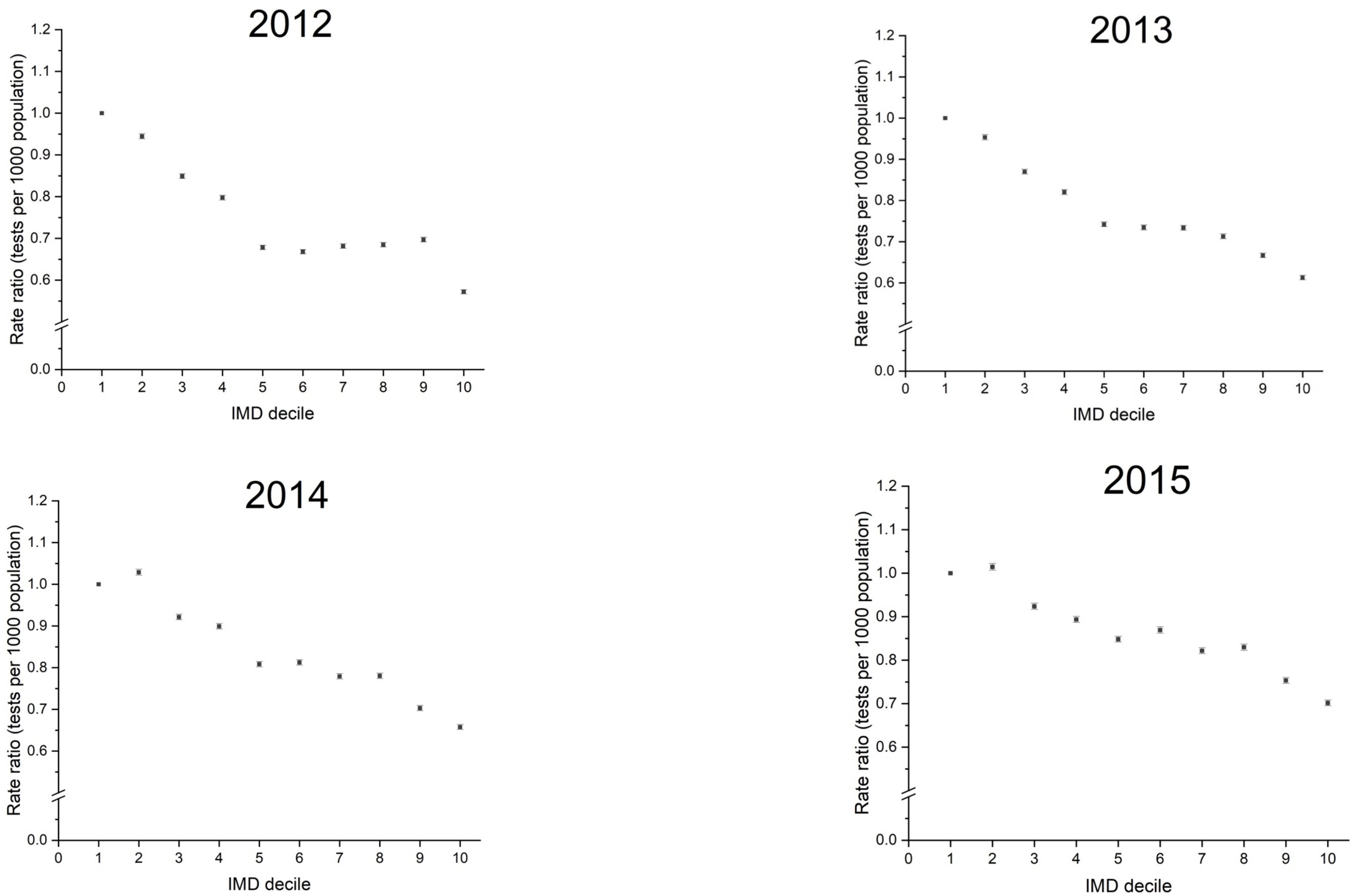
As with gonorrhoea, when compared to tests performed on women who identified as White British, tests performed on women who identified as Black were consistently more likely to be positive for chlamydia. Between 2012 and 2019, the rate ratio for the relationship between CPR among White British women and CPR among Black Caribbean women increased from 1.16 (1.11 – 1.21) to 1.42 (1.37 – 1.48), while the rate ratio for women of other Black ethnicities increased from 1.20 (1.15 – 1.25) to 1.28 (1.23 – 1.32). The rate ratio for Black African women also displayed a large increase; diagnosis rates were lower among Black African women in 2012 (RR 0.93, 0.88 – 0.98), but the rate ratio had increased to 1.30 (1.26 – 1.35) by 2019 (Figure 6.6).

For the majority of Asian ethnicities, tests among women who identified as Asian were consistently less likely to be positive than those among women who identified as White British. Between 2012 and 2019, the rate ratio for the relationship between CPR among White British women and CPR among Asian Bangladeshi women increased from 0.50 (0.41 – 0.61) to 0.99 (0.87 – 1.13). The rate ratio for Asian Indian women increased from 0.45 (0.39 – 0.49) to 0.75 (0.69 – 0.82). The rate ratio for Asian Pakistani women increased from 0.48 (0.41 – 0.57) to 0.77 (0.69 – 0.86). The rate ratio for other women of Asian ethnicity increased from 0.48 (0.41 – 0.57) to 0.93 (0.87 – 0.99). Tests among women who identified as Asian Chinese often had a similar or slightly higher rate of positivity when compared to tests on those who identified as White British, with rate ratios increasing from 0.88 (0.77 – 1.02) to 1.02 (0.92 – 1.13) (Figure 6.6).

Among women who reported White ethnicities other than White British, diagnosis rates were similar to those seen among White British women. The rate ratio for the relationship between CPR among White British women and CPR among White Irish women was 0.99 (0.87 – 1.12) in 2012 and 0.96 (0.87 – 1.07) in 2019, while the rate ratio for other women of White ethnicity increased from 0.85 (0.82 – 0.87) in 2012 to 0.97 (0.93 – 1.00) in 2019.

Annual rate ratios for the relationship between diagnosis rates among White British women and women of Asian, Black and other White ethnicities can be found in Appendix 4.

Figure 6.4: Rate ratios for relationship between the chlamydia testing rate in IMD deciles 2 – 9 and the chlamydia testing rate in decile 1 stratified by calendar year



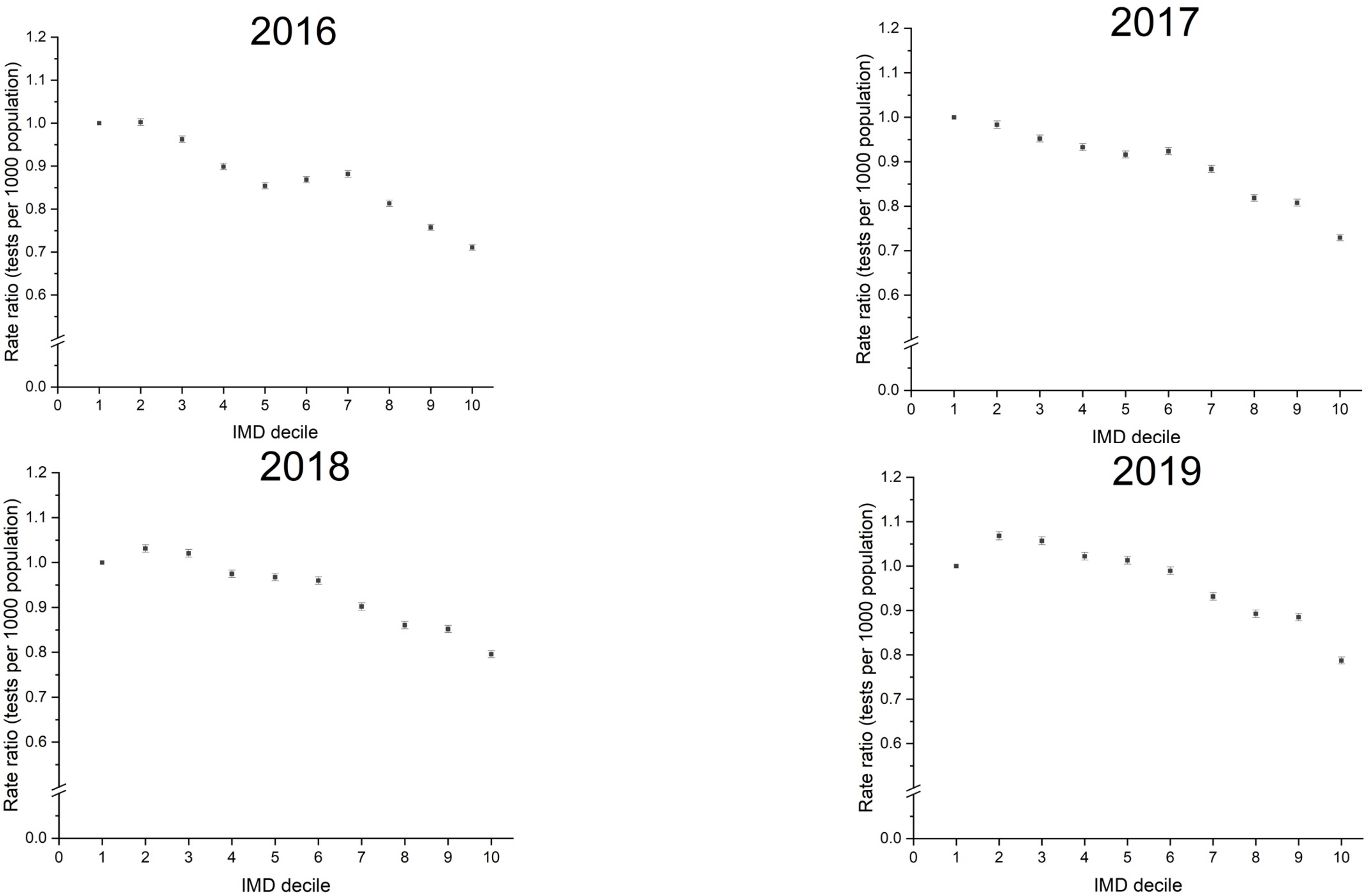

2016
2017
2018
2019
Rate ratio (tests per 1000 population)
IMD decile
1.2
1.1
1.0
0.9
0.8
0.7
0.6
0.0
0
1
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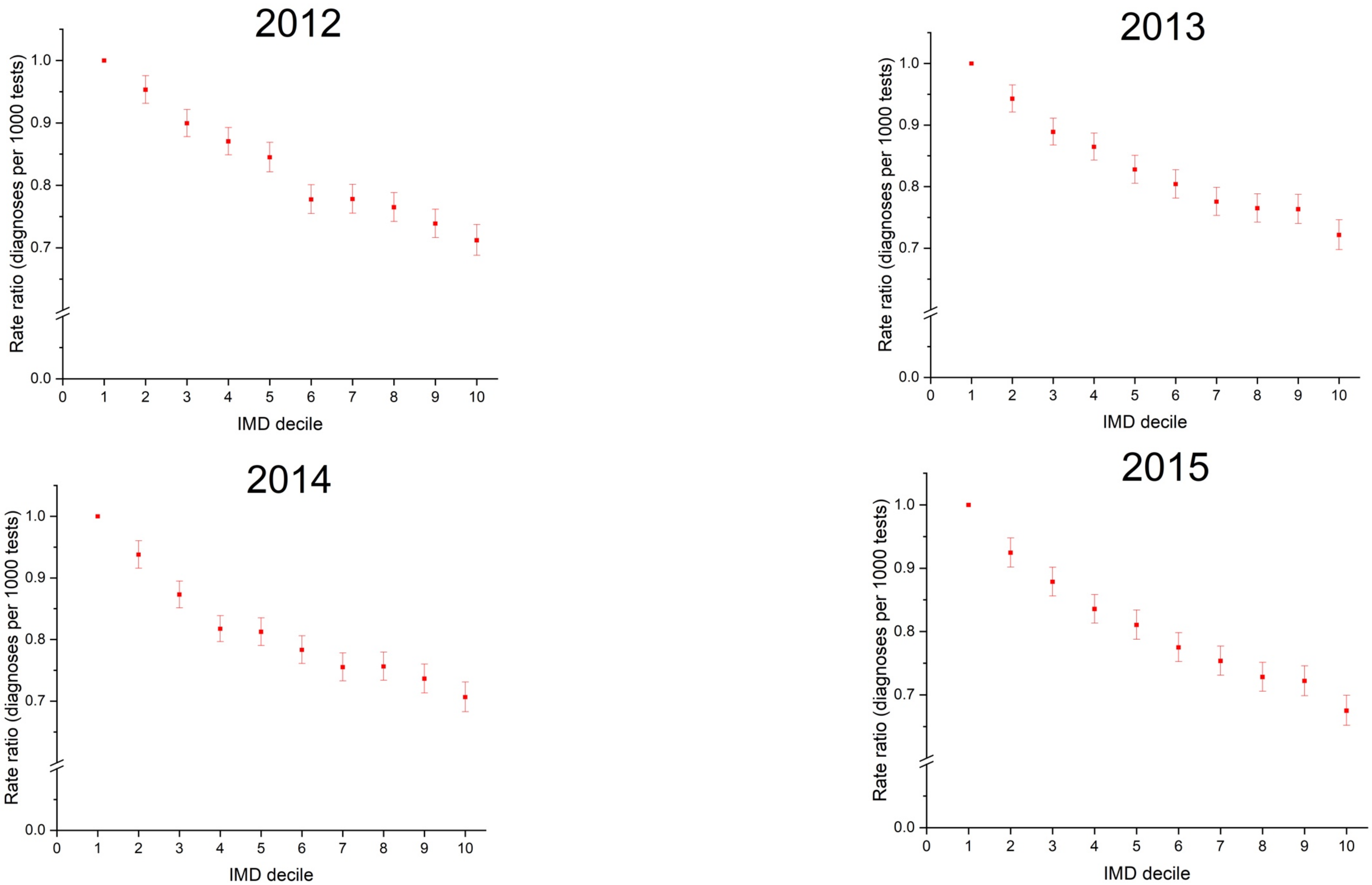
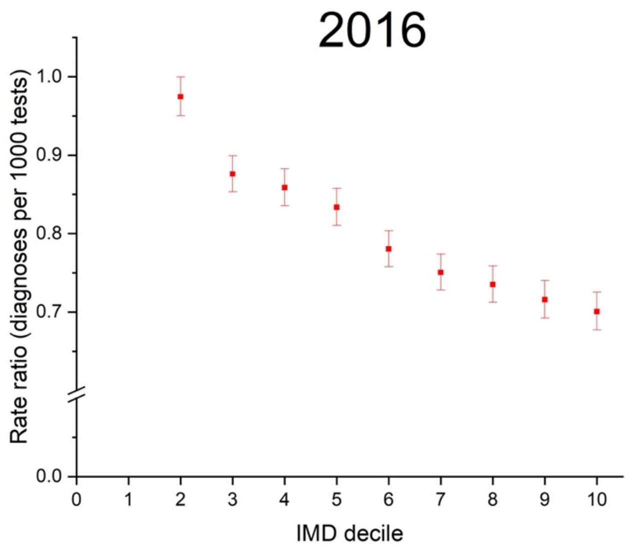
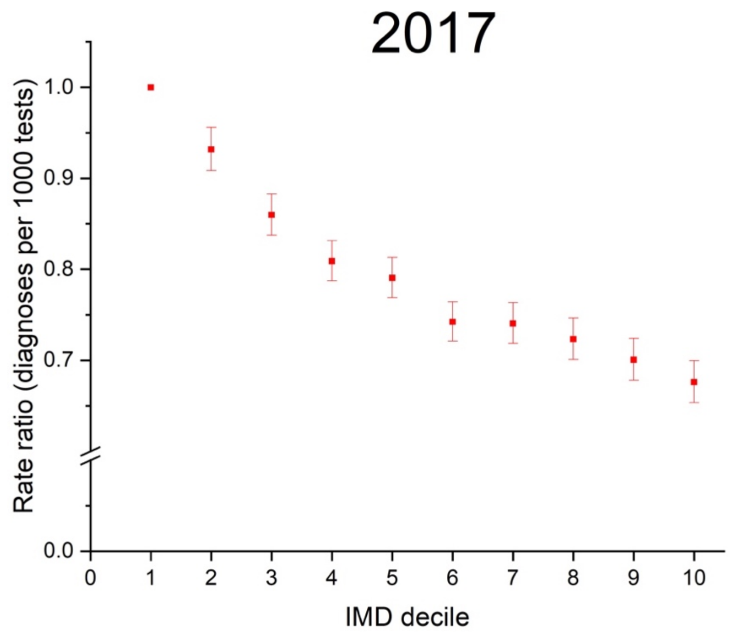
Figure 6.5: Rate ratios for relationship between the CPR in IMD deciles 2 – 9 and the CPR in decile 1, stratified by calendar year




2016
Rate ratio (diagnoses per 1000 tests)
1.0
0.9
0.8
0.7
0.0
0
1
2
3
4
5
6
7
8
9
10
IMD decile


2017
Rate ratio (diagnoses per 1000 tests)
1.0
0.9
0.8
0.7
0.0
0
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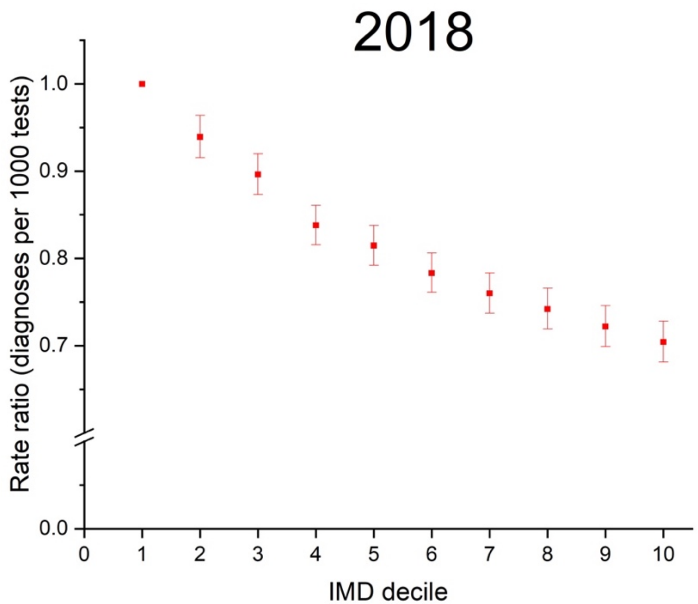
10
IMD decile


2018
Rate ratio (diagnoses per 1000 tests)
1.0
0.9
0.8
0.7
0.0
0
1
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IMD decile

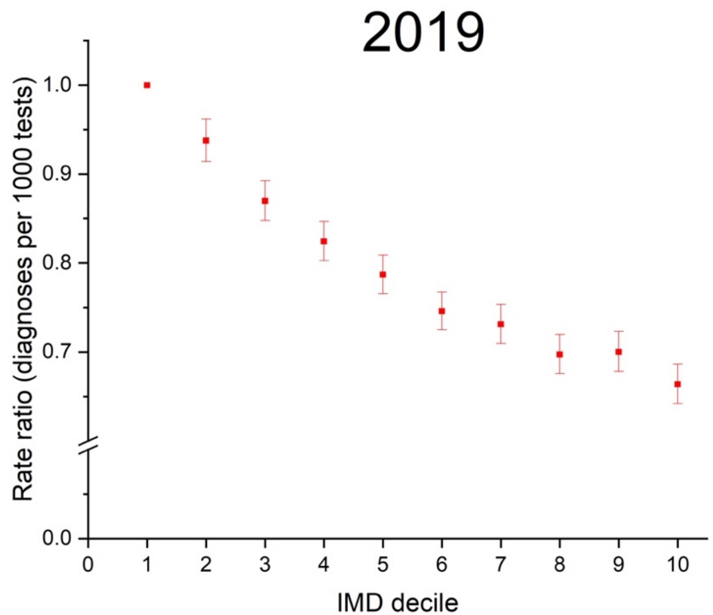
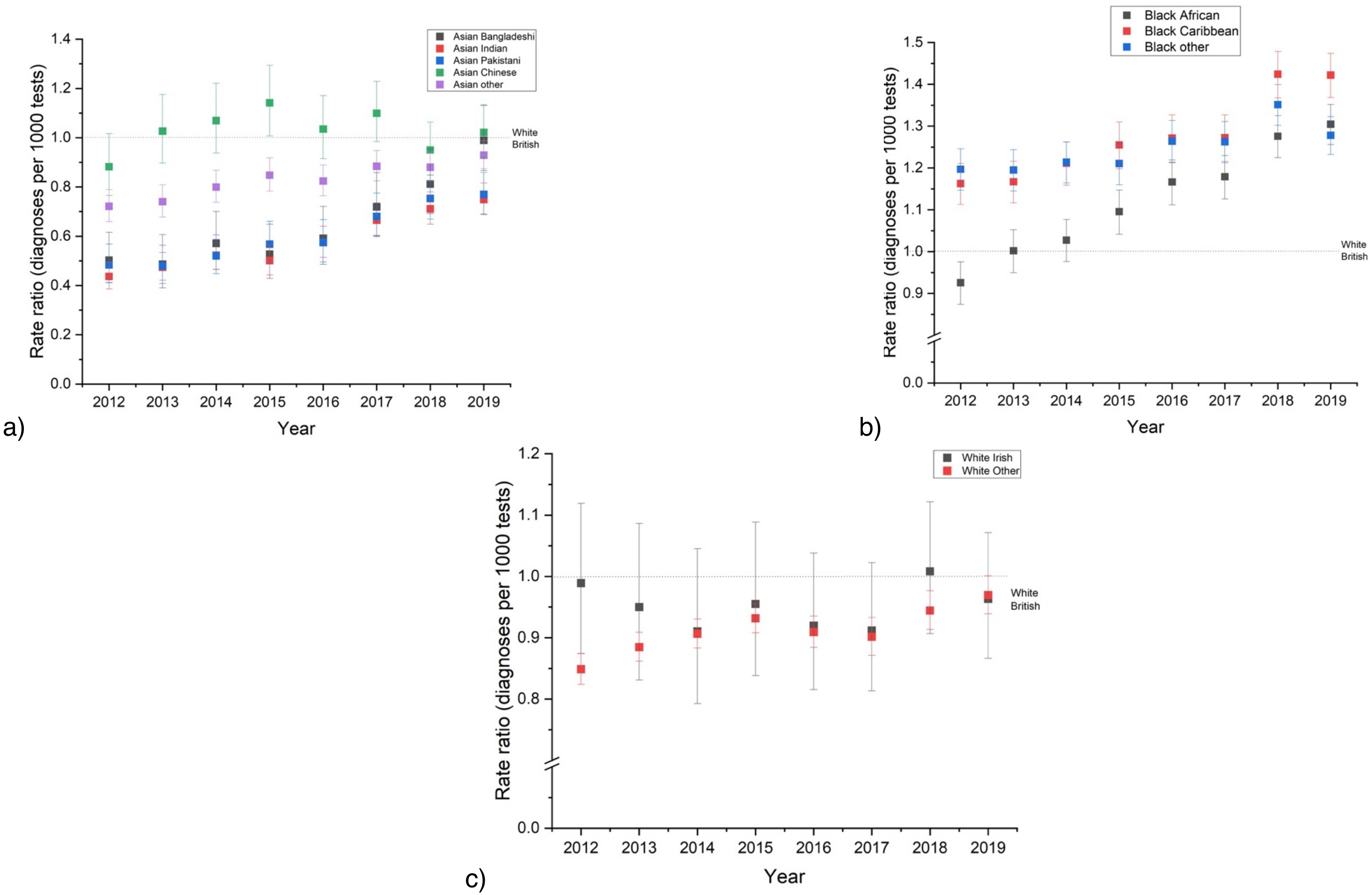

2019
Rate ratio (diagnoses per 1000 tests)
1.0
0.9
0.8
0.7
0.0
0
1
2
3
4
5
6
7
8
9
10
IMD decile

Figure 6.6:

a) **Rate ratios for relationship between the CPR among women of Asian ethnicity and the CPR among women of White British ethnicity**
b) **Rate ratios for relationship between the CPR among women of Black ethnicity and the CPR among women of White British ethnicity**
c) **Rate ratios for relationship between the CPR among women of other White ethnicities and the CPR among women of White British ethnicity**

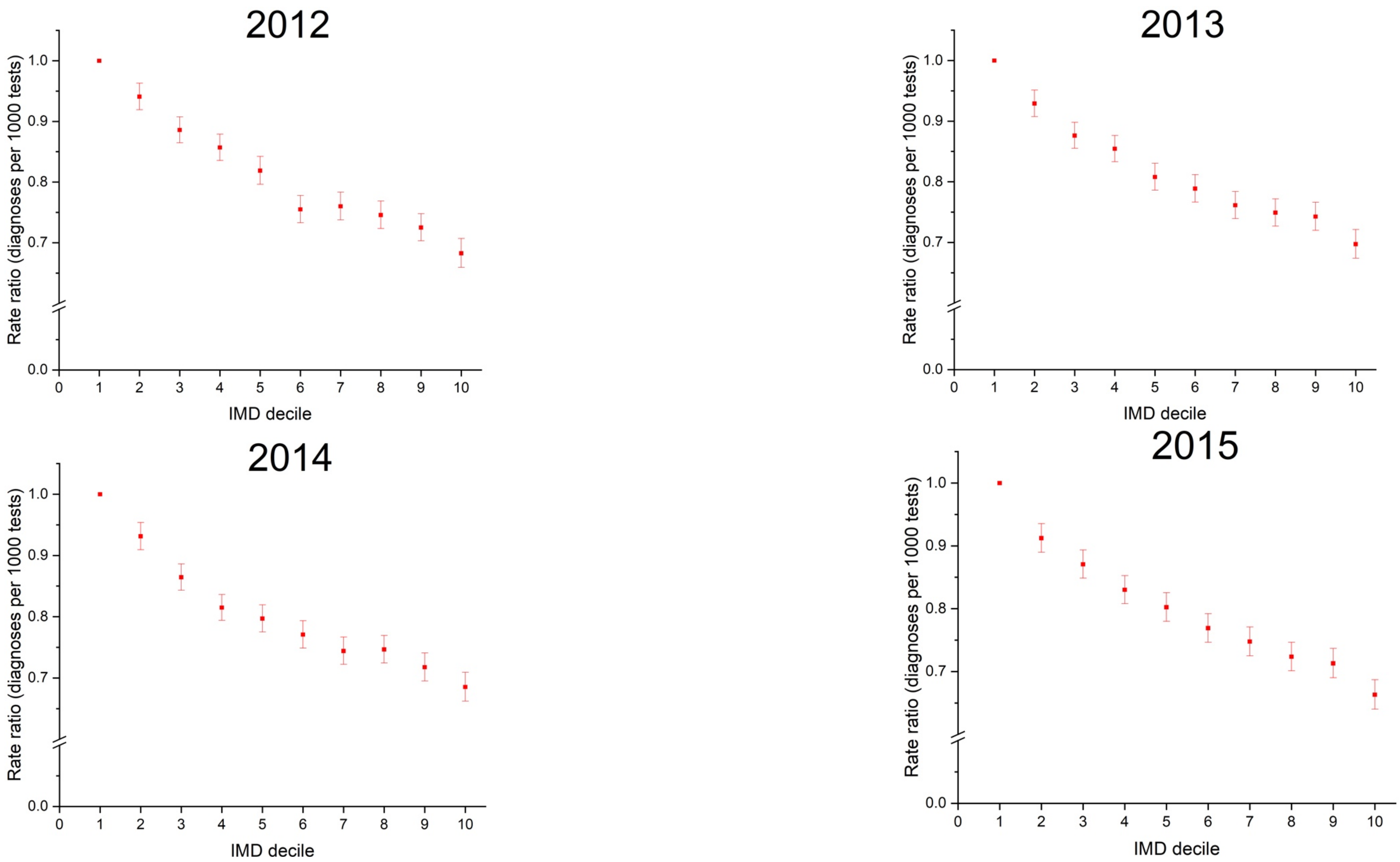


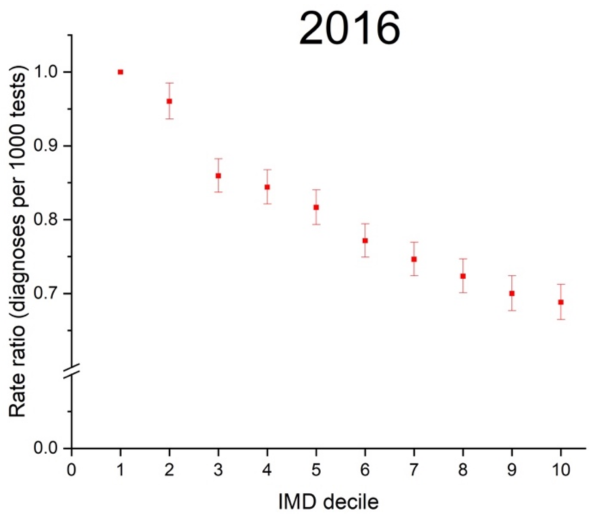
Multivariable analyses

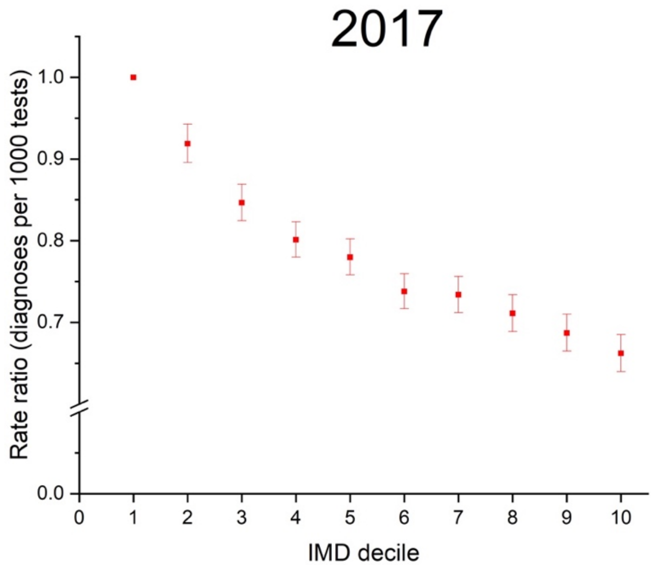
Controlling the deprivation analysis for ethnicity did not have a large impact on the relationship between deprivation and chlamydia diagnosis rates among women aged 16-24 in England. The multivariable analysis continued to suggest a negative correlation between IMD decile and diagnoses per 1000 tests. There was, however, little change in this relationship over time within the multivariable analysis. When controlled for ethnicity, the ARR for the relationship between chlamydia diagnosis rates in IMD decile 1 and IMD decile 10 was 0.68 (0.66 – 0.71) in 2012, falling slightly to 0.66 (0.64 – 0.68) by 2019 (Figure 6.7).

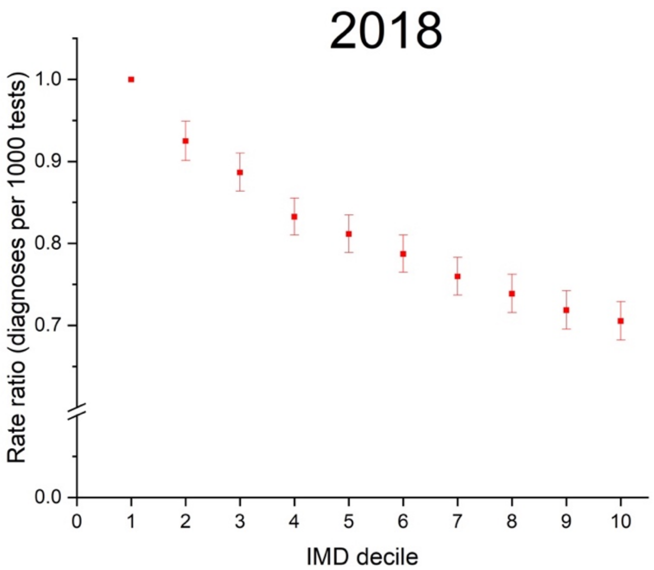
The overarching relationship between ethnicity and diagnosis rates also did not change when adjusted for deprivation. Among Asian populations, tests among women who identified their ethnicity as Bangladeshi, Pakistani, Indian and other Asian ethnicities continued to be less likely to be positive than those performed on women who identified as White British, while the ARR for the relationship between diagnosis rates among Chinese women and White British women remained close to 1. The ARR for the relationship between diagnosis rates among women of non-British white ethnicity and diagnosis rates among White British women also remained close to 1. While tests among most women of Black ethnicity continued to be more likely to be positive than those among women of White British ethnicity, the gap between diagnosis rates among Black women and diagnosis rates among White British women narrowed once adjusted for deprivation. The ARR for the relationship between diagnosis rates among Black African women and white British women rose from 0.86 (0.82 – 0.91) in 2012 to 1.22 (1.17 – 1.26) in 2019. The ARR for Black Caribbean women rose from 1.08 (1.04 – 1.13) in 2012 to 1.32 (1.27 – 1.37) in 2019, and the ARR for other women of Black ethnicity rose from 1.12 (1.08 – 1.17) in 2012 to 1.21 (1.17 – 1.25) in 2019 (Figure 6.8).

Figure 6.7: Rate ratios for relationship between the CPR in IMD deciles 2 – 9 and the CPR in decile 1 (controlled for ethnicity and stratified by year)




2016
Rate ratio (diagnoses per 1000 tests)
1.0
0.9
0.8
0.7
0.0
0
1
2
3
4
5
6
7
8
9
10
IMD decile


2017
Rate ratio (diagnoses per 1000 tests)
1.0
0.9
0.8
0.7
0.0
0
1
2
3
4
5
6
7
8
9
10
IMD decile


2018
Rate ratio (diagnoses per 1000 tests)
1.0
0.9
0.8
0.7
0.0
0
1
2
3
4
5
6
7
8
9
10
IMD decile

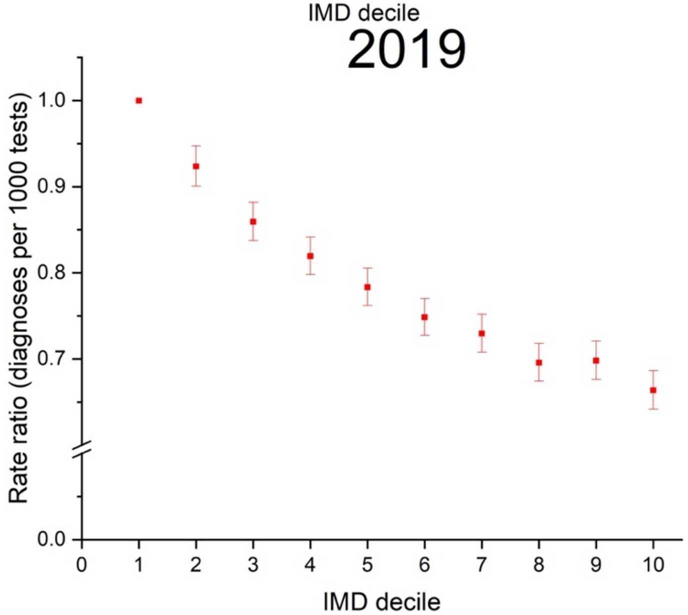
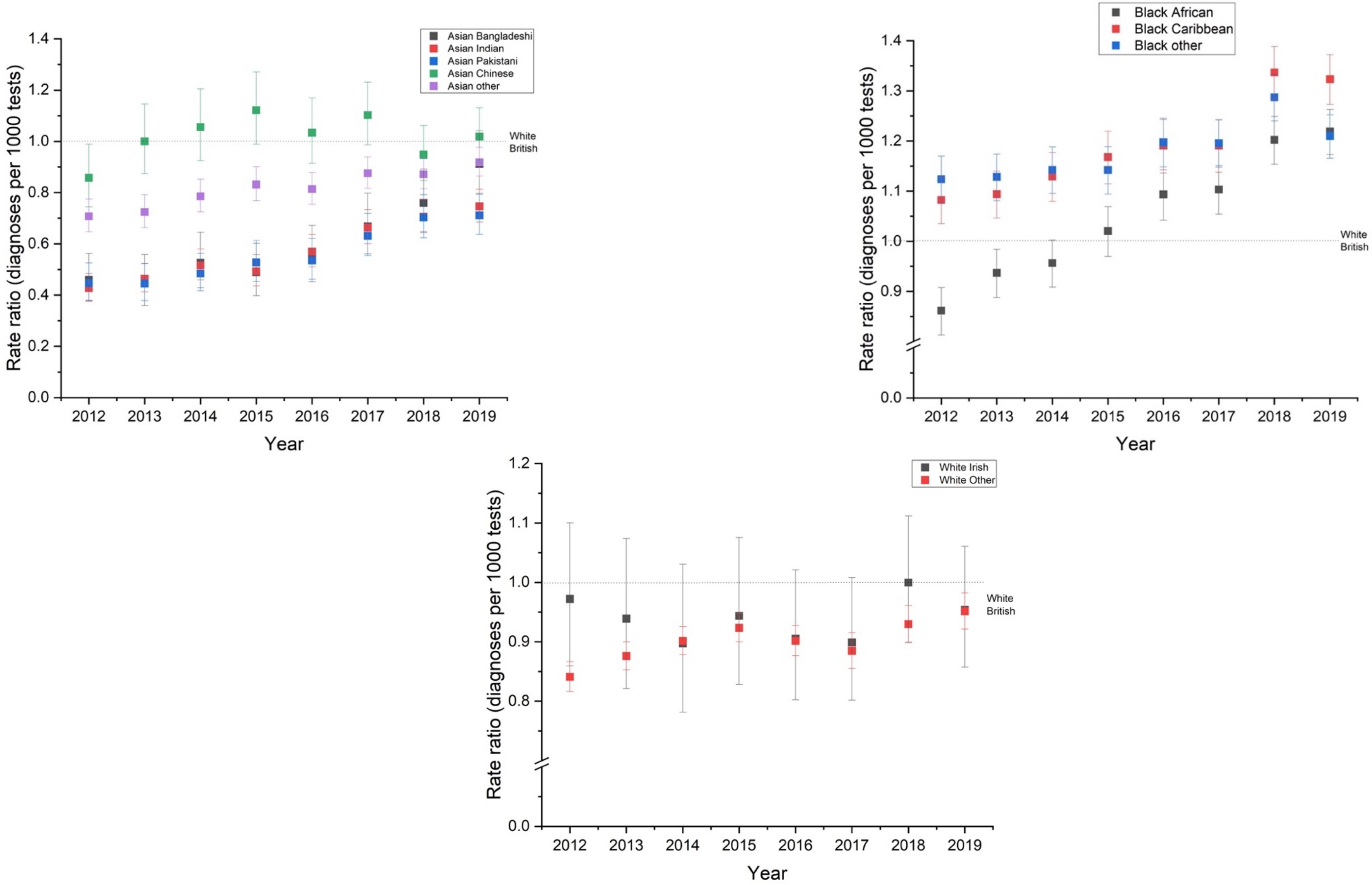

2019
Rate ratio (diagnoses per 1000 tests)
1.0
0.9
0.8
0.7
0.0
0
1
2
3
4
5
6
7
8
9
10
IMD decile

Figure 6.8:

a) Rate ratios for relationship between the CPR among women of Asian ethnicity and the CPR among women of White British ethnicity (controlled for deprivation and stratified by year)
b) Rate ratios for relationship between the CPR among women of Black ethnicity and the CPR among women of White British ethnicity (controlled for deprivation and stratified by year)
c) Rate ratios for relationship between the CPR among women of other White ethnicities and the CPR among women of White British ethnicity (controlled for deprivation and stratified by year)



6.2.3 Level 3 analysis

Overview

Between 2012 and 2019, 2,730,014 chlamydia tests within the target population were recorded by Level 3 sexual health services, and 288,552 (10.6%) of these tests were positive. Overall, 12.1% of the tests in the Level 3 dataset were performed in the LSOAs in the most deprived decile, compared to 7.2% in the LSOAs in the least deprived decile. Similarly, 14.7% of the diagnoses in the Level 3 dataset occurred in the LSOAs in the most deprived decile, compared to 5.9% in the LSOAs in the least deprived decile.

There were 2,564,049 Level 3 chlamydia tests were performed on women who identified their ethnicity as Asian, Black or White, and 271997 of these tests were positive. The majority of tests (69.2%) and diagnoses (69.4%) were among women who reported their ethnicity as White British. 165,965 tests (6.1% of the total) and 16,555 diagnoses (5.7% of the total) were excluded from this analysis, as they were among women who reported another ethnicity or who did not report any ethnicity at all (Table 6.4).

Table 6.4: Overall characteristics of women whose Level 3 chlamydia tests and diagnoses were included in this dataset

		Chlamydia tests		Chlamydia diagnoses	
		N	%	N	%
Total		2730014	100	288552	100
IMD (2015)					
(most deprived)	1	330731	12.1	42500	14.7
	2	367484	13.5	42914	14.9
	3	350226	12.8	38258	13.3
	4	315553	11.6	33569	11.6
	5	273529	10.0	27790	9.6
	6	242184	8.8	23969	8.3
	7	230032	8.4	22176	7.7
	8	218086	8.0	20894	7.2
	9	205504	7.5	19253	6.7
	10	196672	7.2	17141	5.9
Ethnicity					
	White British	1890000	69.2	200216	69.4
	Bangladeshi	8099	0.3	643	0.2
	Indian	27002	1.0	1803	0.6
	Pakistani	15590	0.6	1177	0.4
	Chinese	13740	0.5	1478	0.5
	Any other Asian background	23095	0.8	2071	0.7
	African	101325	3.7	11487	4.0
	Caribbean	101528	3.7	12665	4.4
	Any other Black background	34261	1.3	4180	1.4
	Mixed White and Asian	19809	0.7	1825	0.6
	Mixed White and Black African	19187	0.7	2228	0.8
	Mixed White and Black Caribbean	63313	2.3	8210	2.8
	Mixed other	42342	1.6	4446	1.5
	White Irish	16294	0.6	1501	0.5
	White other	188451	6.9	17979	6.2
	Any other ethnicity	33999	1.2	3340	1.2
	Not known/not stated	131966	4.8	13215	4.6

Deprivation

Tests per 1000 population

Regression analysis of Level 3 data revealed a somewhat different relationship between deprivation and chlamydia testing rates than that observed when analysing data collected from all levels of sexual health service. In 2012, testing rates in deciles 1 and 10 were very similar (RR 0.96, 0.95 – 0.98), with the rate ratios for other IMD deciles falling near or above 1. The gap between testing rates in the most and least deprived deciles then widened over time; the rate ratio for the relationship between testing rates in IMD decile 1 and IMD decile 10 in 2019 was 0.77 (0.76 – 0.79) (Figure 6.9).

CPR

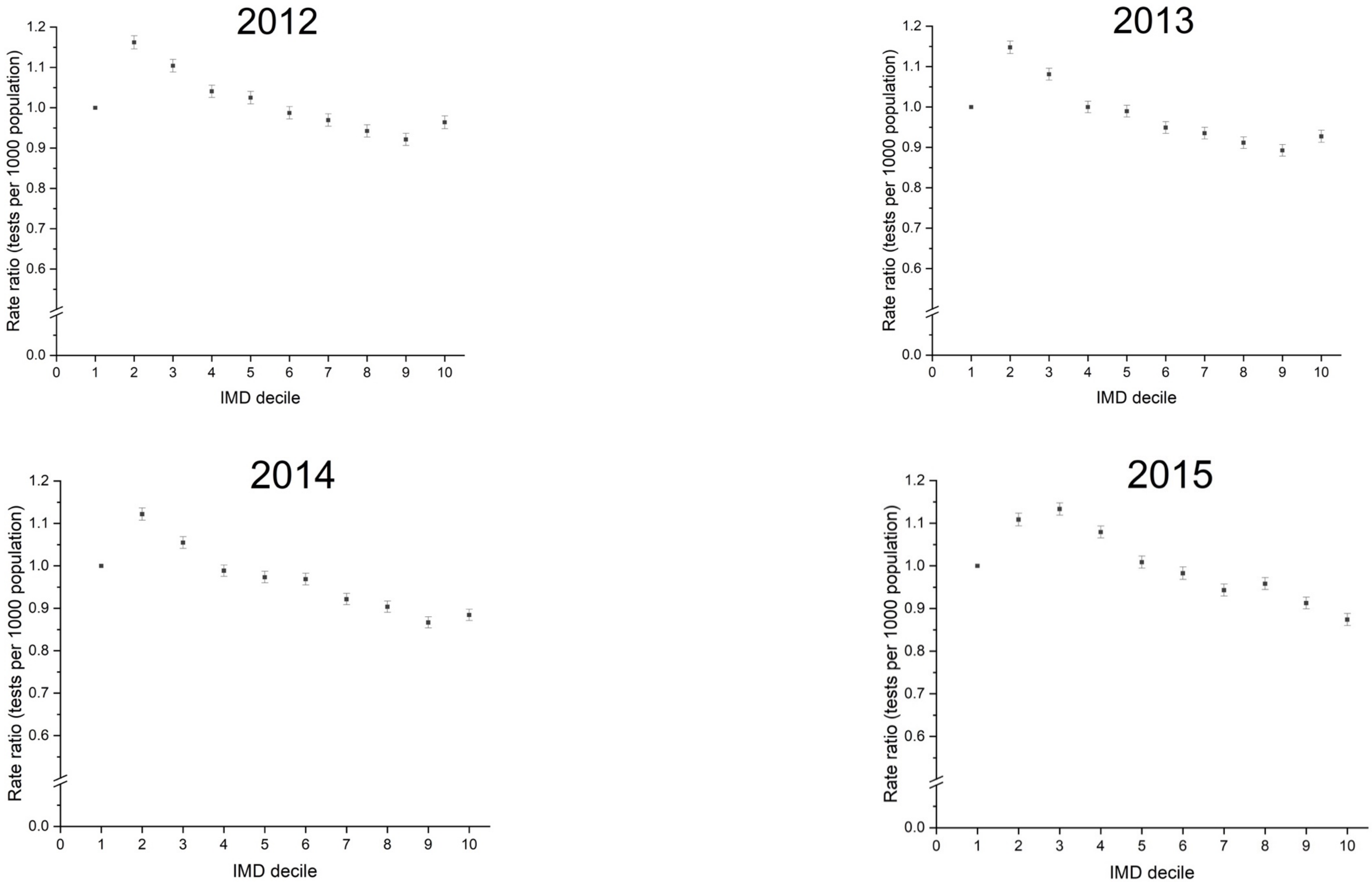
Results of the regression analysis examining diagnosis rates using Level 3 data were more similar to those seen in the entire dataset, with a negative correlation between diagnosis rates and IMD decile. The gap between diagnosis rates in the most and least deprived areas was relatively stable over time: the rate ratio for the relationship between diagnosis rates in IMD decile 1 and IMD decile 10 was 0.67 (0.63 – 0.71) in 2012 and 0.67 (0.64 – 0.71) in 2019 (Figure 6.10).

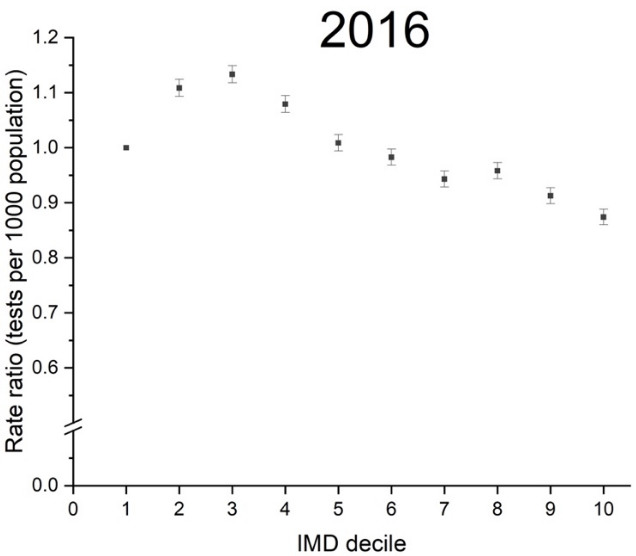
Ethnicity

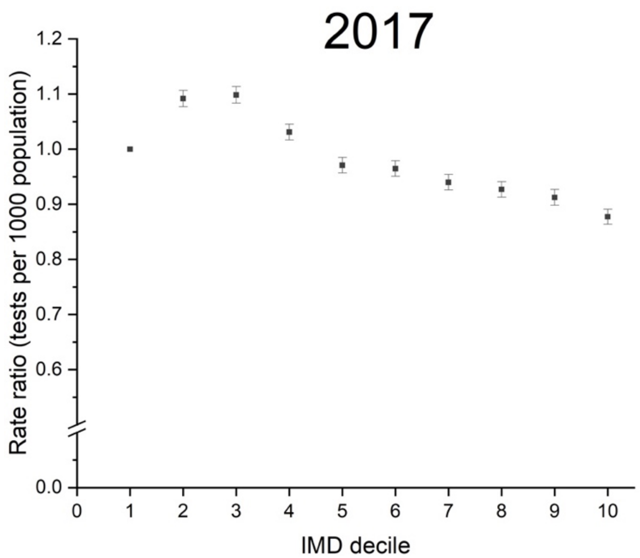
For most ethnicities, the relationship between ethnicity and CPR within the Level 3 was similar to that seen within the full dataset. Bangladeshi, Indian and other women of Asian descent had lower diagnosis rates than White British women, while Chinese women had diagnosis rates that were similar to those of White British women. Diagnosis rates among Black Caribbean women were consistently higher than those of White British women, while diagnosis rates among Black African women were lower than those of White British women until 2015, at which point they became consistently higher than rates among White British women. Diagnosis rates were slightly lower among White Irish women and other women of White ethnicity when compared to rates among White British women.

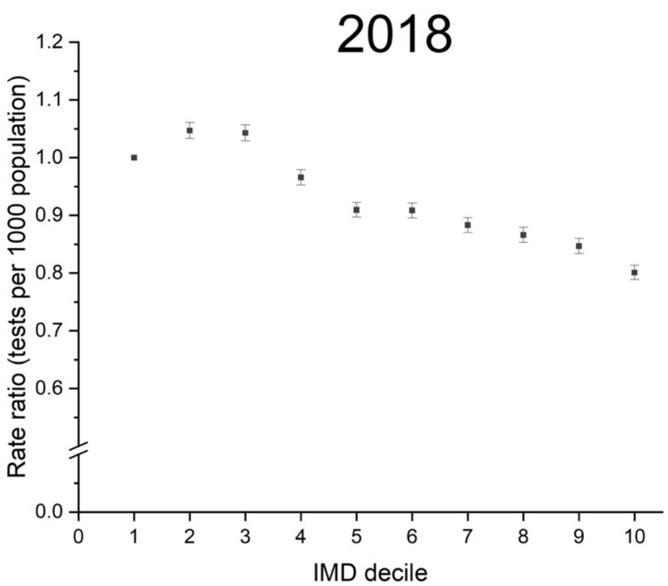
For two ethnicities, there was a noticeable difference between the results of the full regression analysis and the Level 3 regression analysis. When compared to diagnosis rates among White British women, diagnosis rates among Pakistani women – when calculated using the full dataset – were much lower (RR 0.48, 0.41 – 0.57 in 2012, RR 0.77, 0.69 – 0.86 in 2019). In comparison, Level 3 diagnosis rates among Pakistani women were only slightly lower (and in some years, slightly higher): the rate ratio for this relationship was 0.88 (0.82 – 0.93) in 2012 and 0.89 (0.85 – 0.92) in 2019. When compared to diagnosis rates among White British women, diagnosis rates among women who reported their ethnicity as 'Black other' – when calculated using the full dataset – were much higher (RR 1.20, 1.15 – 1.25 in 2012, RR 1.28, 1.23 – 1.32 in 2019). In comparison, Level 3 diagnosis rates among 'Black other' women were only slightly higher (and in 2012, slightly lower): the rate ratio for this relationship was 0.98 (0.92 – 1.05) in 2012 and 1.09 (1.03 – 1.16) in 2019 (Figure 6.11).

Figure 6.9: Rate ratios for relationship between the chlamydia testing rate in IMD deciles 2 – 9 and the chlamydia testing rate in decile 1 stratified by calendar year (Level 3 data)




2016
Rate ratio (tests per 1000 population)
1.2
1.1
1.0
0.9
0.8
0.7
0.6
0.0
0 1 2 3 4 5 6 7 8 9 10
IMD decile


2017
Rate ratio (tests per 1000 population)
1.2
1.1
1.0
0.9
0.8
0.7
0.6
0.0
0 1 2 3 4 5 6 7 8 9 10
IMD decile


2018
Rate ratio (tests per 1000 population)
1.2
1.1
1.0
0.9
0.8
0.7
0.6
0.0
0 1 2 3 4 5 6 7 8 9 10
IMD decile

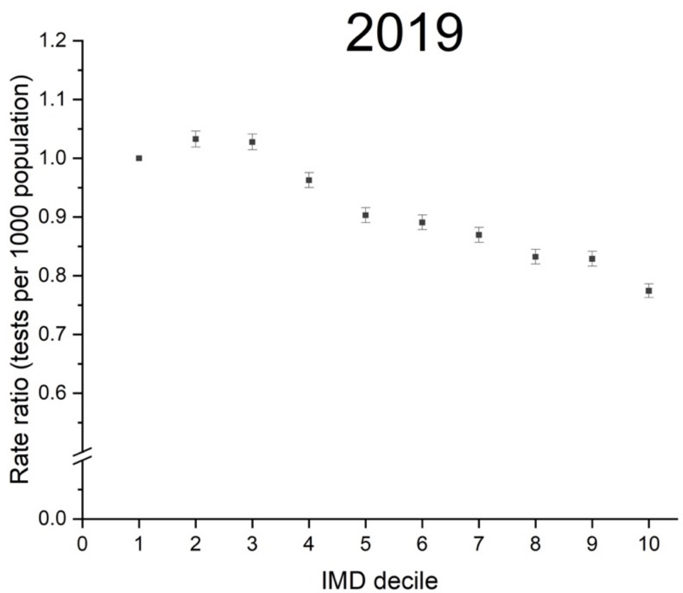
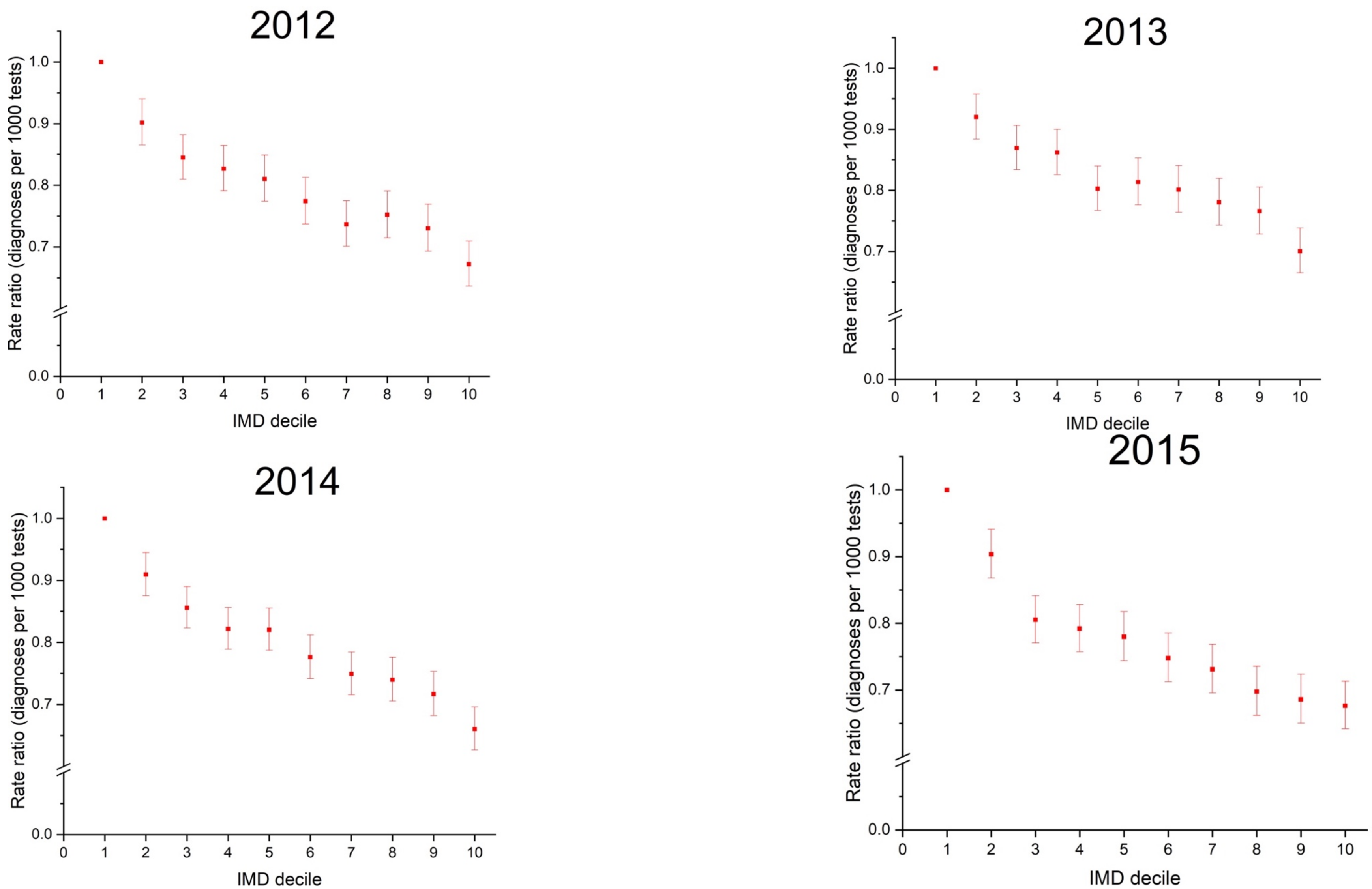

2019
Rate ratio (tests per 1000 population)
1.2
1.1
1.0
0.9
0.8
0.7
0.6
0.0
0 1 2 3 4 5 6 7 8 9 10
IMD decile

Figure 6.10: Rate ratios for relationship between the CPR in IMD deciles 2 – 9 and the chlamydia testing rate in decile 1, stratified by calendar year (Level 3 data)



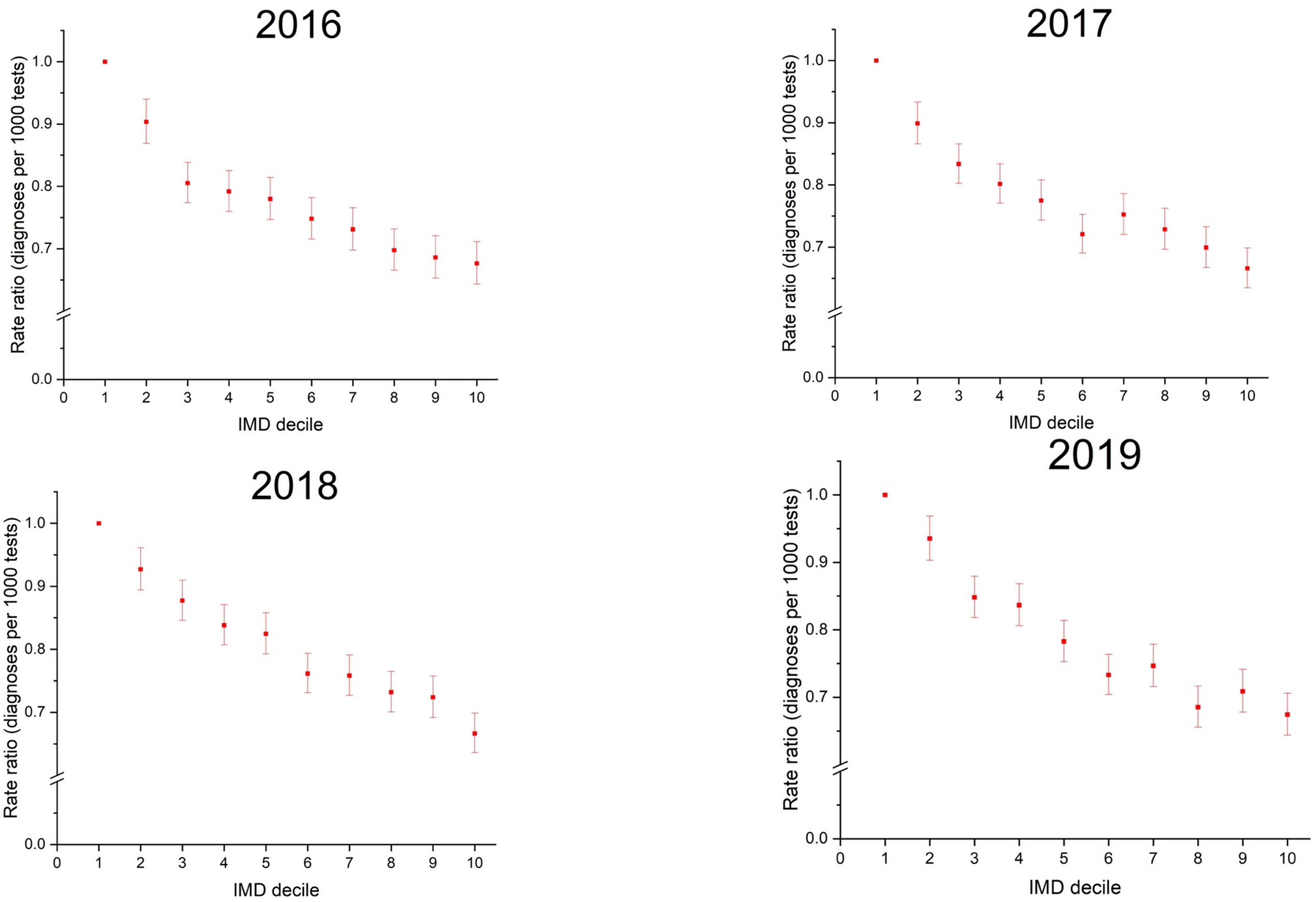
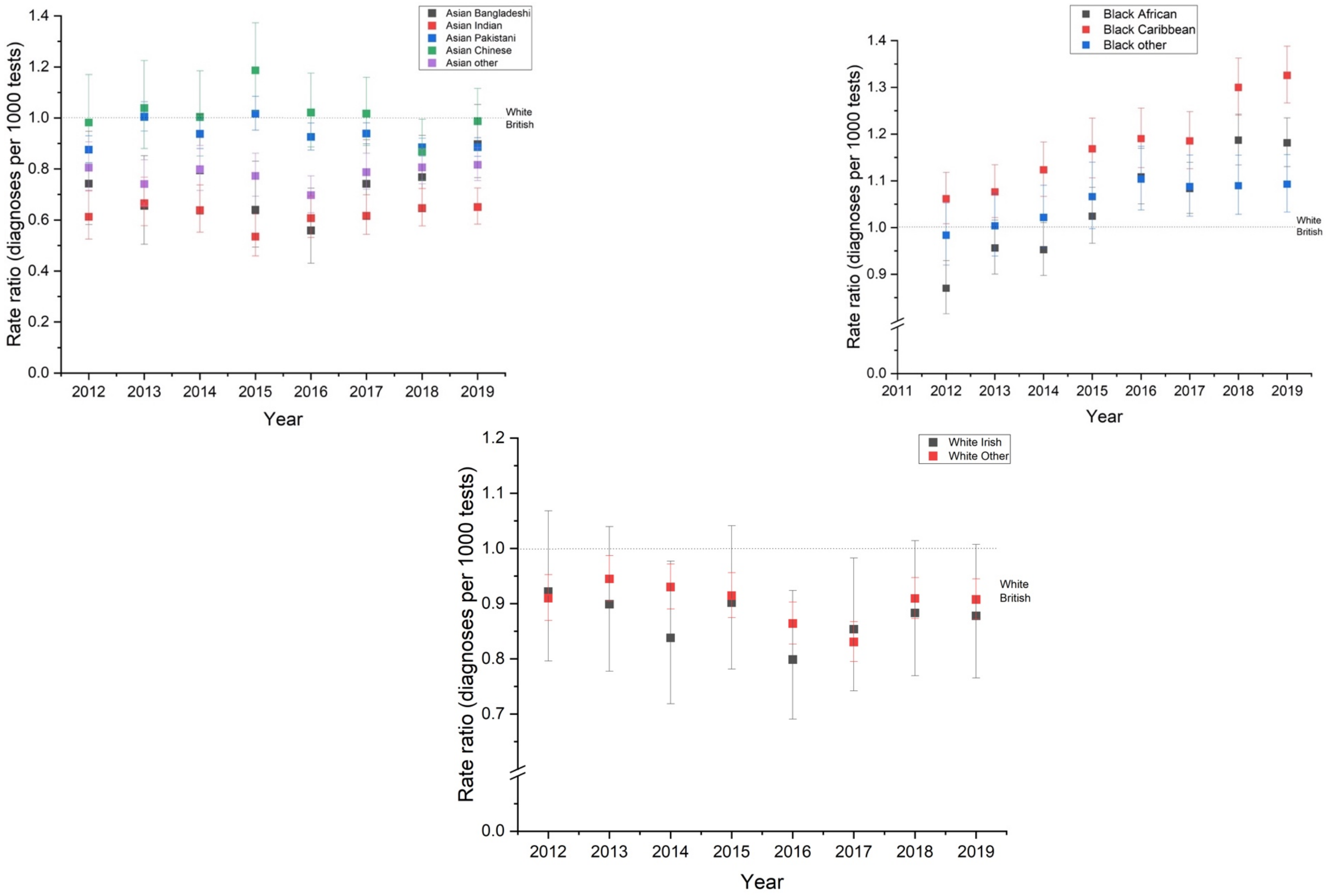

2016
2017
2018
2019
Rate ratio (diagnoses per 1000 tests)
IMD decile
0.0
0.7
0.8
0.9
1.0
0
1
2
3
4
5
6
7
8
9
10

Figure 6.11:

a) **Rate ratios for relationship between the CPR among women of Asian ethnicity and the CPR among women of White British ethnicity (controlled for deprivation and stratified by year, Level 3 data)**

b) **Rate ratios for relationship between the CPR among women of Black ethnicity and the CPR among women of White British ethnicity (controlled for deprivation and stratified by year, Level 3 data)**

c) **Rate ratios for relationship between the CPR among women of other White ethnicities and the CPR among women of White British ethnicity (controlled for deprivation and stratified by year, Level 3 data)**



6.3 Discussion

6.3.1 Key findings

Between 2012 and 2019, the number of chlamydia tests among this population (and the number of tests per 1000 population) fell dramatically, particularly between 2012 and 2017. This pattern was not mirrored by diagnosis rates: in particular, the rate of positivity increased steadily between 2012 and 2019.

When examining the impact of deprivation on testing and diagnosis, patterns were very similar to those seen when analysing gonorrhoea-related outcomes. For both infections, there was an inverse relationship between IMD and both testing rate (per 1000 population) and positivity rate, indicating that more testing occurred in more deprived areas, and that tests in these areas were more likely to be positive. The relationship between ethnicity and diagnosis also followed similar patterns to those seen when examining gonorrhoea-related outcomes. Chlamydia tests among women whose ethnicity was classified as either Black Caribbean or Black Other were between 1.2 and 1.5 times more likely than to be positive than those taken by women whose ethnicity was classified as White British.

Multivariable regression analysis of these relationships (using a model that incorporated both deprivation and ethnicity) indicated that controlling for each of these demographic variables has little impact on the overall pattern observed. Limiting the analysis to data collected from Level 3 sexual health centres also did not have a large impact on the overall disparities observed.

6.3.2 Implications

Patterns of inequality – gonorrhoea and chlamydia

The results of the analyses described in Chapters 5 and 6 indicate a pattern of inequality within sexual health: testing and diagnosis rates for chlamydia and gonorrhoea appear to be higher in more deprived communities, and also appear to be higher among women of Black ethnicity (when compared to women of White British ethnicity). Analyses of the impact of deprivation and Black ethnicity both reached statistical significance, however interpretation of statistical significance within this analysis needs to take into account the size of the dataset, which makes it likely to produce statistically significant results even for very small differences in outcome. Similarly, the analyses involving Asian populations that did not reach statistical significance are likely to have been affected by the relatively small number of gonorrhoea and chlamydia tests within these populations. The size and direction of the correlation, however, indicate levels of disparity in outcome between groups that are likely to be relevant from a service development and policy perspective.

These findings are broadly consistent with the published literature; multiple investigations within the UK (including other analyses of PHE data) have indicated higher STI diagnosis rates within more deprived populations and populations who have been designated as having Black ethnicity[32,190,191]. One of the major studies in this area that has reported differing results is the third iteration of the National Survey of Sexual Attitudes and Lifestyles (Natsal-3). Although many of the findings within this analysis were similar to those seen in Natsal, analyses of Natsal-3 data have previously indicated that although chlamydia prevalence was higher among women aged 16-24 who lived in more deprived areas, testing was not associated with deprivation[192]. This may, however, be to do with the timescales of data analysis – Natsal data was collected between September 2010 and August 2012, meaning that the results largely predate this dataset. In addition, the discrepancy may be related to the difference in methodology – Natsal uses questionnaire data to ascertain testing, and calculates chlamydia prevalence using urine samples from a certain proportion of respondents[193], methods which may produce different results to analyses of routine datasets.

There are likely to be multiple reasons for the trends seen in these analyses. The most intuitive are a combination of differential risk profiles and differential access to services. When examining the correlation between testing, diagnosis and deprivation, the fact that there are more gonorrhoea and chlamydia tests per 1000 population in deprived LSOAs and that these tests are more likely to be positive appears to indicate an increased demand for services in more deprived areas that is concurrent with an increased risk of infection. Similarly, the consistently increased likelihood of a positive test among Black women when compared to White women appears to indicate an increased prevalence among this ethnic group. Although changes in test positivity can be ascribed to differences in screening practices, population composition and even test technology[194], multiple studies have found that the impact of these confounders on population STI positivity is often not significant[195–197]. The fact that these patterns of inequality persist when examining testing and diagnosis rates for both chlamydia and gonorrhoea are a further indication of a genuine disparity in outcome.

Directly ascribing unmet need to these results, however, is particularly complex. A disparity in the absolute number of STI diagnoses, for example, does not necessarily indicate that the group with the higher number of diagnoses has a higher STI incidence, as this result would likely be biased by differences in test uptake between populations[194]. It is even difficult to define a high testing or diagnosis rate as a negative reflection of unmet need at the population level, as both of these may be the desirable consequence of programmes that are targeted towards high risk groups. It is important, therefore, when using these data to create an indicator of unmet need, to use the results of this analysis in a way that is most likely to indicate need, rather than differential service use.

The multivariable analyses within this chapter indicate that while relationships between deprivation, ethnicity and STI diagnosis rates are intertwined, the drivers of these two relationships are likely to be different. The distribution of different ethnic groups (i.e. the fact that racially minoritised people are more likely to live in more deprived areas than white people) does not appear to be a significant contributor to the negative correlation between IMD and GPR/CPR. Within these analyses, when the IMD analysis was controlled for ethnicity, the linear relationship between IMD and diagnosis rates (in which diagnosis rates fell with each increase in IMD decile) was similar to that seen within the univariate analyses. The relationship between IMD and diagnosis, however, appeared to differ between ethnic groups. Similarly, controlling the ethnicity analyses for deprivation did not have a large impact on the relationship between positivity rate and ethnicity. When controlled for IMD, the pattern of the ethnicity analyses remained much the same, with positivity rate being higher among certain Black ethnicities and lower among certain Asian ethnicities when compared to the rate among White British women.

Overall, the multivariable analyses indicated that the ethnic distribution of the population is not a large contributor to the relationship between deprivation and STI diagnosis rates, and that the prevalence of deprivation among racially minoritised communities is not a significant driver of the relationship between ethnicity and STI diagnosis rates. While these two relationships mirror each other, it would appear that they have separate causes, indicating that both relationships would benefit from further, mixed-methods, investigation at a more granular level.

Role of the NCSP

While the overarching patterns of disparity (higher testing and diagnosis rates among more deprived and Black Caribbean communities) were similar across STI analyses, there were differences between the gonorrhoea analysis, the full chlamydia analysis and the Level 3 chlamydia analysis. Between 2012 and 2019 there has been an increase in gonorrhoea testing among women aged 16-24, an increase that was particularly noticeable between 2016 and 2019. Chlamydia testing did not follow the same pattern and was instead observed to decrease sharply between 2012 and 2017. This testing pattern, among this age group, has previously been reported by PHE, and is likely attributable to reprioritisation of the NCSP, leading to a substantial decrease in the number of community-based tests between 2012 and 2019[188]. Chlamydia diagnosis rates, however, increased over the same period. Given the changes in testing practices, this either indicates that the NCSP increasingly prioritised women who were more likely to be diagnosed with chlamydia, or that the risk profile of this population changed over time, meaning that tests among this group were more likely to be positive than they had been previously.

One insight into this phenomenon can be examined through comparison of the deprivation analyses of both the full chlamydia dataset and the Level 3 dataset. In 2012, the chlamydia testing rate among women living in less deprived areas was much lower than that seen among women living in more deprived areas, but tests among women living in less deprived areas were only slightly less likely to be positive. This relationship differed from analyses of tests from Level 3 sexual health facilities – in 2012, Level 3 testing rates among women in the least and most deprived areas were very similar, while the gap in positivity rates that correlated with deprivation persisted. This indicates that a large amount of the testing that occurred outside of Level 3 sexual health centres (i.e. the testing most likely to be affected by an opportunistic screening programme) was being taken up by women in less deprived areas, despite the risk of testing positive being higher among women in more deprived areas. This pattern had changed by 2019. By this point, the gap in overall testing rates had decreased, while the gap in diagnosis rates had increased, meaning that women in less deprived areas were only slightly less likely to be tested for chlamydia, but were significantly less likely to be diagnosed. This pattern was not reflected in the Level 3 data – instead, the gap in testing rates widened between 2012 and 2019 (with higher testing rates among women in more deprived areas), while the gap in diagnosis rates remained roughly the same. Overall, the patterns indicate that the increased likelihood of chlamydia diagnosis among women in more deprived areas isn't accounted for by targeted screening that is aimed at this population (as demonstrated by the fact that diagnosis rates in more deprived areas continue to rise, while the testing rates that are most likely to be linked to the NSCP continue to fall in more deprived areas).

Measuring unmet need within sexual health

As I outlined in Chapters 1 and 2, unmet need within SRH lacks a standardised definition. Although the definitions of unmet need within the published literature are heterogeneous, they can be largely divided into two categories. A large proportion of studies within the literature review described in the previous chapter defined unmet need as the incidence or prevalence of the outcome of interest failing to meet a certain objective level. For example, in studies that measured unmet need for contraception using the Bradley and Westoff indicators, the implicit assumption was that any woman who did not want to become pregnant in the next two years should be using a form of contraception, and that non-use among these women constituted unmet need. The remainder of studies compared outcomes in one population to outcomes in another population (often populations who had recognised disparities that had been measured using validated metrics) and regarded the disparity in outcomes between the two populations as an indicator of unmet need.

When deciding how to incorporate this analysis of GUMCAD and CTAD data into an indicator of unmet need, I needed to make a choice between these two methods of defining unmet need. One option would be to use absolute data as a marker of unmet need (for example, the number of tests per capita within a certain group of the population), while another option is the use of comparative data (for example, the rate ratio of tests per capita in two different ethnicities). As discussed above, there is a concern that absolute data may be misinterpreted – for example, high testing rates in a more deprived area may be a result of deliberately targeted testing programmes. Comparative measures, on the other hand, may be a more intuitive indicator of unmet need, particularly when analyses of different metrics are combined, and particularly when measured over time.

Using conclusions drawn from both the literature review and the quantitative analyses discussed within Chapters 5 and 6, I decided that inequality would be the most useful metric of unmet need within sexual health. Disparities, particularly those in historically underserved groups (such as more deprived populations and those who are racially minoritised) are a likely indicator of a level of need among the most vulnerable – particularly when these trends persist across different infections (particularly gonorrhoea and chlamydia, which have different risk and screening profiles within the population of interest[37]) and over time. The fact that the pattern of inequality seen within these analyses has remained constant within this population between 2012 and 2019 also indicates that measurement of these disparities is likely to be a robust geographical indicator of need in the most vulnerable groups.

6.3.3 Strengths and weaknesses

The analysis of a large population-level dataset, such as the ones used for this part of the project, are complex, and there are often multiple limitations. One significant limitation was a function of the dataset itself. GUMCAD and CTAD are both records of clinical activity, which means that the inferences that can be drawn from analyses of GUMCAD and CTAD data are limited. For example, the datasets that I used for these analyses outlined the number of women in each LSOA who were tested for chlamydia or gonorrhoea, and how many of these tests were positive. As individual level data were not available, there was no way to disaggregate repeat testing. This, combined with the fact that the dataset is naturally biased towards people who come forward for testing, makes it very difficult to draw any conclusions from these analyses about any absolute metrics such as population incidence or prevalence. It is also difficult to draw conclusions about individuals from these analyses, without falling victim to ecological fallacy (making erroneous assumptions about individual outcomes using aggregated data)[198]. For example, although my analyses indicate that chlamydia testing and diagnosis rates are higher in more deprived areas, it would not be possible to conclude that women who experience higher individual levels of deprivation are more likely get tested for (or diagnosed with) chlamydia. It is therefore important for me to use these data to draw conclusions at the population level, and to use them to formulate comparisons between groups, as this is the level at which the data has the most utility.

Another challenge is the choice of demographic and outcome measures. Deprivation was measured at the LSOA level using the IMD. Within the IMD, LSOAs are ranked using a composite score, created using a range of deprivation related metrics. When examining a sub-section of the population, there is a concern that the patterns of deprivation calculated using data on the entire population may not be reflected within the sub-population (which then calls into question the conclusions that have been made about the correlation between deprivation and various outcomes). As an example, when considering women aged 16-24, none of the metrics within the ‘Education, Skills and Training Deprivation’ section of the IMD apply to this group. However, given that this section comprises only 13.5% of the overall score, it seems unlikely that this alone would cause the pattern of deprivation across the population to differ significantly from the pattern of deprivation seen among women under the age of 25. The other theoretical concern is that this demographic would score differently if the IMD was calculated without the inclusion of the entire population, and that the IMD therefore does not accurately reflect the distribution of deprivation among women aged 16-24. For example, if the majority of Universal Credit claimants (an indicator within the 'income deprivation' domain of the IMD) were over 25, this may lead to people under 25 experiencing less deprivation that the IMD of the area that they live in would indicate. There is, however, little evidence that women aged 16-24 follow a different pattern of geographical deprivation than the rest of the population[199], particularly in a way that would affect the conclusions drawn by this analysis.

The availability of population size data stratified by ethnicity was also a limitation within this analysis (as outlined in Chapter 4). Although I was able to calculate the difference between rates of diagnosis among those of different ethnic groups (using positivity rate as an outcome), I was unable to examine the relationship between ethnicity and testing. Challenges such as these are one of the many reasons that my aim was to create a composite measure of unmet need, the intention being to combine multiple indicators of inequality, each of which contains some gaps, but which together may allow for an overall understanding of geographical patterns of need. In addition, the chlamydia dataset within this analysis is missing a large amount of ethnicity data (nearly half of tests within this dataset were performed on a person whose ethnicity was not recorded). There is a concern that this missing data may be systematic i.e. people of certain ethnicities may be more likely to report their ethnicity than others. However, the Level 3 data analysis, which was performed using a dataset containing significantly less missing ethnicity data, indicated similar patterns of outcome disparity as those seen within the analysis of the full dataset. I therefore decided to not to use CTAD data when calculating ethnicity-related chlamydia metrics within my indicator of unmet need (something that will be discussed further in Chapter 8).

Despite these challenges, this analysis has a number of strengths. The use of two national datasets allowed for the drawing of robust conclusions about patterns of inequality within sexual health. The dataset was split by year, meaning that I was able do an analysis for each year of data, investigating the persistence of certain results over time while avoiding comparisons of indicators and outcomes that had changed during the study period (such as the IMD rankings of each LSOA). Additionally, the use of multiple outcomes (and the subsequent similarity of results) helped reduce the likely effect of structural confounders such as targeting of screening programmes. The multivariable analyses allowed for investigation into the overlap between deprivation-related disparities and ethnicity-related disparities. Given that adding deprivation to the multivariable analyses did not largely change the relationship between testing rates, diagnosis rates and ethnicity, and that adding ethnicity to the multivariable analyses did not largely change the relationship between testing rates, diagnosis rates and deprivation, it is likely that the two sets of relationships may have different drivers. This also supported the use of both deprivation and ethnicity-related markers within my indicator of unmet need, assuaging concerns about the risk of multicollinearity.

6.3.4 Summary

This analysis of gonorrhoea and chlamydia-related outcomes among women aged 16-24 in England indicated several disparities:

- The rate of both chlamydia and gonorrhoea testing is higher in more deprived areas, when compared to less deprived areas.
- The rate of chlamydia and gonorrhoea positivity is higher in more deprived areas, when compared to less deprived areas.
- The rate of chlamydia and gonorrhoea positivity is higher among women of Black ethnicity (particularly Black Caribbean or Black other), when compared to women of White British ethnicity.

The purpose of these analyses was to identify indicators of unmet need in sexual health within this population that can be used to create a composite measure of unmet need. Given the persistence of ethnic and socioeconomic inequalities within this analysis, it would appear that the best way to outline unmet need, particularly within the most vulnerable groups, is to focus on the markers of disparity between the groups with the best and worst outcomes. The sexual health indicators that I therefore used to create my index of unmet need were:

- Chlamydia:
    - Disparity between testing rates within the most and least deprived sections of the population.
    - Disparity between diagnosis rates within the most and least deprived sections of the population.
    - Disparity between diagnosis rates among Black Caribbean and White British women

- Gonorrhoea:
    - Disparity between testing rates within the most and least deprived sections of the population.
    - Disparity between diagnosis rates within the most and least deprived sections of the population.
    - Disparity between diagnosis rates among Black Caribbean and White British women

The way in which these indicators were calculated for use within the index of unmet need will be discussed in more detail in Chapter 8.

7 Inequalities in Reproductive Health Outcomes between 2012 and 2019

In this chapter, I will discuss the results of my analyses of the patterns of inequality in abortion-related outcomes between 2012 and 2019 among women aged 16-24 in England. These analyses informed the creation of the reproductive health indicators that used to generate an index of unmet need within SRH (alongside the sexual health indicators that were discussed in Chapters 5 and 6).

7.1 Results: Abortion

7.1.1 Descriptive analyses

Baseline

Between 2012 and 2019, 585,641 abortions were recorded within the target population, 160,971 of which were among women who had undergone at least one previous abortion (repeat abortions). The majority of abortions (70.2%) and repeat abortions (69.3%) were among women who reported their ethnicity as White British. Overall, 13.2% of the abortions in this dataset were among women living in the most deprived IMD decile, compared to 7.55% in the least deprived decile. Similarly, 14.2% of the repeat abortions in this dataset were among women living in the most deprived IMD decile, compared to 6.96% in the least deprived decile (Table 7.1). There was, once again, a correlation between ethnicity and deprivation ($p<0.001$). As an example, 26.2% of abortions among Asian Bangladeshi women were undergone by women who lived in IMD decile 1, compared to 15.1% of abortions among White British women. In comparison, 1.0% of abortions among Asian Bangladeshi women were undergone by women who lived in IMD decile 10, compared to 6.4% of abortions among White British women (Table 7.2).

Table 7.1: Overall characteristics of women whose abortions were included in this dataset

		Abortions		Repeat abortions	
		N	%	N	%
Total		585641	100	160971	100
IMD (2015)					
(most deprived)	1	77584	13.2	22852	14.2
	2	75912	13.0	22538	14.0
	3	70594	12.1	19857	12.3
	4	61823	10.5	17035	10.6
	5	57023	9.73	15640	9.72
	6	52961	9.04	14058	8.73
	7	49868	8.52	12943	8.04
	8	48656	8.31	12536	7.79
	9	46984	8.02	12314	7.65
	10	44236	7.55	11198	6.96
Ethnicity					
	White British	411211	70.2	111604	69.3
	Bangladeshi	4874	0.83	1427	0.89
	Indian	9968	1.70	2420	1.50
	Pakistani	9542	1.63	2606	1.62
	Chinese	4831	0.82	857	0.53
	Any other Asian background	9351	1.60	2418	1.50
	African	25009	4.27	8272	5.14
	Caribbean	14267	2.44	5282	3.28
	Any other Black background	3373	0.58	1021	0.63
	Mixed White and Asian	3482	0.60	1030	0.64
	Mixed White and Black African	3505	0.60	1269	0.79
	Mixed White and Black Caribbean	12083	2.06	4585	2.85
	Mixed other	6982	1.19	2260	1.40
	White Irish	2826	0.48	667	0.41
	White other	38987	6.66	9183	5.70
	Any other ethnicity	6491	1.11	1631	1.01
	Not known/not stated	18859	3.22	4439	2.76

Table 7.2: Number of abortions among women living in IMD deciles 1 and 10 within each ethnic group

Ethnicity	Abortions among women living in IMD decile 1		Abortions among women living in IMD decile 10	
	N	% (of abortions within ethnic group)	N	% (of abortions within ethnic group)
White British	1279	26.2	48	1.0
Bangladeshi	1108	11.1	323	3.2
Indian	2945	30.9	145	1.5
Pakistani	462	9.6	198	4.1
Chinese	1216	13.0	250	2.7
Any other Asian background	4972	19.9	253	1.0
African	2644	18.5	108	0.8
Caribbean	712	21.1	27	0.8
Any other Black background	555	15.9	212	6.1
Mixed White and Asian	626	17.9	93	2.7
Mixed White and Black African	2495	20.6	293	2.4
Mixed White and Black Caribbean	1194	17.1	204	2.9
Mixed other	61965	15.1	26260	6.4
White Irish	379	13.4	126	4.5
White other	10091	25.9	927	2.4
Any other ethnicity	1075	16.6	160	2.5
Not known/not stated	3252	17.2	680	3.6

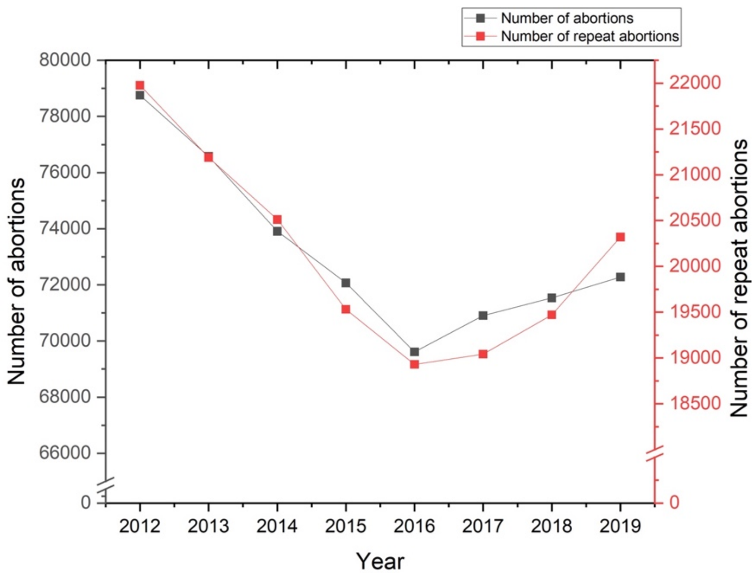
The annual number of abortions in this population fell (from 78,754 to 69,612) between 2012 and 2016, before increasing to 72,281 between 2016 and 2019. Repeat abortions followed a similar pattern, falling from 21,977 to 18930 between 2012 and 2016, and then rising to 20,320 by 2019.

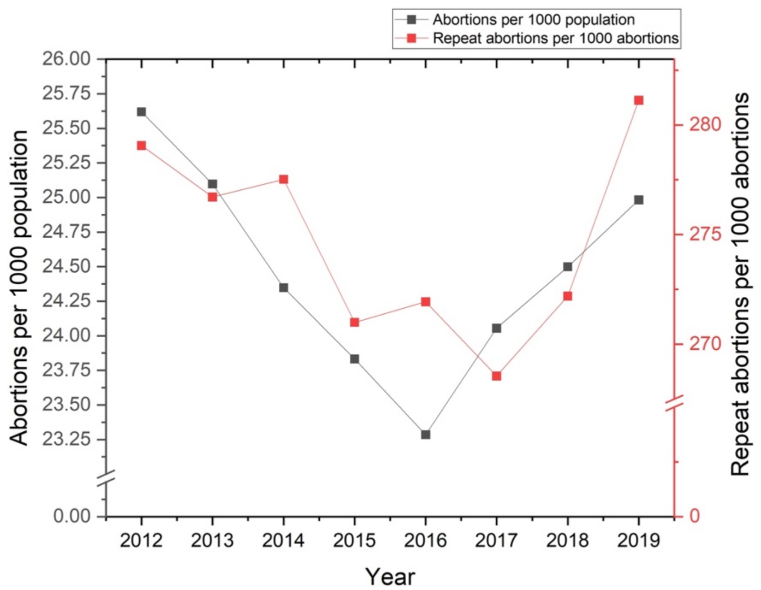
Annual abortion rates also followed this pattern. There were 25.6 abortions per 1000 population in 2012, falling to 23.3 abortions per 1000 population in 2016 and rising to compared to 25.0 per 1000 population in 2019. Similarly, the number of repeat abortions per 1000 abortions (hereafter referred to as the repeat abortion rate, or RAR) was 279.1 in 2012, falling to 268.5 in 2017 and then rising to 281.1 in 2019 (Table 7.3 and Figure 7.1).

Table 7.3: Abortion rates and repeat abortion rates in England among women between the ages of 16 and 24 (2012 - 2019)

Year	Population	Abortions	Abortions per 1000 population	Repeat abortions	Repeat abortions per 1000 abortions
2012	3073993	78754	25.6	21977	279.1
2013	3050979	76574	25.1	21189	276.7
2014	3035522	73908	24.3	20511	277.5
2015	3024178	72072	23.8	19531	271.0
2016	2989586	69612	23.3	18930	271.9
2017	2947698	70907	24.1	19042	268.5
2018	2919889	71533	24.5	19471	272.2
2019	2893203	72281	25.0	20320	281.1
Total		**585641**		**160971**	**274.9**

Figure 7.1: Abortion rates and repeat abortion rates in England among women between the ages of 16 and 24 (2012 - 2019)

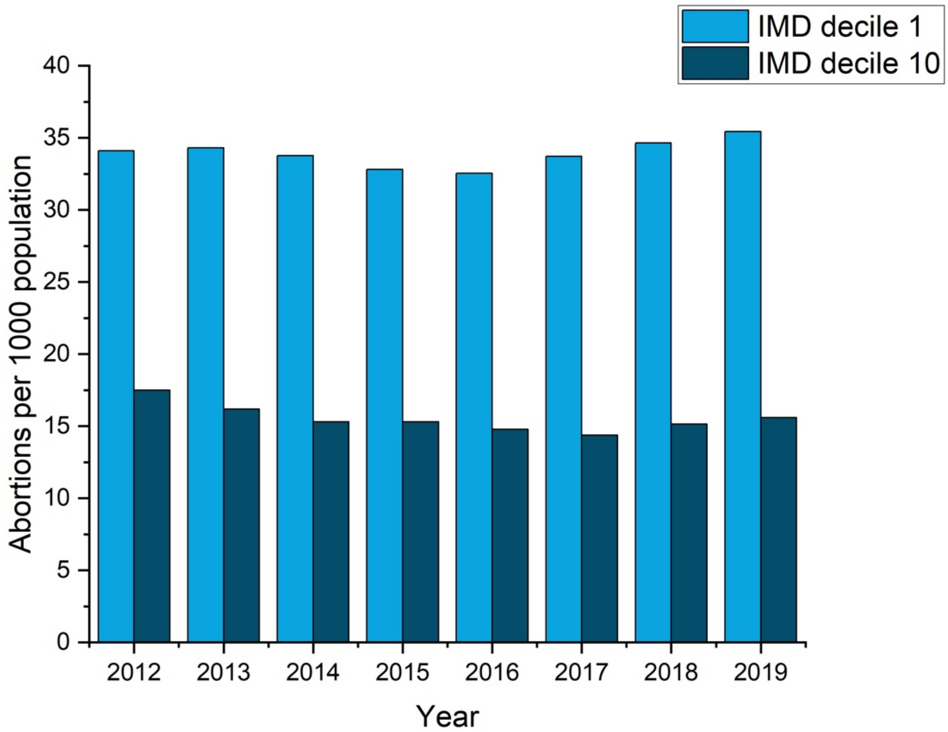


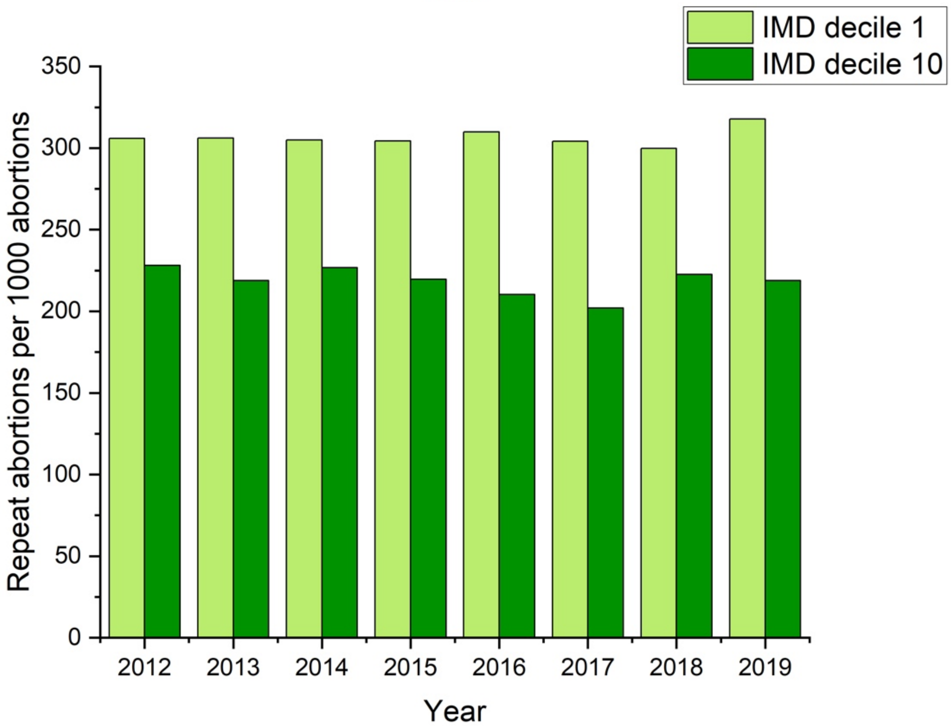


Deprivation

Between 2012 and 2019, there was an inverse relationship between abortion rate and IMD. In decile 1, there were 34.1 abortions per 1000 population in 2012, compared to 17.5 abortions per 1000 population in decile 10. Similarly, the RAR in IMD decile 1 was 317.7 in 2012, while the RAR in decile 10 was 218.7. This pattern persisted over time. In 2019, there were 35.4 abortions per 1000 population in decile 1, compared to 15.6 abortions per 1000 population in decile 10. The RAR in decile 1 was 317.7 in 2019, while the RAR in decile 10 was 218.7 (Figure 7.2). A table outlining the abortion rates and repeat abortion rates in each IMD decile between 2012 and 2019 can be found in Appendix 5.

Figure 7.2: Abortion rates among women between the ages of 16 and 24 in IMD decile 1 and IMD decile 10 (2012 - 2019)





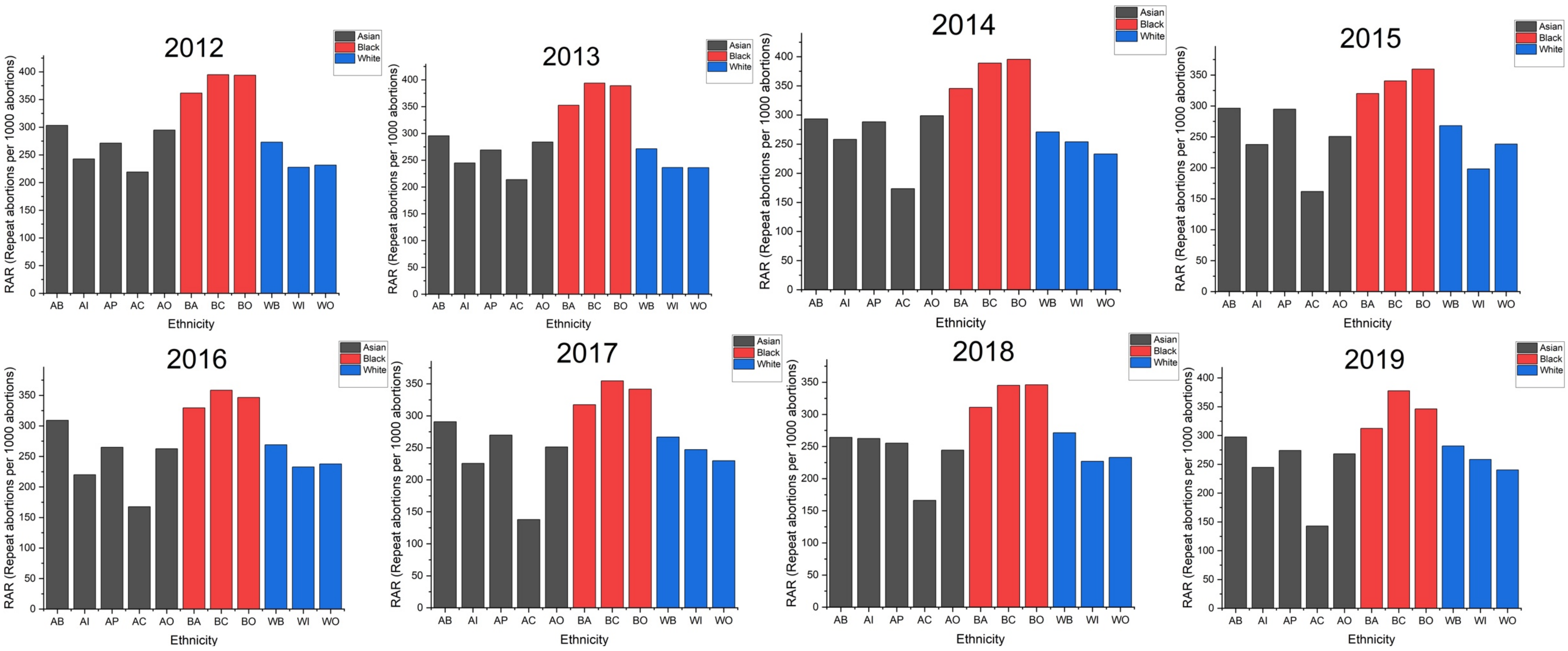
Ethnicity

Between 2012 and 2019, 560,291 abortions were undergone by women who identified their ethnicity as Asian, Black or White, and 154,901 of these were repeat abortions. There were 25,350 abortions (4.33% of the total) and 6070 repeat abortions (3.77% of the total) excluded from this analysis, as they were undergone by women who reported another ethnicity or who did not report an ethnicity at all. (Table 7.1).

Women of Black ethnicity had the highest annual rates of repeat abortion, with women who had reported their ethnicity as Black Caribbean most commonly displaying the highest annual rate of repeat abortion. Women of Asian ethnicity had the lowest annual rates of repeat abortion, with women who had reported their ethnicity as Asian Chinese most commonly displaying the lowest annual rate of repeat abortion. In 2012 the RAR among Black Caribbean women was 394.9, compared to 273.1 among White British women and 219.2 among Asian Chinese women. In 2019, the RAR among Black Caribbean women was 377.5, compared to 282.0 among White British women and 142.9 among Asian Chinese women (Figure 7.3).

A table outlining the abortion rates and repeat abortion rates for each ethnic group between 2012 and 2019 can be found in Appendix 5.

Figure 7.3 Repeat abortion rates in England by ethnicity among women between the ages of 16 and 24 (2012 - 2019)



AB: Asian Bangladeshi AI: Asian Indian AP: Asian Pakistani AC: Asian Chinese AO: Asian other	BA: Black African BC: Black Caribbean BO: Black other WB: White British WI: White Irish WO: White other

7.1.2 Regression analyses

Deprivation

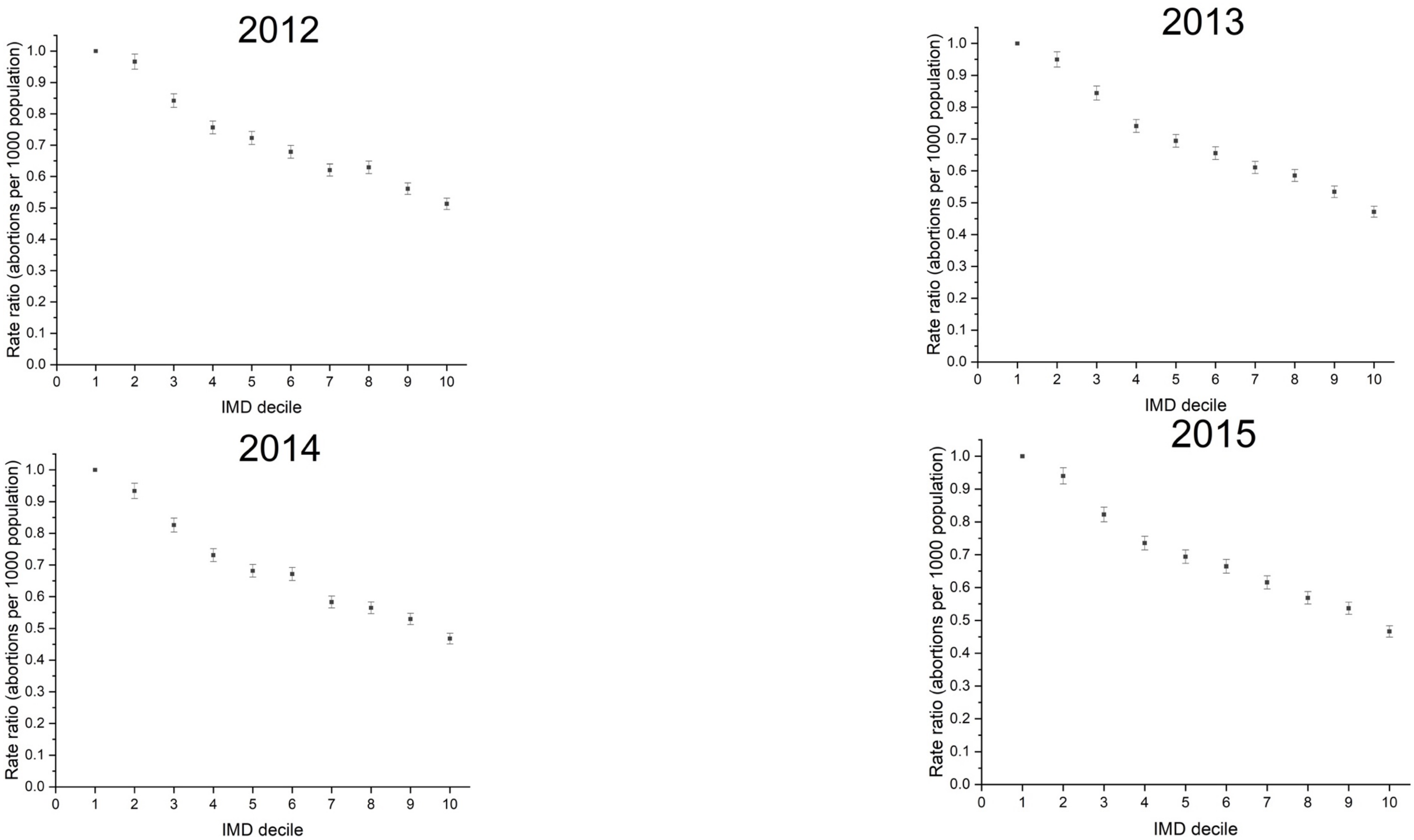
Abortions per 1000 population

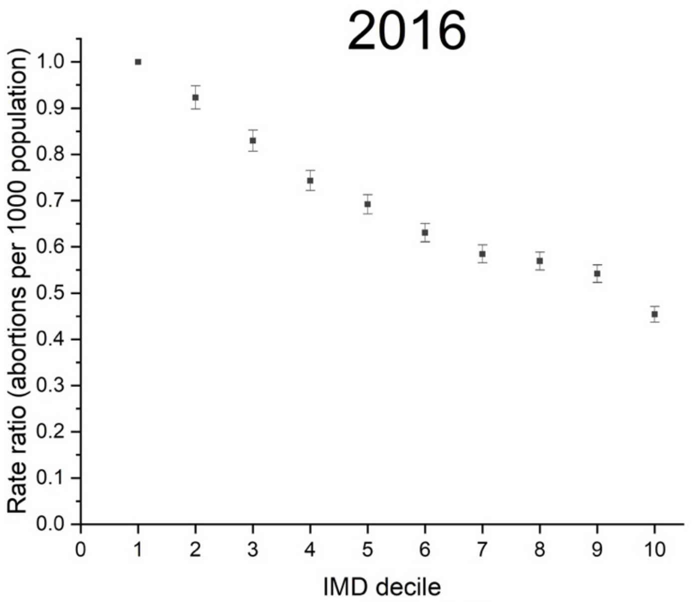
The deprivation regression analyses displayed a negative correlation between IMD and abortion rate during each year of the study period, indicating that there were fewer abortions per 1000 population among women aged 16-24 living in less deprived areas when compared to those living in more deprived areas. Between 2012 and 2019, the gap between abortion rates in the most and least deprived areas widened (Figure 7.4): the rate ratio for this relationship was 0.51 (0.50 – 0.53) in 2012, falling to 0.44 (0.42 – 0.46) by 2019. Annual rate ratios for the relationship between abortion rates in IMD decile 1 and all other IMD deciles can be found in Appendix 5.

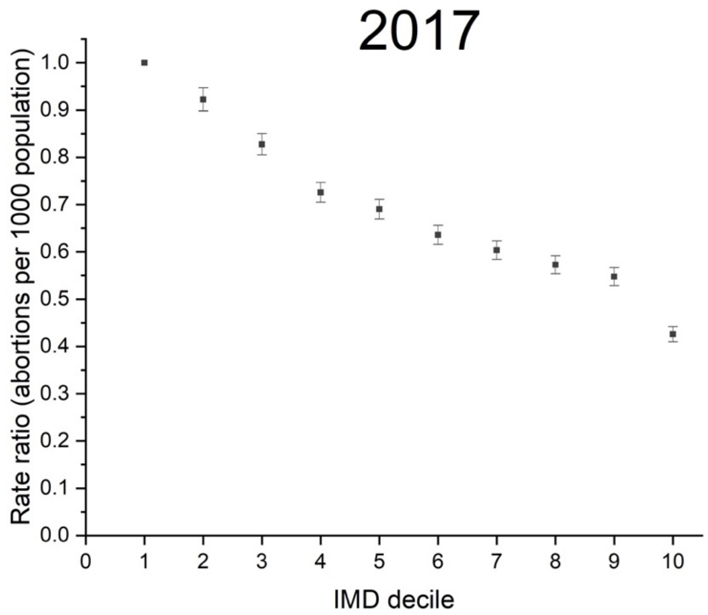
Repeat abortion rate

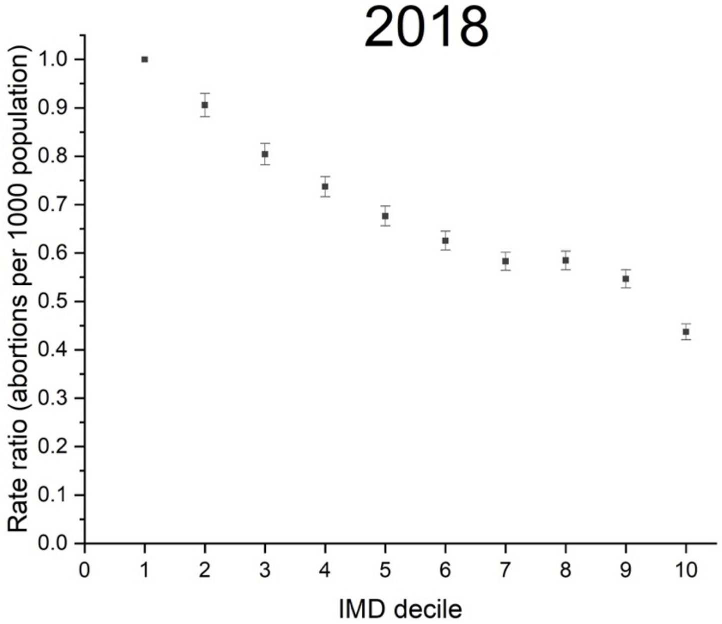
The deprivation regression analyses also displayed a negative correlation between IMD and RAR during each year of the study period, indicating that the repeat abortion rate was lower among women living in less deprived areas when compared to those living in more deprived areas. This gap also widened between 2012 and 2019 (Figure 7.5); the rate ratio for this relationship was 0.75 (0.69 – 0.80) in 2012, falling to 0.69 (0.64 – 0.74) by 2019. Annual rate ratios for the relationship between repeat abortion rates in IMD decile 1 and all other IMD deciles can be found in Appendix 5.

Figure 7.4: Rate ratios for relationship between the abortion rate in IMD deciles 2 – 9 and the abortion rate in decile 1 stratified by calendar year




2016
Rate ratio (abortions per 1000 population)
IMD decile


2017
Rate ratio (abortions per 1000 population)
IMD decile


2018
Rate ratio (abortions per 1000 population)
IMD decile

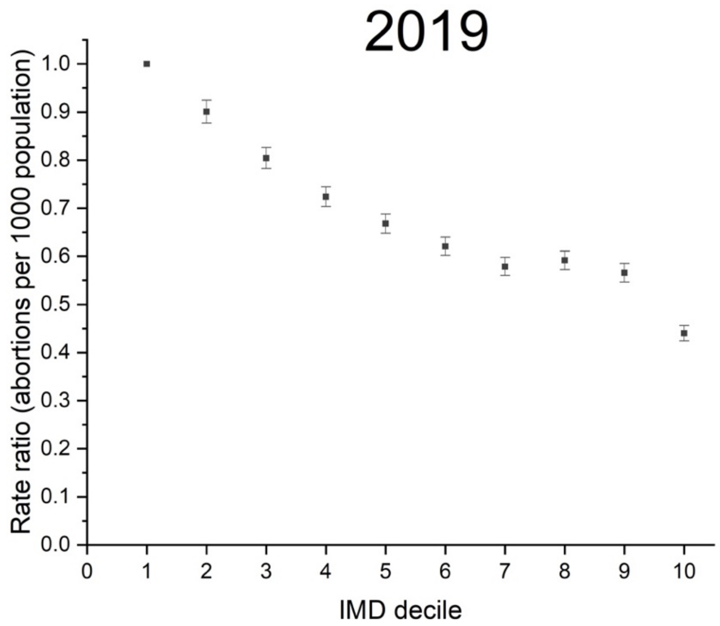
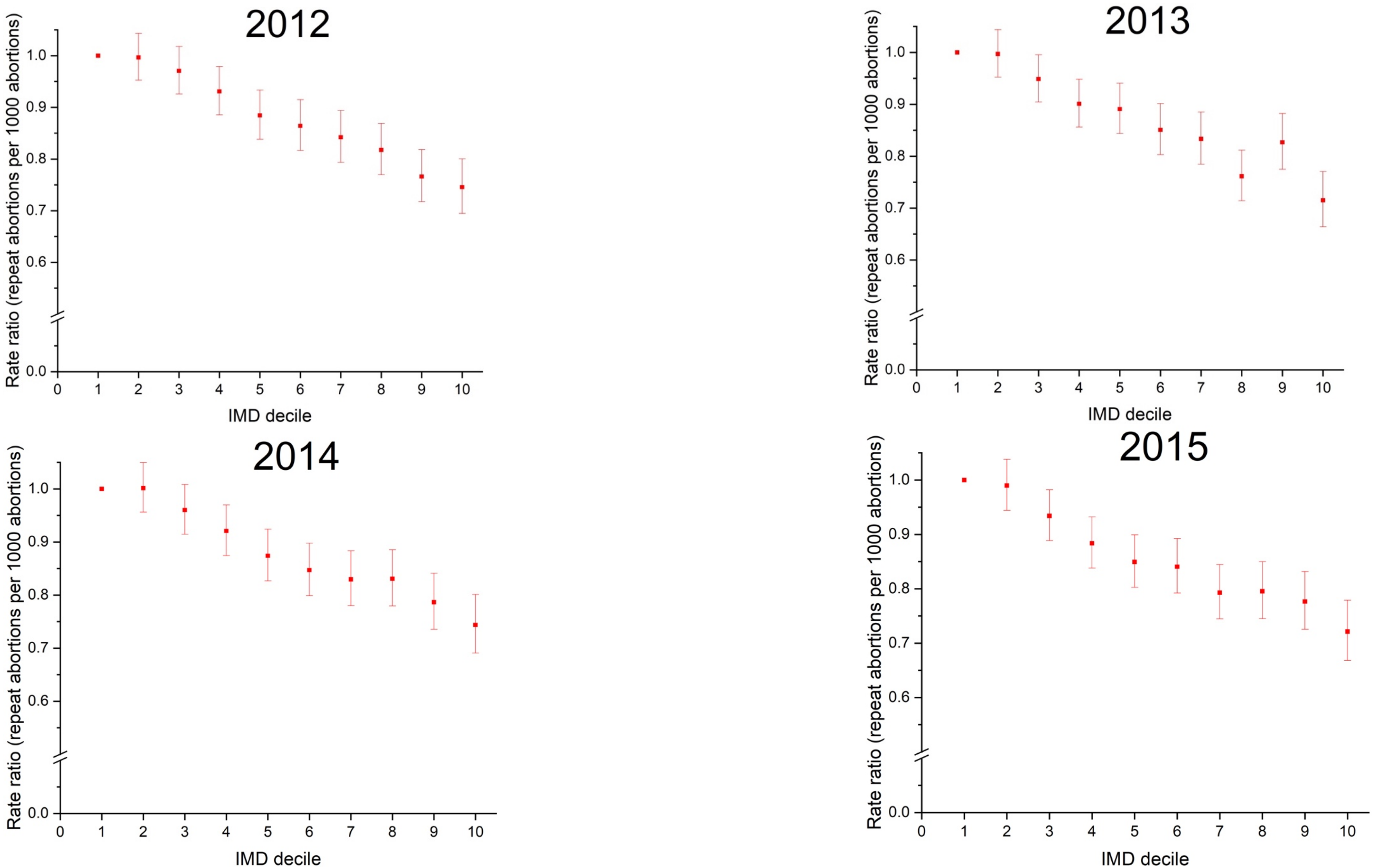
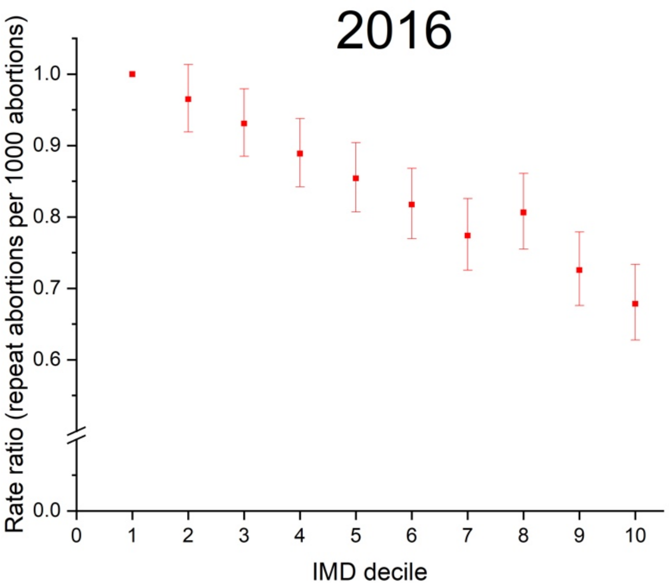
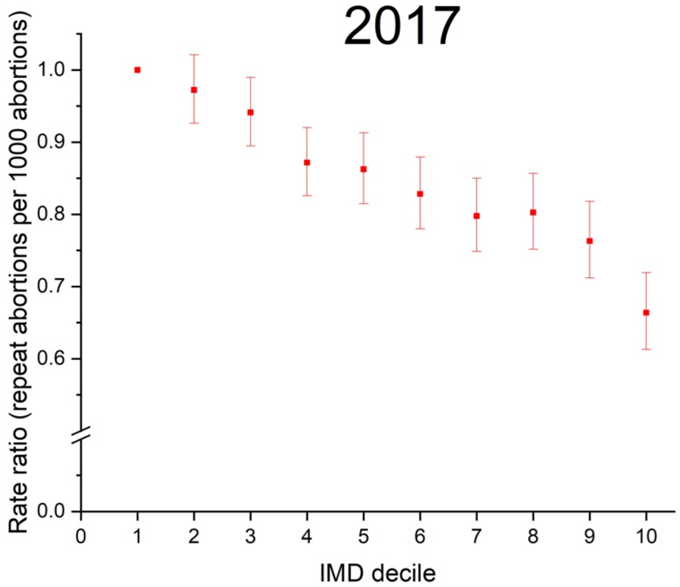
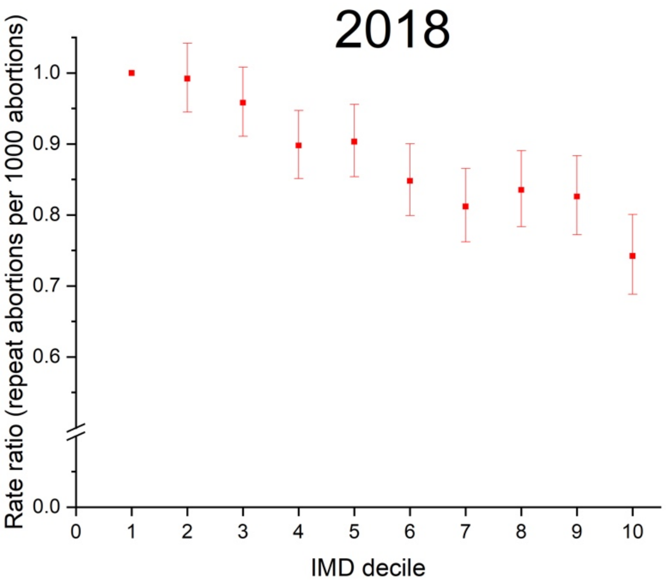

2019
Rate ratio (abortions per 1000 population)
IMD decile

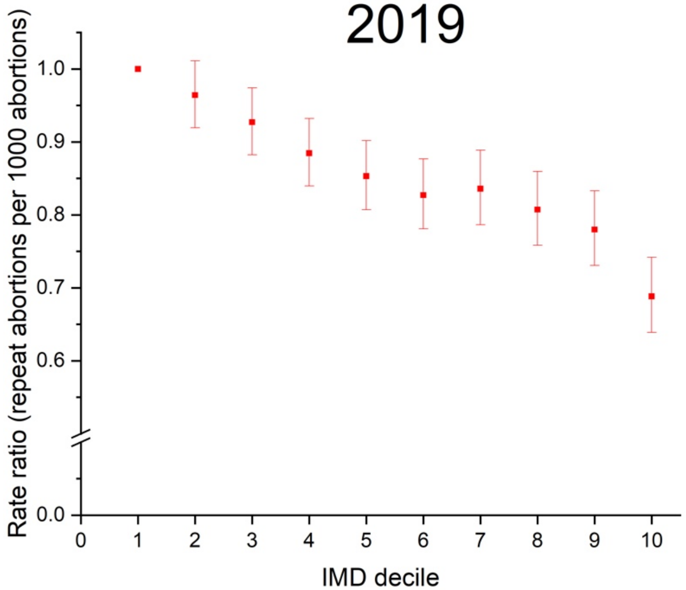
Figure 7.5: Rate ratios for relationship between the RAR in IMD deciles 2 – 9 and the RAR in decile 1, stratified by calendar year




2016
Rate ratio (repeat abortions per 1000 abortions)
IMD decile


2017
Rate ratio (repeat abortions per 1000 abortions)
IMD decile


2018
Rate ratio (repeat abortions per 1000 abortions)
IMD decile


2019
Rate ratio (repeat abortions per 1000 abortions)
IMD decile

Ethnicity

Repeat abortion rate

Between 2012 and 2019, the RAR varied significantly by ethnic group ($p<0.001$).

When compared to abortions undergone by women who identified as White British, abortions undergone by women of Black ethnicity were consistently more likely to be repeat abortions. The group with the highest rate of repeat abortion was predominantly the Black Caribbean group: between 2012 and 2019, the rate ratio for the relationship between RAR among Black Caribbean women and RAR among White British women ranged between 1.19 (1.12 – 1.27) and 1.45 (1.38 – 1.53). Similar patterns were seen among other Black ethnicities, with abortions among women who identified as Black African or another Black ethnicity being consistently between 1.1 and 1.5 times as likely to be repeat abortions as those among White British women (Figure 7.6).

Among Asian ethnicities, the rate of repeat abortion was often lower than that seen among White British women. The ethnicity that displayed the lowest repeat abortion rate was the Asian Chinese group: between 2012 and 2019, the rate ratio for the relationship between RAR among Asian Chinese women and RAR among White British women ranged between 0.51 (0.39 – 0.65) and 0.80 (0.69 – 0.93). Similarly, abortions among Asian Indian women were between 0.9 and 0.8 times as likely to be repeat abortions when compared to those among White British women.

Asian Pakistani women and women of other Asian ethnicity had a similar rate of repeat abortion as that seen among women of White British ethnicity.

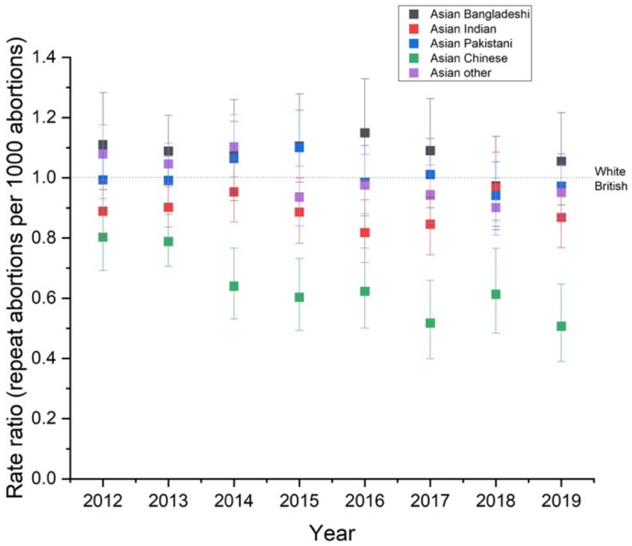
Abortions among Asian Bangladeshi women, however, were more often likely to be repeat abortions than those undergone by women who identified as White British, although this relationship displayed less of a defined pattern that the relationship between abortions within the White and Black communities. During the study period, the rate ratio for the relationship between RAR among Asian Bangladeshi women and RAR among White British women ranged from 1.15 (0.99 – 1.33) to 0.97 (0.83 – 1.14) (Figure 7.6). Among all three of the previously mentioned ethnicities (Asian Bangladeshi, Asian Pakistani and Asian other), rate ratio estimates were often close to 1 and generally lacked statistical significance.

The RAR among White Irish women and women of other White ethnicity was consistently lower than that seen among White British women. During the study period, the rate ratio among White Irish women ranged from 0.74 (0.57 – 0.94) to 0.94 (0.72 – 1.93), and the rate ratio among women of other White ethnicity ranged from 0.89 (0.84 – 0.94) to 0.86 (0.81 – 0.91) (Figure 7.6).

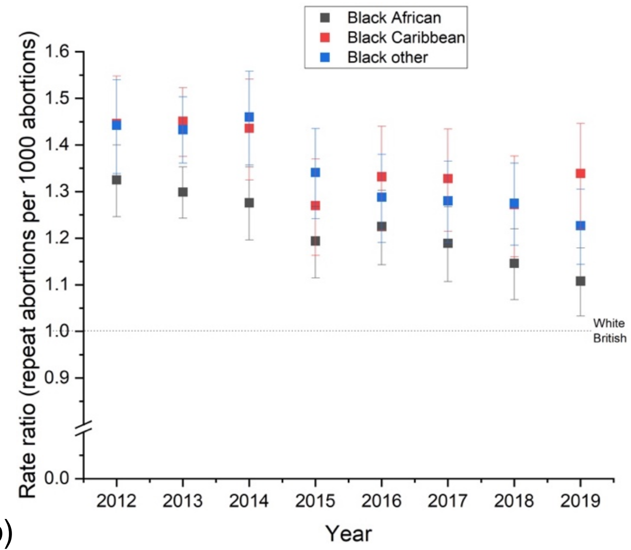
Annual rate ratios for the relationship between repeat abortion rates among White British women and women of Asian, Black and other White ethnicities can be found in Appendix 5.

Figure 7.6:

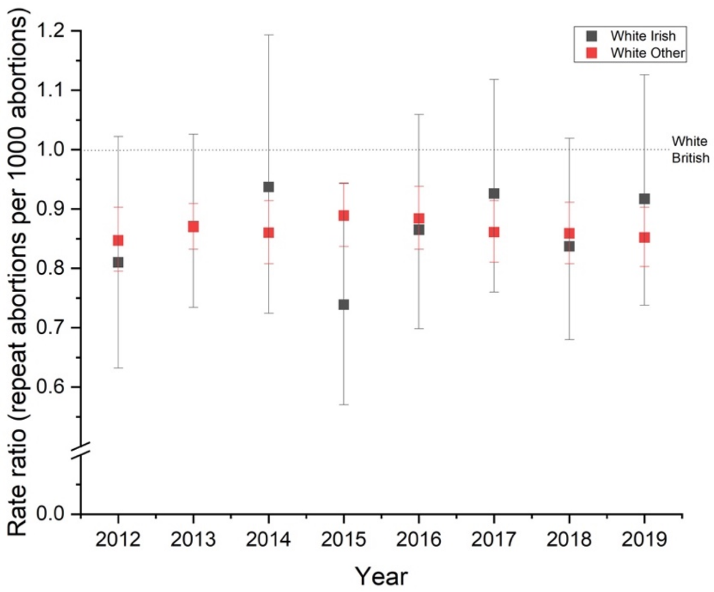
a) **Rate ratios for relationship between the RAR among women of Asian ethnicity and the RAR among women of White British ethnicity**
b) **Rate ratios for relationship between the RAR among women of Black ethnicity and the RAR among women of White British ethnicity**
c) **Rate ratios for relationship between the RAR among women of other White ethnicities and the RAR among women of White British ethnicity**



a)



b)



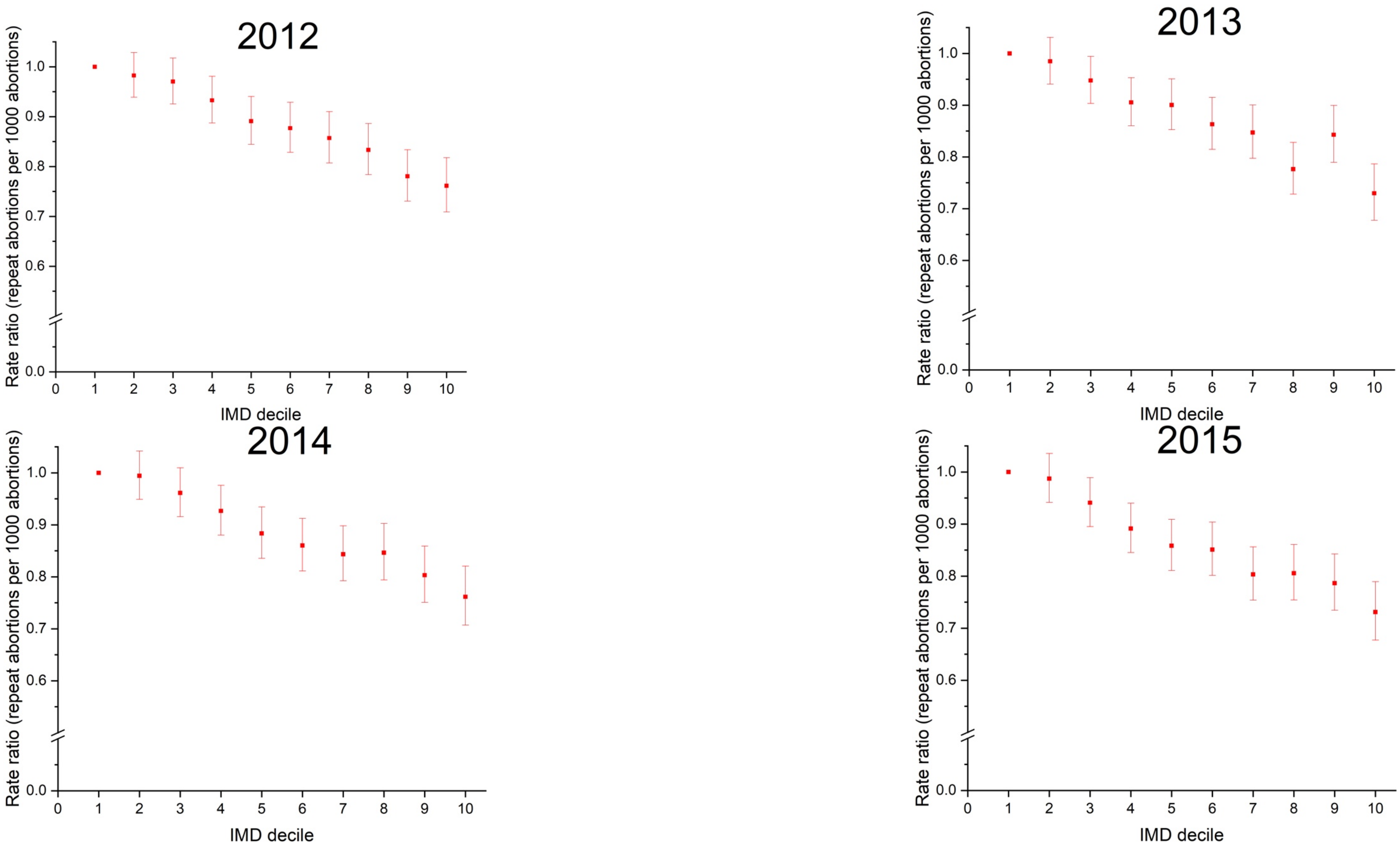
c)

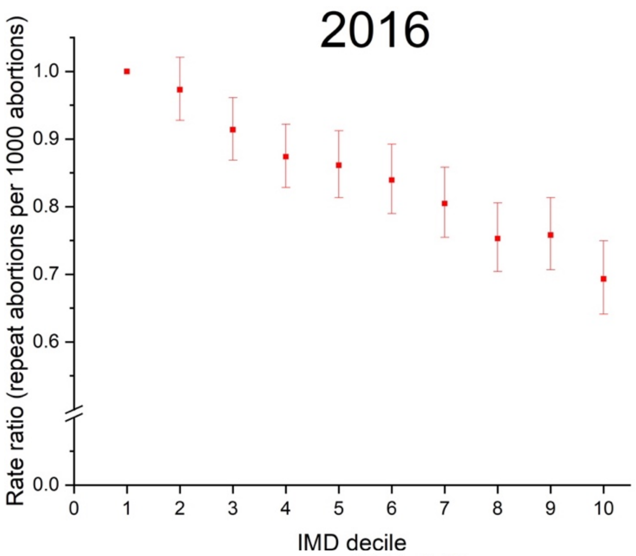
Multivariable analyses

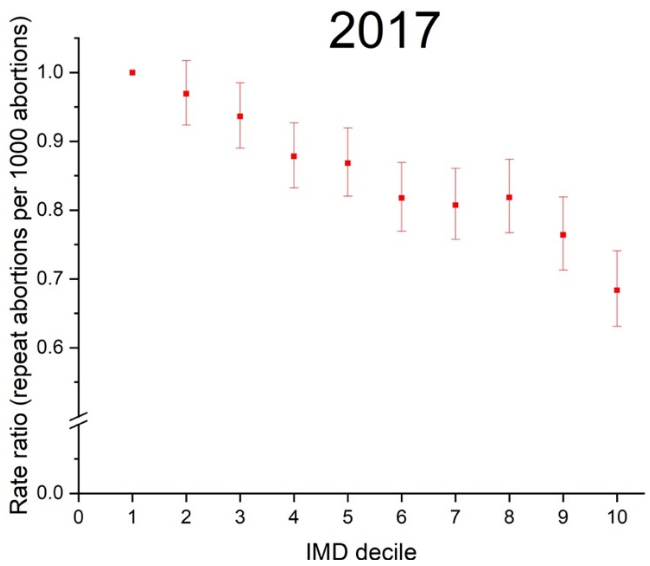
Controlling the deprivation analysis for ethnicity did not have a large impact on the overall relationship between deprivation and repeat abortion rates among women aged 16-24 in England. The multivariable analysis continued to suggest a negative correlation between IMD decile and repeat abortions per 1000 abortions. When controlled for ethnicity, the ARR for the relationship between repeat abortion rates in IMD decile 1 and IMD decile 10 was 0.76 (0.71 – 0.82) in 2012 and was 0.70 (0.65 – 0.76) by 2019 (Figure 7.7).

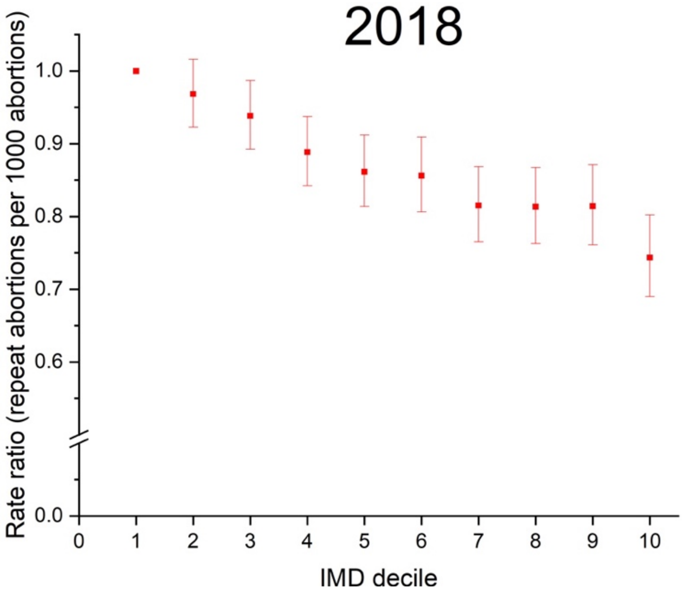
Similarly, the overarching relationship between ethnicity and repeat abortion rates was not greatly impacted by the addition of deprivation to the multivariable model. The repeat abortion rate among women of White ethnicities other than White British remained slightly lower than that seen among women of White British ethnicity. Among Asian populations, abortions among women who identified as Chinese, Indian or of other Asian ethnicity continued to be less likely to be repeat abortions than those undergone by women who identified as White British. The ARR for the relationship between repeat abortion rates among Pakistani women and White British women, having indicated a slightly higher rate of repeat abortion among Pakistani women within the univariate model, indicated a slightly lower diagnosis rate among Pakistani women when controlled for deprivation: ARR was 0.95 (0.85 – 1.05) in 2012, and 0.92 (0.83 – 1.02) in 2019. Similarly, the ARR for the relationship between repeat abortion rates among White British women and Bangladeshi women was slightly lower within the multivariable analysis than it was within the univariate analysis: ARR was 1.04 (0.90 – 1.21) in 2012, and 0.99 (0.86 – 1.14) in 2019. Abortions among women of Black ethnicity continued to be more likely to be repeat abortions than those among women of White British ethnicity, however the gap between repeat abortion rates among Black women and repeat abortion rates among White British women narrowed slightly once adjusted for deprivation. The ARR for the relationship between diagnosis rates among Black African women and white British women was 1.26 (1.19 – 1.34) in 2012, falling to 1.05 (0.98 – 1.12) in 2019. The ARR for Black Caribbean women was 1.38 (1.28 – 1.48) in 2012, falling to 1.27 (1.17 – 1.38) in 2019. The ARR for other women of Black ethnicity was 1.39 (1.29 – 1.49) in 2012 and 1.19 (1.11 – 1.27) in 2019 (Figure 7.8).

Figure 7.7: Rate ratios for relationship between the RAR in IMD deciles 2 – 9 and the RAR in decile 1 (controlled for ethnicity and stratified by year)




2016
Rate ratio (repeat abortions per 1000 abortions)
0.0
0.6
0.7
0.8
0.9
1.0
0 1 2 3 4 5 6 7 8 9 10
IMD decile


2017
Rate ratio (repeat abortions per 1000 abortions)
0.0
0.6
0.7
0.8
0.9
1.0
0 1 2 3 4 5 6 7 8 9 10
IMD decile


2018
Rate ratio (repeat abortions per 1000 abortions)
0.0
0.6
0.7
0.8
0.9
1.0
0 1 2 3 4 5 6 7 8 9 10
IMD decile

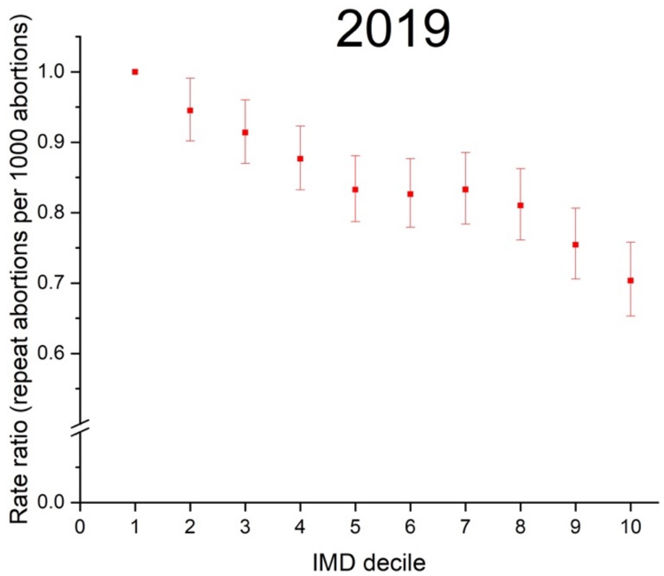
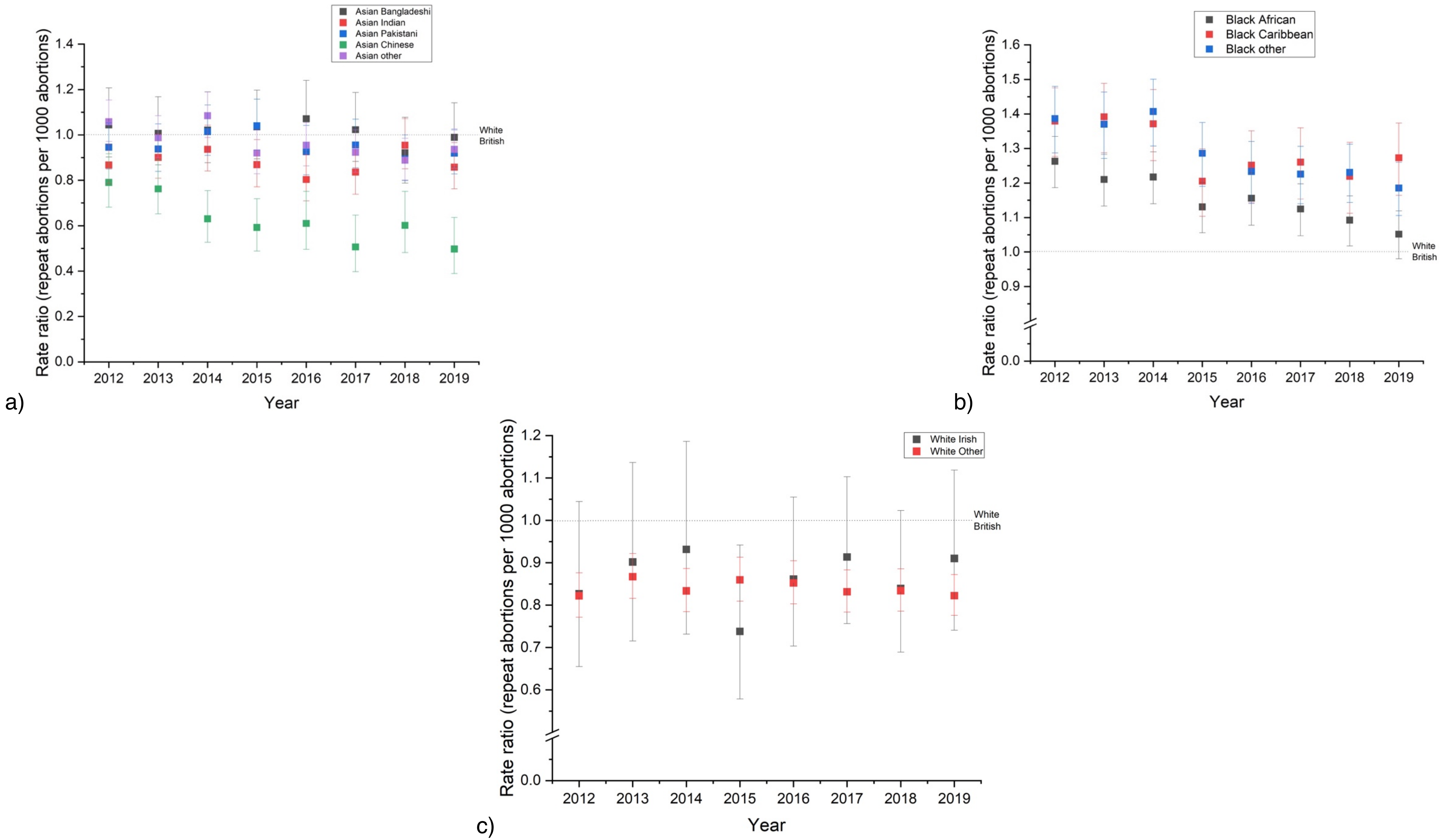

2019
Rate ratio (repeat abortions per 1000 abortions)
0.0
0.6
0.7
0.8
0.9
1.0
0 1 2 3 4 5 6 7 8 9 10
IMD decile

Figure 7.8:

a) Rate ratios for relationship between the RAR among women of Asian ethnicity and the RAR among women of White British ethnicity (controlled for deprivation and stratified by year)
b) Rate ratios for relationship between the RAR among women of Black ethnicity and the RAR among women of White British ethnicity (controlled for deprivation and stratified by year)
c) Rate ratios for relationship between the RAR among women of other White ethnicities and the RAR among women of White British ethnicity (controlled for deprivation and stratified by year)



7.2 Discussion

7.2.1 Key findings

When examining the impact of deprivation on rates of abortion among women aged 16-24, there was an inverse relationship between IMD and both abortion rate and repeat abortion rate, indicating that abortions were more likely to occur in areas of greater deprivation, and that abortions in these areas were more likely to be among women who had already undergone one or more abortions.

There was also a relationship between ethnicity and abortion rates. During the study period, abortions among women of Black ethnicity were more likely to be repeat abortions than those undergone by women whose ethnicity was classified as White British, while abortions among women of Asian ethnicity were less likely to be repeat abortions.

Multivariable regression analysis of these relationships (using a model that incorporated both deprivation and ethnicity) indicated that controlling for each of these demographic variables had little impact on the overall pattern observed.

7.2.2 Implications

Patterns of inequality

Analyses of the relationship between deprivation and abortion rates among women aged 16-24 in England displayed similar patterns as those observed when examining testing and diagnosis for gonorrhoea and chlamydia within this group (as outlined in Chapters 5 and 6). Once again, abortion rates appeared to be higher in more deprived communities, and also appeared to be higher among people of Black ethnicity (when compared to people of White British ethnicity). These correlations reflected those identified within the published literature: the DHSC abortion reports have consistently found that more deprived areas report a higher abortion rate than less deprived areas[53] and an analysis of data from Natsal-2 found a higher rate of repeat abortion among Black respondents[200]. There is, however, a noticeable gap in the literature with very few analyses of demographic trends in abortion rates (and even fewer that use national datasets), and a marked paucity of discourse surrounding ethnicity and abortion.

Identifying the underlying causes of these trends is particularly complex in the case of abortion. Unlike the previous chapters, which focused on an outcome that is inherently undesirable (chlamydia and gonorrhoea infection), there are logistical, structural and ethical barriers to deciding that a certain incidence of abortion indicates a negative outcome[52]. Although higher abortion rates among certain groups may indicate a need for prevention of unplanned pregnancy, this may also indicate a need for abortion access among the groups who have a lower rate of abortion. In addition, it is fallacious to assume that abortions are universally the result of an unplanned pregnancy, or that all unplanned pregnancies result in abortion[53], and care must therefore be taken when drawing conclusions that rely on that assumption.

There are, however, reasons to believe that an elevated rate of abortion among certain groups may be the result of a complex interaction of unmet needs at the population level, many of which are linked to disparities in the rate of unplanned pregnancy. Although unplanned pregnancy is not the only indicator for abortion, the recorded grounds for the majority (98.1%) of abortions in 2020 were *"That the pregnancy has NOT exceeded its 24th week and that the continuance of the pregnancy would involve risk, greater than if the pregnancy were terminated, of injury to the physical or mental health of the pregnant woman"*. Of these, almost all abortions (99.9%) were due to a risk to the woman's mental health, classified using the International Classification of Disease version 10 (ICD-10) code F99 (mental disorder, not otherwise specified)[201]. As previously discussed (in Chapter 1), the legal framework surrounding abortion access in the UK means that abortion providers are required to indicate grounds for an abortion, and the majority of abortions that are due to unplanned pregnancy are recorded as being required due to a non-specific risk to the mental health of the person who is pregnant. When examining trends at a population level, the fact that nearly all abortions fall into this category therefore indicates that the majority of abortions are likely to be linked to unplanned or unwanted pregnancies.

Despite this, a higher rate of abortion among a certain group may not necessarily relate to a concomitant higher rate of unplanned pregnancy. The decision not to carry a pregnancy to term is often influenced by a range of structural, cultural and personal factors[202] that could result in a disparity in abortion rates despite a similar prevalence of unplanned pregnancy. Previous investigations of this topic have presented evidence for both an increased rate of unplanned pregnancy and an increased likelihood of abortion within certain demographic groups. Multiple studies have found that Black ethnicity, lower SES and lower levels of education are associated with a higher likelihood of unplanned pregnancy[41,203], and that women of lower SES are more likely to terminate an unplanned pregnancy (with one study finding that 'money worries' were the most common reason for requesting an abortion in a UK TOP clinic)[202,203]. Drivers of repeat abortion are even more complex. Numerous studies have found that (contrary to popular opinion[204]) women who have two or more abortions do not have a lower likelihood of contraceptive use than those who have a single abortion. Instead, type of contraceptive used (particularly oral contraceptives)[205], availability of preferred contraceptive method[206], a history of relationship violence[205], and greater number of sexual partners[200] have all been found to correlate with repeat abortion. It is therefore likely that the disparity in abortion rates is the results of a combination of clinical, educational and structural needs within each population.

As seen in the previous chapters, the multivariable analyses indicated that the ethnic distribution of the population is not a large contributor to the relationship between deprivation and abortion rates, and that the prevalence of deprivation among racially minoritised communities is not a significant driver of the relationship between ethnicity and abortion rates.

Measuring unmet need within reproductive health

As discussed in Chapter 6, my literature review indicated that unmet need within SRH is predominantly measured in one of two ways: the incidence or prevalence of a specific outcome, or the disparity in outcomes between two populations. As with the indicators of sexual health within this project, I have decided to use a comparative measure of unmet need in reproductive health when creating an overall indicator of unmet need within SRH. The benefits of this approach are also discussed in Chapter 6.

7.2.3 Strengths and weaknesses

The strength and weaknesses of these analyses that relate to the size and composition of datasets and indicators have been outlined in Chapter 6. Here, I will therefore focus on the strengths and weaknesses that are specific to the abortion dataset and analyses.

Two factors that are key to these analyses are self-reported: ethnicity and number of previous abortions. It is therefore possible that the dataset is not a comprehensive and accurate report of the abortions undergone by women aged 16-24 in England between 2012 and 2019.

With regards to ethnicity, there is a particular concern that there may be a systematic pattern of non-disclosure (for example, people of certain ethnicities being more likely not to disclose their ethnicity) that would lead to people of certain ethnicities being more likely to be excluded from the analysis and thus introducing bias. Non-disclosure within this dataset was relatively low, however, making it unlikely that this form of self-report would lead to bias. Self-report of previous abortions, which may be susceptible to social desirability bias (in which women who had previous abortions were less likely to report this than women who had not), could potentially have an impact on the analyses of repeat abortion. The records within this dataset, however, are compiled from HSA-4 forms submitted by physicians, and the information that they contain is collected as part of a medical consultation. The data are also verified, as much as possible, by the Department of Health[207]. As a result, this is likely to be the most reliable method for collecting this information.

A key strength of this analysis is its use of large national datasets. Very few analyses of abortion trends have used the data collected through HSA-4 forms to investigate the patterns of abortion among various demographics, and data on the distribution of repeat abortions is particularly scarce. This is therefore a unique set of analyses that have allowed for the drawing of robust conclusions about patterns of inequality within reproductive health.

7.2.4 Summary

This analysis of abortion-related outcomes among women aged 16-24 in England has indicated several disparities:

- The rate of abortions per 1000 population is higher in more deprived areas, when compared to less deprived areas.
- The rate of repeat abortions is higher in more deprived areas, when compared to less deprived areas.
- The rate of repeat abortions is higher among people of Black ethnicity (particularly Black Caribbean or Black other), when compared to people of White British ethnicity.

As with the indicators of unmet need within sexual health, I decided that the most appropriate method of measuring unmet need within reproductive health was to focus on the markers of disparity between the groups with the best and worst outcomes. The reproductive health indicators that I therefore used to create an index of unmet need were:

- Abortion:
    - Disparity between abortion rates within the most and least deprived sections of the population.
    - Disparity between repeat abortion rates within the most and least deprived sections of the population.
    - Disparity between repeat abortion rates among Black Caribbean and White British women

The way that values for these indicators were calculated for use within the index of unmet need will be discussed in more detail in Chapter 8.

8 CREATING THE INDEX OF UNMET NEED WITHIN SRH

In this chapter, I will discuss the methods that I used to achieve the primary objective of this project: the creation of an indicator of unmet need within sexual and reproductive health. I will also discuss the spatial analyses that I used to investigate the geographical patterns of unmet need demonstrated by this indicator, and outline the way in which this indicator can be used at the regional level.

8.1 Overview

The composite indicator that I created to measure unmet need within SRH is called the Index of Unmet Need within Sexual and Reproductive Health (IUSRH). The IUSRH combines a range of indicators within sexual and reproductive health, allowing levels of intraregional outcome disparity to be quantified, mapped and compared. The indicator contains three levels of information:

- A score that indicates the absolute disparity in sexual or reproductive outcomes between either the most and least deprived LSOAs within a region, or between the Black and White British communities within a region.

- A score that indicates the way in which the level of disparity within a region compares to the mean level of disparity for England.
- A score that ranks all the regions in England by size of outcome disparity.

8.2 Creating a geographical indicator of unmet need

As outlined in Chapter 1, outcome mapping has previously been used within the published literature to identify patterns of unmet need. The creation of the IUSRH involved two notable additions to existing methodology:

- **Focus on disparity in outcomes, rather than absolute outcomes.**

The indicators discussed in Chapter 1 all use a score that is derived from calculation (and, usually, aggregation) of prevalence or incidence of a certain outcome within a certain geographical area. The aim of my indicator, however, was to map patterns of inequality within SRH i.e. investigating whether the differences in outcome that correlate with deprivation and ethnicity differ by geographical region. This aspect of the spatial analysis is influenced by the findings of my literature review, and my qualitative Delphi exercise, as outlined in Chapters 2 and 3. Within the published literature, methods used to measure unmet need within SRH largely fall into one of two categories, defining unmet need as the failure of the prevalence of an outcome to reach a certain threshold, or defining unmet need as a disparity in outcomes between two populations. Although most geographical indicators of unmet need fall into the latter category, there is no indicator of unmet need that uses disparity itself as the outcome of interest. In addition, the Delphi participants highlighted health inequalities as a key contributor to, and outcome of, unmet need within SRH, indicating that a focus on outcome disparities is likely to make the IUSRH useful for those who are attempting to address unmet need.

The value in examining geographical disparities in sexual health outcomes was outlined recently in a toolkit created by PHE. This publication aimed to help sexual health commissioners and service providers to understand the implications of between-area and in-area variation with regards to sexual health outcomes[208]. One aspect of the toolkit was a suggested approach to analysing STI diagnosis rates, combining within area inequality and between area variability to divide LAs into four quartiles:

- Quartile 1: **Low** rates of infection compared to other areas and **low** within area variation
- Quartile 2: **High** rates of infection compared to other areas and **low** within area variation
- Quartile 3: **Low** rates of infection compared to other areas and **high** within area variation
- Quartile 4: **High** rates of infection compared to other areas and **high** within area variation

A geographical area falling within quartiles 2, 3 and 4 was thought to be experiencing a level of unmet need (with each pattern of disparity likely requiring a different approach to addressing inequalities). Inherent within this methodology is the idea that needs within sexual health are likely to be complex, and that identifying patterns of disparity creates a starting point from which unmet need can be investigated in more depth. This concept was the foundation of my indicator of unmet need. Interpreting the trends within the datasets used to create this indicator was incredibly challenging: the impact of the NCSP on chlamydia testing and diagnosis within this group, or the complex social and cultural drivers of abortion rates in different communities, for example, were likely to complicate any conclusions regarding unmet need. Focusing on disparity, however, meant that the only preconceived conclusion inherent in the interpretation of the indicator is the idea that a difference in outcome between two populations is worthy of further investigation.

- **Focus on single population group**

The majority of population-level indicators, particularly those related to health, measure outcomes within the entire population, rather than focusing on a single group. While this method has many benefits (particularly with regards to reliability of data, given that many datasets are not consistently broken down using demographic factors such as age, gender or ethnicity), one significant disadvantage is the barriers that this method creates when using these indicators to assess patterns within a population subgroup. As outlined in my literature review (Chapter 2), the needs of sub-populations differ substantially[114–116], which means that certain patterns of need may be obscured by an indicator that measures outcomes at the whole population level. My aim, therefore, was to create an indicator that used data and outcomes that were specific to a population subgroup (women aged 16-24).

8.3 Methods

8.3.1 Creating the indicator

The IUSRH was created using a framework developed by the Organisation for Economic Co-operation and Development (OECD) and the Joint Research Centre (JRC) of the European Commission in 2008[209]. In an attempt to improve the quality of the composite indicators that are increasingly being used to communicate trends across a range of fields, the OECD and JRC created a handbook outlining methods for the design, development and dissemination of composite indicators (indicators that use multiple variables to create a summary measure that describes a multi-dimensional phenomenon). This handbook included a checklist to aid in the creation of a composite indicator. This checklist comprised ten steps:

1. Theoretical framework

Starting the process with the development of a theoretical framework ensures a clear understanding of the concept that is being measured. The theoretical framework outlines the context of the indicator, and provides a basis for the selection of outcomes, ensuring that all variables that are included are fit for purpose. This section of the handbook begins with the sentence *"What is badly defined is likely to be badly measured",* advice that is particularly important for an indicator that aims to measure a concept as complex as unmet need. The process that I used to understand and define unmet need is largely outlined in Chapters 2 and 3 (the literature review and the qualitative Delphi exercise) of this thesis.

The spatial analyses within this project fall within the field of social epidemiology, an area of research that examines the effect of social, political and structural factors on the distribution and aetiology of health outcomes[210]. The idea that an individual's status in society may have an impact on their health is not a recent one – this concept has been explored within Western public health since at least the 19th century[211]. It was in the 1980s, however, that the study of social epidemiology began to gain prominence, resulting in the development of a range of theories about the impact that social and structural factors can have on health, particularly at the population level[210]. The theoretical framework for the IUSRH is the theory of social determinants of health, and in particular the theory of social causation. This theory posits that structural and socio-economic circumstances (including those linked to race and ethnicity) have a direct impact on health outcomes[212]. This theory aims to explain the persistent finding (across settings and time periods) of a gradient of health inequality that correlates directly with certain sociodemographic factors[213]. Within this thesis, I am aiming to conceptualise unmet need within SRH via an examination of geographical and structural inequalities. While the methodology used within this project does not rely on these inequalities causing a subsequent inequality in health outcomes, many of the conclusions that arise from these analyses rely on the idea that understanding and addressing these inequalities would have a direct impact on population health. The theory of social causation is therefore foundational to the creation of the IUSRH.

2. Selecting variables

Nine variables (Table 8.1) were used to create this indicator of unmet need within SRH. I chose these variables after consideration of my quantitative analyses of gonorrhoea, chlamydia and abortion datasets (these analyses, and the rationale for the choice of variables, were outlined in Chapters 5, 6 and 7).

Many of the decisions regarding calculation of the variables used within the indicator of unmet need were influenced by the geographical units that were being used for the spatial analysis. These choices will therefore be discussed in more detail later in the chapter, as part of a wider discussion of the spatial methods within this project.

Table 8.1: Variables included within the indicator of unmet need within SRH.

	Variable	Calculation
Gonorrhoea		
$gTPC_{diff}$ (d)	Gonorrhoea tests per capita difference: deprivation	(gonorrhoea tests per 1000 women living in IMD quintile 1) — (gonorrhoea tests per 1000 women living in IMD quintile 5)
GPR_{diff} (d)	Gonorrhoea positivity rate difference: deprivation	(gonorrhoea diagnoses per 1000 gonorrhoea tests among women living in IMD quintile 1) — (gonorrhoea diagnoses per 1000 gonorrhoea tests among women living in IMD quintile 5)
GPR_{diff}(e)	Gonorrhoea positivity rate difference: ethnicity	(gonorrhoea diagnoses per 1000 gonorrhoea tests among women who reported their ethnicity as Black Caribbean or Black other) — (gonorrhoea diagnoses per 1000 gonorrhoea tests among women who reported their ethnicity as White British)
Chlamydia		
$cTPC_{diff}$ (d)	Chlamydia tests per capita difference: deprivation	(chlamydia tests per 1000 women living in IMD quintile 1) — (chlamydia tests per 1000 women living in IMD quintile 5)
CPR_{diff} (d)	Chlamydia positivity rate difference: deprivation	(chlamydia diagnoses per 1000 chlamydia tests among women living in IMD quintile 1) — (chlamydia diagnoses per 1000 chlamydia tests among women living in IMD quintile 5)
CPR_{diff}(e)	Chlamydia positivity rate difference: ethnicity	(chlamydia diagnoses per 1000 chlamydia tests among women who reported their ethnicity as Black Caribbean or Black other) — (chlamydia diagnoses per 1000 chlamydia tests among women who reported their ethnicity as White British)
Abortion		
APC_{diff} (d)	Abortions per capita difference: deprivation	(abortions per 1000 women living in IMD quintile 1) — (abortions per 1000 women living in IMD quintile 5)
RAR_{diff} (d)	Repeat abortion rate difference: deprivation	(repeat abortions per 1000 abortions among women living in IMD quintile 1) — (repeat abortions per 1000 abortions among women living in IMD quintile 5)
RAR_{diff}(e)	Repeat abortion rate difference: ethnicity	(repeat abortions per 1000 abortions among women who reported their ethnicity as Black Caribbean or Black other) — (repeat abortions diagnoses per 1000 abortions among women who reported their ethnicity as White British)

3. Handling missing data

When using population data to create an indicator, it is likely that there will be some variables that do not have recorded data for every observation. There are three commonly recognised patterns via which data can be missing from a dataset[209]:

- **Missing completely at random:** there is no association between missing data and any other variable (e.g. there is income data missing, however people of all income levels were equally likely to report their income).
- **Missing at random:** there is no association between missing data and the variable of interest, but the missing variable correlates with another variable within the dataset (e.g. people of certain ethnicities are less likely to report their income, but within each ethnicity, income data are missing at random).
- **Missing not at random:** there is an association between the value of the missing data and the likelihood that the data are missing (e.g. people with higher income levels are less likely to report their income).

The pattern of missing data has an impact on the way in which missing data can be dealt with, particularly when considering the decision between case deletion (removing observations with missing data from the dataset) and imputation of missing data (insertion of values based on statistical analysis of non-missing data). I previously outlined, in Chapter 3, the case deletion within the GUMCAD dataset that resulted from inconsistencies with regards to testing and diagnosis data linked to certain observations. As there was no indication that these data were missing in a non-random pattern, I decided that case deletion (for both the quantitative analyses earlier in the chapter, and the spatial analyses within this chapter) was the most appropriate method for handling this missing data, particularly as the size of the dataset precluded any concerns regarding statistical power. The other data that were routinely missing from all of the datasets was information on ethnicity. Although the methods that I used to create this indicator incorporated deletion of observations where people had not reported their ethnicity (particularly as the ethnicity portion of the spatial analyses only included women who had reported their ethnicity as White British or Black Caribbean/Black other), it was difficult to be certain that these data were missing at random (it is plausible, for example, that people of certain ethnicities were less likely to report their ethnicity). Data from the CTAD dataset was therefore not used to create the ethnicity variable within this indicator, as this dataset contains far more missing ethnicity data than GUMCAD or the abortion dataset (as outlined in Chapter 6).

4. Multivariable analysis

The next stage of indicator development is a multivariable analysis, allowing for an understanding of the patterns and correlations within the dataset. These analyses have been discussed in Chapters 4 to 7.

5. Normalisation

Composite indicators are often created by aggregating data that use different units and different scales. The process of normalisation converts these data into comparable measures that can be appropriately combined.

While creating the IUSRH, I used z-scores to normalise the variables that were outlined in Table 8.1. z-scores are quantitative descriptions of the distance of an observed value from the mean. The formula for calculating z-scores is:

$$z = \frac{x - \mu}{\sigma}$$

x = observed value μ = mean σ = standard deviation

Within this indicator of unmet need within SRH, z-scores were used as follows:

- **Step 1:** Calculate value of relevant variable for each geographical region.

  Example – Gonorrhoea TPC difference for Cumbria = (gonorrhoea tests per 1000 women aged 16-24 living in IMD quintile 1 in Cumbria) - (gonorrhoea tests per 1000 women aged 16-24 living in IMD quintile 5 in Cumbria).

- **Step 2:** Calculate z-score for relevant variable for each geographical region

  Example - z-score (Cumbria) =

  $gTPC_{diff}$(d) (Cumbria) - mean ($gTPC_{diff}$(d) for all regions in England)/

  Standard deviation ($gTPC_{diff}$(d) for all regions in England)

The choice of normalisation technique has a significant impact on the way in which the indicator can be interpreted. As this indicator uses z-scores as a method of normalisation, the indicator has become a measure of deviation from the mean i.e. the score that a region receives will indicate whether its level of unmet need is higher or lower than average. A key benefit of using a z-score is that it allows for a quantitative indication of how far the pattern of unmet need within a certain area deviates from that of other areas (rather than a normalisation method such as ranking, which would not differentiate between wide and narrow gaps between adjacent areas). However, one disadvantage of using the mean as a benchmark is the potential for creating the erroneous perception that below average is positive, and above average is negative (or that areas that have a negative z-score have little disparity in outcomes and low levels of unmet need). When interpreting the IUSRH, it is therefore important to remember that the z-scores given to each region allow for comparisons between levels of unmet need in different regions, but do not indicate an absolute level of unmet need.

6. Weighting and aggregation

As composite indicators are created using multiple variables, the way in which those variables are combined to create a single value is a key aspect of indicator design. The first step of aggregation involves a decision regarding the impact of each variable on the final indicator value i.e. assessing how heavily each variable will be weighted prior to aggregation. Weighting of variables within a composite indicator requires an understanding of the causal relationships within the concept being measured, meaning that the weight of each variable within the indicator mirrors the real-world impact that the variable has on the concept that is being measured. It is unusual, however, to have a quantifiable understanding of the casual relationships within a multi-factorial concept, which means that most composite indicators weight variables equally[209]. Given the complex nature of unmet need as a concept, and the lack of a standardised definition within the published literature, I decided not to use differential weighting within this indicator.

Once a weighting strategy has been established, the next step involves deciding on a method of combining the variables to create a single score. In particular, it is important to ensure that the method of combining the variables doesn't result in one or more variables being overrepresented within the final score, which is possible if collinearity between the variables results in double counting of a certain concept. The analyses in Chapters 5, 6 and 7 indicated that although there is correlation between the variables that comprise this indicator, the gonorrhoea, chlamydia and abortion outcomes used to create this indicator are measuring different things. I therefore decided to combine the variables within this indicator by calculating the sum of the z-scores for each of the multiple variables. Each geographical region was therefore given a score within three domains, with the score for each domain being the sum of the z-scores for three variables (as outlined in Table 8.2). The domains aimed to combine z-scores for variables that were measuring similar outcomes for gonorrhoea, chlamydia and abortion. The cumulative z scores for each geographical region were then ranked from smallest (rank 1) to largest (rank 33).

Choosing the variables to include within each cumulative domain was challenging – as discussed in earlier chapters, changes in gonorrhoea testing rates among this population have different implications to changes in chlamydia testing rates (due, in part to the NCSP), which in turn have different implications to changes in abortion rates. Combining all of these variables into one ‘service use’ domain had the potential to make interpretation of domain scores particularly complex. I decided, however, that the utility of the cumulative domain scores (and the combination of SRH indicators) outweighed the challenges. This utility is outlined in more detail within the discussion section.

Table 8.2: Domains of the indicator of unmet need within SRH

Domain	Variables
Service use (deprivation)	○ Gonorrhoea tests per capita difference (deprivation) ○ Chlamydia tests per capita difference (deprivation) ○ Abortions per capita difference (deprivation)
Outcomes (deprivation)	○ Gonorrhoea positivity rate difference (deprivation) ○ Chlamydia positivity rate difference (deprivation) ○ Repeat abortion rate difference (deprivation)
Outcomes (ethnicity)	○ Gonorrhoea positivity rate difference (ethnicity) ○ Chlamydia positivity rate difference (ethnicity) ○ Repeat abortion rate difference (ethnicity)

As the rankings for each region were comparative (and therefore relative to the rankings for the other regions in England), it was not appropriate to compare rankings over time (because a change in ranking will not necessarily coincide with a change in absolute levels of disparity). This is a limitation that is common to all indicators that use comparative forms of normalisation[179]. The analyses of domain scores and rankings therefore did not include comparisons of scores over time.

7. Uncertainty and sensitivity analysis

The OECD/JRC handbook recommended sensitivity analyses to test the robustness of the indicator itself. Potential sensitivity analyses include:

- changing the individual variables within the indicator
- changing the normalisation method used to create the indicator
- using different weighting schemes
- using different aggregation systems

The sensitivity analyses used while creating this indicator were:

- Inclusion and exclusion of CTAD data when creating the ethnicity-related chlamydia variables
- Using linear normalisation as a normalisation method, rather than z-scores

Linear normalisation involves converting the raw data into a range of figures between 0 and 1, using the formula:

$$z_i = (x_i - \min(x))/(\max(x) - \min(x))$$

z_i = i^th normalised value in the dataset x_i = i^th value in the dataset

$\min(x)$ = minimum value in the dataset

$\max(x)$ = maximum value in the dataset

Table 8.3 compares the overall ranking that each region received when z-scores were used as a normalisation method, to the ranking received during the sensitivity analysis when linear normalisation was used. The overall positioning of most regions did not change when either of these sensitivity analyses was performed, and the regions whose ranking did change only moved by a maximum of two points, indicating that the IUSRH is robust to changes in methodology.

Table 8.3: Comparison of IUSRH regional ranks (2012 – 2015) using either z-scores or linear normalisation as normalisation methods

	Service use (deprivation)		Outcomes (deprivation)		Outcomes (ethnicity)	
Region Code	Rank of region using z-scores	Rank of region using linear normalisation	Rank of region using z-scores	Rank of region using linear normalisation	Rank of region using z-scores	Rank of region using linear normalisation
UKC1	19	20	22	21	1	1
UKC2	26	26	18	17	4	3
UKD1	28	27	2	2	Insufficient data	
UKD3	2	2	9	9	14	12
UKD4	16	16	12	12	2	2
UKD6	21	22	16	16	16	17
UKD7	10	10	7	7	10	10
UKE1	22	23	4	4	11	11
UKE2	31	31	5	6	Insufficient data	
UKE3	32	32	28	28	5	5
UKE4	8	8	13	11	19	16
UKF1	4	4	15	14	8	6
UKF2	6	6	19	19	23	22
UKF3	5	5	21	22	Insufficient data	
UKG1	11	12	8	8	15	15
UKG2	29	30	10	10	7	8
UKG3	13	13	31	31	17	18
UKH1	25	25	23	23	22	23
UKH2	3	3	26	26	9	9
UKH3	17	17	17	18	26	26
UKI3	1	1	30	29	27	27
UKI4	7	7	29	30	28	28
UKI5	9	9	27	27	25	25
UKI6	15	15	32	32	29	29
UKI7	12	11	25	25	24	24
UKJ1	24	24	24	24	21	20
UKJ2	27	28	1	1	13	13
UKJ3	14	14	11	13	6	7
UKJ4	30	29	20	20	18	19
UKK1	18	18	6	5	20	21
UKK2	23	21	3	3	12	14
UKK3	20	19	Insufficient data		Insufficient data	
UKK4	33	33	14	15	3	4

8. Return to the data

At this stage, the OECD/JRC handbook recommends returning to the original dataset and deconstructing the indicator to further analyse the implications of individual variables when interpreting the composite values. This aspect of the process will be discussed in more detail in the results and discussion sections of this chapter.

9. Links to other indicators

The next step is an analysis of the correlation between the new indicator and other indicators of related concepts. With regards to the IUSRH, I found this step challenging for two reasons. First, the most significant validated indicator that directly relates to the IUSRH is the IMD, which is a component of the IUSRH, meaning that analyses of the correlation between the two indicators would be inappropriate. Second, the size of the geographical units used to create the IUSRH (as discussed later in the methods section of this chapter) was larger than that used to create many other indicators, making direct comparison difficult. This step was therefore omitted in the creation of the IUSRH.

10. Visualisation of the results

The final step recommended by the OECD/JRC is the visualisation of the new indicator. I visualised the IUSRH using maps, leading to spatial analyses that will be discussed in more detail in the next section of this chapter.

8.3.2 Spatial analyses

Outline of the data

The aim the IUSRH was to assess geographical patterns of unmet need. As such, one decision that I had to make when creating the indicator was the level of geography at which the index was going to be calculated. The datasets that were used to create the indicator were those that were used for the analyses in Chapters 5, 6 and 7: a GUMCAD extract, a CTAD extract and an extract from the DHSC abortion dataset, that provided information regarding gonorrhoea tests and diagnoses, chlamydia tests and diagnoses, abortions and repeat abortions among women aged 16-24 in England between 2012 and 2019. It was the nature of these datasets that dictated the level of geography that I was able to use to create an indicator; breaking the data down to a geographical layer that was too granular risked there not being enough data for the calculation of a z-score in certain regions (particularly given that the population of young women in England is not distributed equally across the country). This was a particular concern when considering gonorrhoea tests and diagnoses, given that gonorrhoea positivity is a relatively rare outcome among this population. I therefore decided that the indicator would be calculated at the second level of the Nomenclature of Territorial Units for Statistics (NUTS2). NUTS is a geographical classification that was created by the European Union (EU) in 2003 as a means to subdivide EU territory in a way that is conducive to statistical analysis (a similar concept to output areas, which are discussed in Chapter 4). NUTS geographical units fall into three hierarchical levels: NUTS1 (largest), NUTS2 and NUTS3[214,215]. Each region has a corresponding code. The relationship between the three levels of NUTS classification are outlined in Figure 8.1, and the NUTS2 regions and codes used within this analysis are outlined in Table 8.4.

Unlike output areas, which are designed to be homogenous with regards to population size, NUTS regions are based around administrative units. NUTS1 regions in the UK are analogous to administrative regions, NUTS2 regions are analogous to counties (or groups of counties) and NUTS3 regions are analogous to unitary authorities (or groups of unitary authorities)[215]. Each region is denoted using an alphanumeric code. The first two letters signify the country (e.g. UK), the third letter signifies the region (e.g. UKH) and the subsequent two numbers signify the sub-regions (e.g. UKH3 or UKH36). The NUTS2 level of geography was used for the creation of the IUSRH, as this geographical level had a large enough population of women aged 16-24 in each region to allow for the creation of z-scores.

Despite using relatively large units of geography, creating this indicator using the data available also required certain demographic considerations. Even at the NUTS2 level, there was a relatively small population of women aged 16-24 living in IMD decile 10 in certain regions, which influenced the decision to compare IMD quintiles (rather than deciles) within the deprivation domains of the IUSRH. Similarly, certain regions had very small Black Caribbean populations, which meant that z-scores within the ethnicity domain of the IUSRH were calculated by comparing outcomes among women who had reported their ethnicity as either Black Caribbean or Black Other with outcomes among women who had reported their ethnicity as White British.

This consideration also affected the time period used for each spatial analysis. Although the statistical analyses within Chapters 5, 6 and 7 were done using year-end data, the number of gonorrhoea tests, chlamydia tests and abortions in each region was too small to allow for the creation of z-scores if the data were broken down by year of data collection. The IUSRH was therefore created using data collected over two time periods: 2012 to 2015 and 2016 to 2019. These two time periods were chosen to avoid comparisons between quintiles within the 2015 iteration of the IMD and the 2019 iteration of the IMD when calculating the z-scores for deprivation.

Despite this aggregation of data (with regards to geography, ethnicity and time period), certain regions still had relatively little data that corresponded to certain outcomes. Regions in which there were no data for at least one variable therefore did not receive a z-score calculation.

Figure 8.1: Relationship between NUTS1, NUTS2 and NUTS3 regions in England (2018)

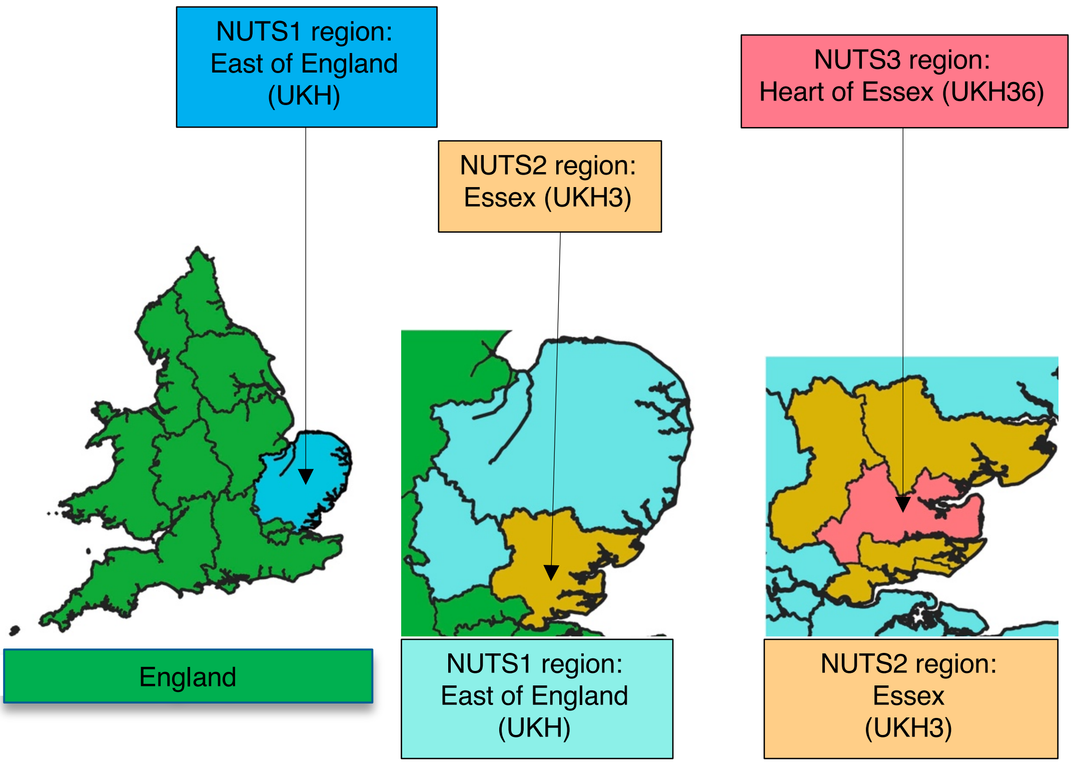


Table 8.4: NUTS2 regions and codes within England (2018)

NUTS2 region	NUTS2 code
Tees Valley and Durham	UKC1
Northumberland and Tyne and Wear	UKC2
Cumbria	UKD1
Greater Manchester	UKD3
Lancashire	UKD4
Cheshire	UKD6
Merseyside	UKD7
East Yorkshire and Northern Lincolnshire	UKE1
North Yorkshire	UKE2
South Yorkshire	UKE3
West Yorkshire	UKE4
Derbyshire and Nottinghamshire	UKF1
Leicestershire, Rutland and Northamptonshire	UKF2
Lincolnshire	UKF3
Herefordshire, Worcestershire and Warwickshire	UKG1
Shropshire and Staffordshire	UKG2
West Midlands	UKG3
East Anglia	UKH1
Bedfordshire and Hertfordshire	UKH2
Essex	UKH3
Inner London - West	UKI3
Inner London - East	UKI4
Outer London - East and North East	UKI5
Outer London - South	UKI6
Outer London - West and North West	UKI7
Berkshire, Buckinghamshire and Oxfordshire	UKJ1
Surrey, East and West Sussex	UKJ2
Hampshire and Isle of Wight	UKJ3
Kent	UKJ4
Gloucestershire, Wiltshire and Bath/Bristol area	UKK1
Dorset and Somerset	UKK2
Cornwall and Isles of Scilly	UKK3
Devon	UKK4

Creating the maps

The maps that were used to visualise the IUSRH were created using the QGIS Geographical Information Systems software (version 3.22)[216]. The NUTS2 borders for England were generated using a Shapefile published by the Office for National Statistics that contained the digital vector boundaries for the NUTS2 regions as they existed in 2018 (these boundaries are the same boundaries that existed between 2012 and 2019, the time period of this analysis)[217].

8.4 Results

In this section, I will describe the geographical trends arising from spatial analysis of the three types of score within the IUSRH.

Raw scores

Raw scores indicate the absolute disparity in sexual or reproductive outcomes between the LSOAs within the 1st (most deprived) and 5th (least deprived) IMD quintiles within a NUTS2 region, or between the Black and White British communities within a NUTS2 region.

Z-scores

Z-scores indicate the way that the raw score for a region compares to the mean raw score for England.

Rank

Each NUTS2 region receives a rank based on its domain z-score (as outlined in Table 8.2).

8.4.1 Interpreting the IUSRH

Raw scores

The calculation method for the raw scores within the IUSRH is described in Table 8.1. The interpretation of each type of raw score is outlined in Table 8.5.

Table 8.5: Interpretation of raw scores within the IUSRH

Type of raw score	Interpretation if positive (greater than zero)	Interpretation if negative (less than zero)
Gonorrhoea		
gTPCdiff(d)	Gonorrhoea testing rates are higher in more deprived areas	Gonorrhoea testing rates are higher in less deprived areas
GPRdiff(d)	GPR is higher in more deprived areas	GPR is higher in less deprived areas
GPRdiff(e)	GPR is higher among Black women than among White British women	GPR is higher among White British women than among Black women
Chlamydia		
Type of raw score	**Interpretation if positive (greater than zero)**	**Interpretation if negative (less than zero)**
cTPCdiff(d)	Chlamydia testing rates are higher in more deprived areas	Chlamydia testing rates are higher in less deprived areas
CPRdiff(d)	CPR is higher in more deprived areas	CPR is higher in less deprived areas
CPRdiff(e)	CPR is higher among Black women than among White British women	CPR is higher among White British women than among Black women
Abortion		
Type of raw score	**Interpretation if positive (greater than zero)**	**Interpretation if negative (less than zero)**
APCRdiff(d)	Abortion rates are higher in more deprived areas	Abortion rates are higher in less deprived areas
RARdiff(d)	RAR is higher in more deprived areas	RAR is higher in less deprived areas
RARdiff(e)	RAR is higher among Black women than among White British women	RAR is higher among White British women than among Black women

z-scores

The calculation method for z-scores within the IUSRH is described in the ‘normalisation’ subsection within the Methods section of this chapter. The interpretation of each type of z-score is outlined in Table 8.6.

Table 8.6: Interpretation of z-scores within the IUSRH

Gonorrhoea		
Type of z score	**Interpretation if positive (greater than zero)**	**Interpretation if negative (less than zero)**
gTPCdiff(d)	Balance of gonorrhoea tests leans towards more deprived areas (when compared to the mean raw gTPCdiff(d) for all regions in England)	Balance of gonorrhoea tests leans towards less deprived areas (when compared to the mean raw gTPCdiff(d) for all regions in England)
GPRdiff(d)	Balance of gonorrhoea diagnoses leans towards more deprived areas (when compared to the mean raw GPRdiff(d) for all regions in England)	Balance of gonorrhoea diagnoses leans towards more deprived areas (when compared to the mean raw GPRdiff(d) for all regions in England)
GPRdiff(e)	Balance of gonorrhoea diagnoses leans towards the Black population (when compared to the mean raw GPRdiff(e) for all regions in England)	Balance of gonorrhoea diagnoses leans towards the White British population (when compared to the mean raw GPRdiff(e) for all regions in England)

Chlamydia		
Type of raw score	**Interpretation if positive (greater than zero)**	**Interpretation if negative (less than zero)**
cTPCdiff(d)	Balance of chlamydia tests leans towards more deprived areas (when compared to the mean raw cTPCdiff(d) for all regions in England)	Balance of chlamydia tests leans towards less deprived areas (when compared to the mean raw cTPCdiff(d) for all regions in England)
CPRdiff(d)	Balance of chlamydia diagnoses leans towards more deprived areas (when compared to the mean raw CPRdiff(d) for all regions in England)	Balance of chlamydia diagnoses leans towards more deprived areas (when compared to the mean raw CPRdiff(d) for all regions in England)
CPRdiff(e)	Balance of chlamydia diagnoses leans towards the Black population (when compared to the mean raw CPRdiff(e) for all regions in England)	Balance of chlamydia diagnoses leans towards the White British population (when compared to the mean raw CPRdiff(e) for all regions in England)
Abortion		
Type of raw score	**Interpretation if positive (greater than zero)**	**Interpretation if negative (less than zero)**
APCRdiff(d)	Balance of abortions leans towards more deprived areas (when compared to the mean raw APCRdiff(d) for all regions in England)	Balance of abortions leans towards less deprived areas (when compared to the mean raw APCRdiff(d) for all regions in England)
RARdiff(d)	Balance of repeat abortions leans towards more deprived areas (when compared to the mean raw RARdiff(d) for all regions in England)	Balance of repeat abortions leans towards less deprived areas (when compared to the mean raw RARdiff(d) for all regions in England)
RARdiff(e)	Balance of repeat abortions leans towards the Black population (when compared to the mean raw RARdiff(e) for all regions in England)	Balance of repeat abortions leans towards the White British population (when compared to the mean raw RARdiff(e) for all regions in England)

Domain scores:

The cumulative domain scores were calculated as follows:

Service use domain (deprivation) = $gTPC_{diff}(d) + cTPC_{diff}(d) + APC_{diff}(d)$

Outcomes domain (deprivation) = $GPR_{diff}(d) + CPR_{diff}(d) + RAR_{diff}(d)$

Outcomes domain (ethnicity) = $GPR_{diff}(e) + CPR_{diff}(e) + RAR_{diff}(e)$

8.4.2 Gonorrhoea

Raw scores (2012 – 2015)

Between 2012 and 2015, the disparities between the rates of gonorrhoea testing and diagnosis differed between NUTS2 regions in England (Table 8.7). $gTPC_{diff}(d)$ ranged from 3.36 in Cumbria (indicating that the testing rate was higher in the more deprived LSOAs within Cumbria, when compared to the less deprived LSOAs) to -6.66 in Inner London West (indicating that the testing rate was higher in less deprived LSOAs within Inner London West, when compared to the more deprived LSOAs). $GPR_{diff}(d)$ ranged from 31.05 in Outer London South (indicating that the GPR was higher in more deprived LSOAs) to -4.67 in Inner London East (indicating that the GPR was higher in less deprived LSOAs). $GPR_{diff}(e)$ ranged from 22.03 in Outer London South (indicating that the GPR was higher among Black populations) to -9.94 in Lancashire (indicating that the GPR was higher among White populations).

When examining the rates across England, a pattern emerged. Testing rates in most regions were higher among women living in less deprived areas: 21 regions had higher testing rates among women living in IMD quintile 5 (less deprived), while 12 had higher testing rates among women living in IMD quintile 1 (more deprived). Diagnosis rates, however, were higher among women living in more deprived areas in most regions (only three regions – Cumbria, Merseyside and Inner London East – had diagnosis rates that were higher among women in IMD quintile 5) and were also higher among women of Black ethnicity in most regions (eight regions – Northumberland, Cumbria, Lancashire, East Yorkshire, North Yorkshire, Lincolnshire, Dorset and Cornwall – had diagnosis rates that were higher among women of White ethnicity).

Raw scores (2016 – 2019)

Between 2016 and 2019, there were similar regional disparities between the rates of gonorrhoea testing and diagnosis in different NUTS2 regions in England as those seen between 2012 and 2015 (Table 8.8). $gTPC_{diff}(d)$ ranged from 5.56 in North Yorkshire to -6.04 in West Midlands; $GPR_{diff}(d)$ ranged from 29.38 in Outer London South to -8.80 in Cornwall; and $GPR_{diff}(e)$ ranged from 25.71 in Inner London West to -15.33 in East London.

The national pattern between 2016 and 2019 was also similar to the pattern seen between 2012 and 2015. Testing rates were generally higher among women living in less deprived areas in most regions: 22 regions had higher testing rates among women living in IMD quintile 5, while 11 had higher testing rates among women living in IMD quintile 1. Diagnosis rates, however, were almost universally higher among women living in more deprived areas (only one region – Cornwall and the Isles of Scilly – had diagnosis rates that were higher among women in IMD quintile 5), and were also higher among women of Black ethnicity (eight regions – Tees Valley, Northumberland, Cumbria, Cheshire, East Yorkshire, Lincolnshire, Hampshire and Cornwall – had diagnosis rates that were higher among women of White ethnicity).

Table 8.7: $gTPC_{diff}$(d), GPR_{diff}(d) and GPR_{diff}(e) and corresponding z-scores (2012 -2015)

NUTS2 region	$gTPC_{diff}$ (d)	z-score	GPR_{diff} (d)	z-score	GPR_{diff} (e)	z-score
Tees Valley and Durham	-1.15	-0.14	15.06	0.67	7.30	0.23
Northumberland and Tyne and Wear	0.63	0.71	20.58	1.37	-1.56	-0.82
Cumbria	3.36	2.01	-0.91	-1.35	-9.36	Insufficient data
Greater Manchester	-5.21	-2.06	5.39	-0.56	5.03	-0.04
Lancashire	-1.64	-0.37	7.37	-0.30	-9.94	-1.82
Cheshire	-0.52	0.16	5.10	-0.59	1.98	-0.40
Merseyside	-2.87	-0.95	-0.20	-1.26	0.10	-0.63
East Yorkshire and Northern Lincolnshire	-0.75	0.05	7.20	-0.33	-1.15	-0.78
North Yorkshire	0.34	0.57	1.81	-1.01	-7.00	Insufficient data
South Yorkshire	1.15	0.96	19.14	1.19	2.98	-0.29
West Yorkshire	-2.44	-0.75	15.31	0.70	9.30	0.46
Derbyshire and Nottinghamshire	-2.90	-0.96	13.46	0.47	3.97	-0.17
Leicestershire, Rutland and Northamptonshire	-1.88	-0.48	12.65	0.36	17.72	1.46
Lincolnshire	-1.19	-0.15	7.64	-0.27	-7.41	Insufficient data
Herefordshire, Worcestershire and Warwickshire	-2.60	-0.82	12.87	0.39	7.10	0.20
Shropshire and Staffordshire	0.76	0.77	12.60	0.36	4.31	-0.13
West Midlands	-1.32	-0.22	24.03	1.81	9.04	0.43
East Anglia	0.52	0.66	11.34	0.20	6.88	0.18
Bedfordshire and Hertfordshire	-4.18	-1.57	12.42	0.34	4.71	-0.08
Essex	-0.50	0.17	7.08	-0.34	17.26	1.41
Inner London - West	-6.66	-2.75	10.41	0.08	18.99	1.62
Inner London - East	-2.33	-0.70	-4.67	-1.83	18.15	1.52
Outer London - East and North East	-1.19	-0.15	18.03	1.05	14.35	1.06
Outer London - South	-0.73	0.07	31.05	2.70	22.03	1.98
Outer London - West and North West	-0.88	0.00	10.14	0.05	14.81	1.12
Berkshire, Buckinghamshire and Oxfordshire	-0.65	0.10	20.71	1.39	10.70	0.63
Surrey, East and West Sussex	0.52	0.66	2.40	-0.94	0.84	-0.54
Hampshire and Isle of Wight	-1.20	-0.16	3.26	-0.83	3.01	-0.28
Kent	1.65	1.19	6.68	-0.39	1.77	-0.43
Gloucestershire, Wiltshire and Bath/Bristol area	1.30	1.03	8.12	-0.21	12.84	0.88
Dorset and Somerset	0.84	0.81	2.71	-0.90	-0.36	-0.68
Cornwall and Isles of Scilly	0.47	0.63	2.77	Insufficient data	-3.04	Insufficient data
Devon	2.70	1.69	1.02	-1.11	2.34	-0.36

$gTPC_{diff}$ (d) = tests per capita higher in IMD quintile 1
GPR_{diff} (d) = GPR higher in IMD quintile 1
GPR_{diff} (e) = GPR higher among Black Caribbean/Black other women

$gTPC_{diff}$ (d) = tests per capita higher in IMD quintile 5
GPR_{diff} (d) = GPR higher in IMD quintile 5
GPR_{diff} (e) = GPR higher among White British women

Table 8.8: $gTPC_{diff}$(d), GPR_{diff}(d) and GPR_{diff}(e) and corresponding z-scores (2016 -2019)

NUTS2 region	$gTPC_{diff}$ (d)	z-score	GPR_{diff} (d)	z-score	GPR_{diff} (e)	z-score
Tees Valley and Durham	-1.15	-0.14	15.06	0.67	7.30	0.23
Northumberland and Tyne and Wear	0.63	0.71	20.58	1.37	-1.56	-0.82
Cumbria	3.36	2.01	-0.91	-1.35	-9.36	Insufficient data
Greater Manchester	-5.21	-2.06	5.39	-0.56	5.03	-0.04
Lancashire	-1.64	-0.37	7.37	-0.30	-9.94	-1.82
Cheshire	-0.52	0.16	5.10	-0.59	1.98	-0.40
Merseyside	-2.87	-0.95	-0.20	-1.26	0.10	-0.63
East Yorkshire and Northern Lincolnshire	-0.75	0.05	7.20	-0.33	-1.15	-0.78
North Yorkshire	0.34	0.57	1.81	-1.01	-7.00	Insufficient data
South Yorkshire	1.15	0.96	19.14	1.19	2.98	-0.29
West Yorkshire	-2.44	-0.75	15.31	0.70	9.30	0.46
Derbyshire and Nottinghamshire	-2.90	-0.96	13.46	0.47	3.97	-0.17
Leicestershire, Rutland and Northamptonshire	-1.88	-0.48	12.65	0.36	17.72	1.46
Lincolnshire	-1.19	-0.15	7.64	-0.27	-7.41	Insufficient data
Herefordshire, Worcestershire and Warwickshire	-2.60	-0.82	12.87	0.39	7.10	0.20
Shropshire and Staffordshire	0.76	0.77	12.60	0.36	4.31	-0.13
West Midlands	-1.32	-0.22	24.03	1.81	9.04	0.43
East Anglia	0.52	0.66	11.34	0.20	6.88	0.18
Bedfordshire and Hertfordshire	-4.18	-1.57	12.42	0.34	4.71	-0.08
Essex	-0.50	0.17	7.08	-0.34	17.26	1.41
Inner London - West	-6.66	-2.75	10.41	0.08	18.99	1.62
Inner London - East	-2.33	-0.70	-4.67	-1.83	18.15	1.52
Outer London - East and North East	-1.19	-0.15	18.03	1.05	14.35	1.06
Outer London - South	-0.73	0.07	31.05	2.70	22.03	1.98
Outer London - West and North West	-0.88	0.00	10.14	0.05	14.81	1.12
Berkshire, Buckinghamshire and Oxfordshire	-0.65	0.10	20.71	1.39	10.70	0.63
Surrey, East and West Sussex	0.52	0.66	2.40	-0.94	0.84	-0.54
Hampshire and Isle of Wight	-1.20	-0.16	3.26	-0.83	3.01	-0.28
Kent	1.65	1.19	6.68	-0.39	1.77	-0.43
Gloucestershire, Wiltshire and Bath/Bristol area	1.30	1.03	8.12	-0.21	12.84	0.88
Dorset and Somerset	0.84	0.81	2.71	-0.90	-0.36	-0.68
Cornwall and Isles of Scilly	0.47	0.63	2.77	Insufficient data	-3.04	Insufficient data
Devon	2.70	1.69	1.02	-1.11	2.34	-0.36

$gTPC_{diff}$ (d) = tests per capita higher in IMD quintile 1
GPR_{diff} (d) = GPR higher in IMD quintile 1
GPR_{diff} (e) = GPR higher among Black Caribbean/Black other women

$gTPC_{diff}$ (d) = tests per capita higher in IMD quintile 5
GPR_{diff} (d) = GPR higher in IMD quintile 5
GPR_{diff} (e) = GPR higher among White British women

IUSRH z-scores

$gTPC_{diff}$ (d)

z-scores for $gTPC_{diff}$(d) between 2012 and 2015 ranged from 2.06 in Cumbria to -2.75 in Inner London West (Table 8.7). Although there was not a strict geographical pattern of z-scores (Figure 8.2), the majority of regions in the South and North of England had positive $gTPC_{diff}$(d) z-scores (indicating that the balance of gonorrhoea tests leant toward more deprived areas in these regions when compared to the mean), while the majority of regions in London and the Midlands had negative $gTPC_{diff}$(d) z-scores (indicating that the balance of gonorrhoea tests leant toward less deprived areas in these regions when compared to the mean).

z-scores for $gTPC_{diff}$ (d) between 2016 and 2019 ranged from 2.35 in North Yorkshire to -1.79 in West Midlands(Table 8.8). The relationship between raw scores and the mean changed in five regions, with z-scores in Cornwall, Outer London South and Berkshire becoming negative (having been positive between 2012 and 2015) and z-scores in Lincolnshire and Tees Valley becoming positive (having been negative in between 2012 and 2015).

GPR_{diff}(d)

z-scores for GPR_{diff}(d) between 2012 and 2015 ranged from 2.70 in Outer London South to -1.83 in Inner London East (Table 8.7). The geographical pattern of z-scores was almost an inversion of that seen with the z-scores for $gTPC_{diff}$(d) (Figure 8.3). In this case, the majority of regions in the South and North of England had negative z-scores (indicating that the balance of gonorrhoea diagnoses leant toward less deprived areas in these regions when compared to the mean), while the majority of regions in London and the Midlands had positive z-scores (indicating that the balance of gonorrhoea diagnoses leant toward more deprived areas in these regions when compared to the mean).

z-scores for GPR_{diff}(d) between 2016 and 2019 ranged from 2.81 in Outer London South to -2.75 in Cornwall (Table 8.8). The relationship between raw scores and the mean changed in eight regions, with z-scores in South Yorkshire, Herefordshire and Berkshire becoming negative (having been positive between 2012 and 2015), and z-scores in Greater Manchester, Lancashire, East Yorkshire, Essex and Inner London East becoming positive (having been negative in between 2012 and 2015).

GPR_{diff}(e)

z-scores for GPR_{diff}(e) between 2012 and 2015 ranged from 1.98 in Outer London South to -1.82 in Lancashire (Table 8.7). The geographical pattern of z-scores was similar to that of the z-scores for GPR_{diff}(d) (Figure 8.4). Once again, the majority of regions in the South and North of England had negative z-scores (indicating that the balance of gonorrhoea diagnoses leant toward the White population in these regions when compared to the mean), while the majority of regions in London and the Midlands had positive z-scores (indicating that the balance of gonorrhoea diagnoses leant toward the Black population in these regions when compared to the mean).

z-scores for GPR_{diff}(e) between 2016 and 2019 ranged from 1.77 in Inner London West to -2.09 in East Yorkshire (Table 8.8). The relationship between raw scores and the mean changed in eight regions, with z-scores in Tees Valley and Gloucestershire becoming negative (having been positive between 2012 and 2015), and z-scores in Merseyside, South Yorkshire, Derbyshire, Surrey, Kent and Devon becoming positive (having been negative in between 2012 and 2015).

Figure 8.2: z-scores for $gTPC_{diff}(d)$ among women aged 16 – 24 in England by NUTS2 region

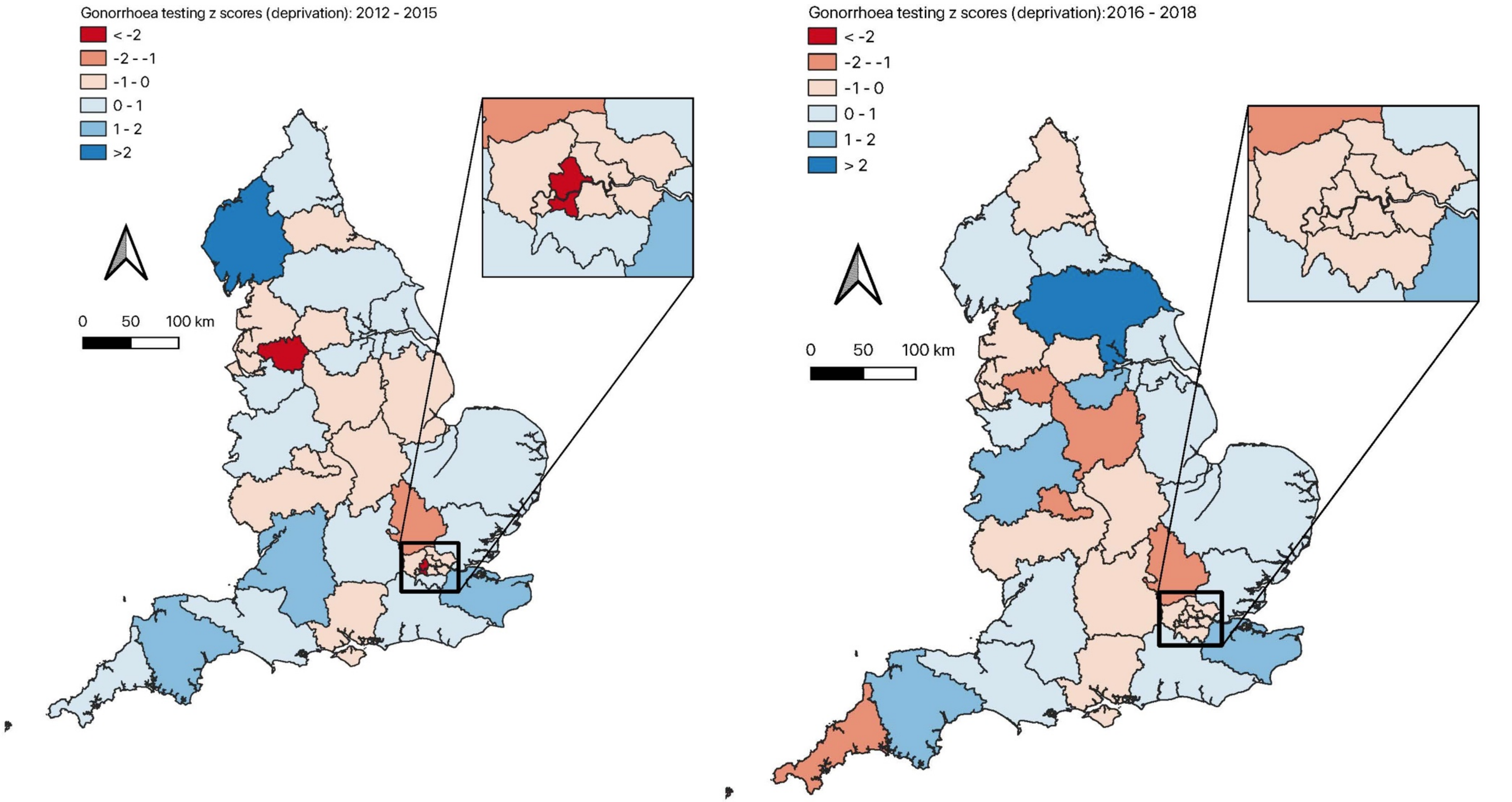


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Figure 8.3: z-scores for the $GPR_{diff}(d)$ among women aged 16 – 24 in England by NUTS2 region

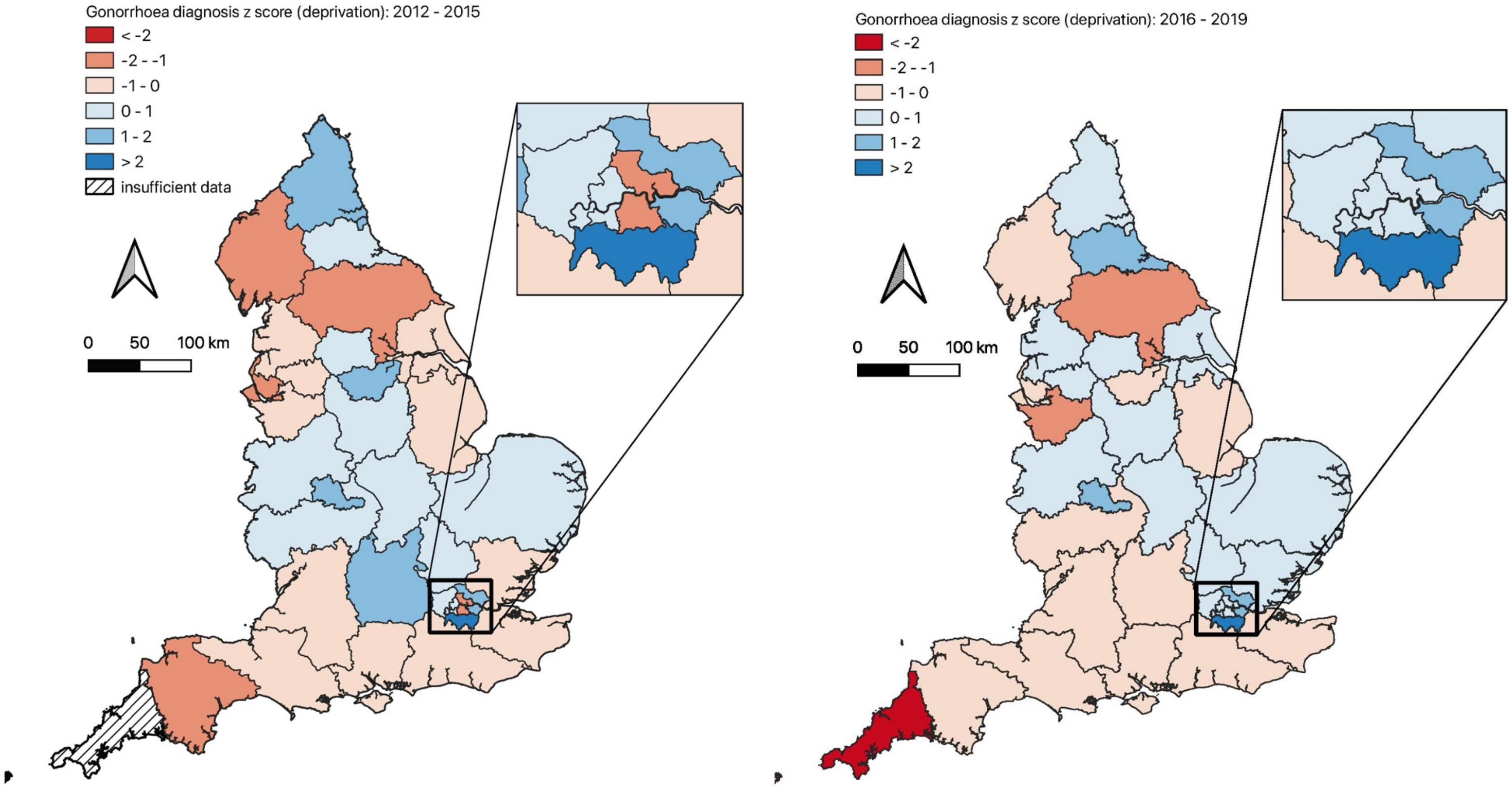
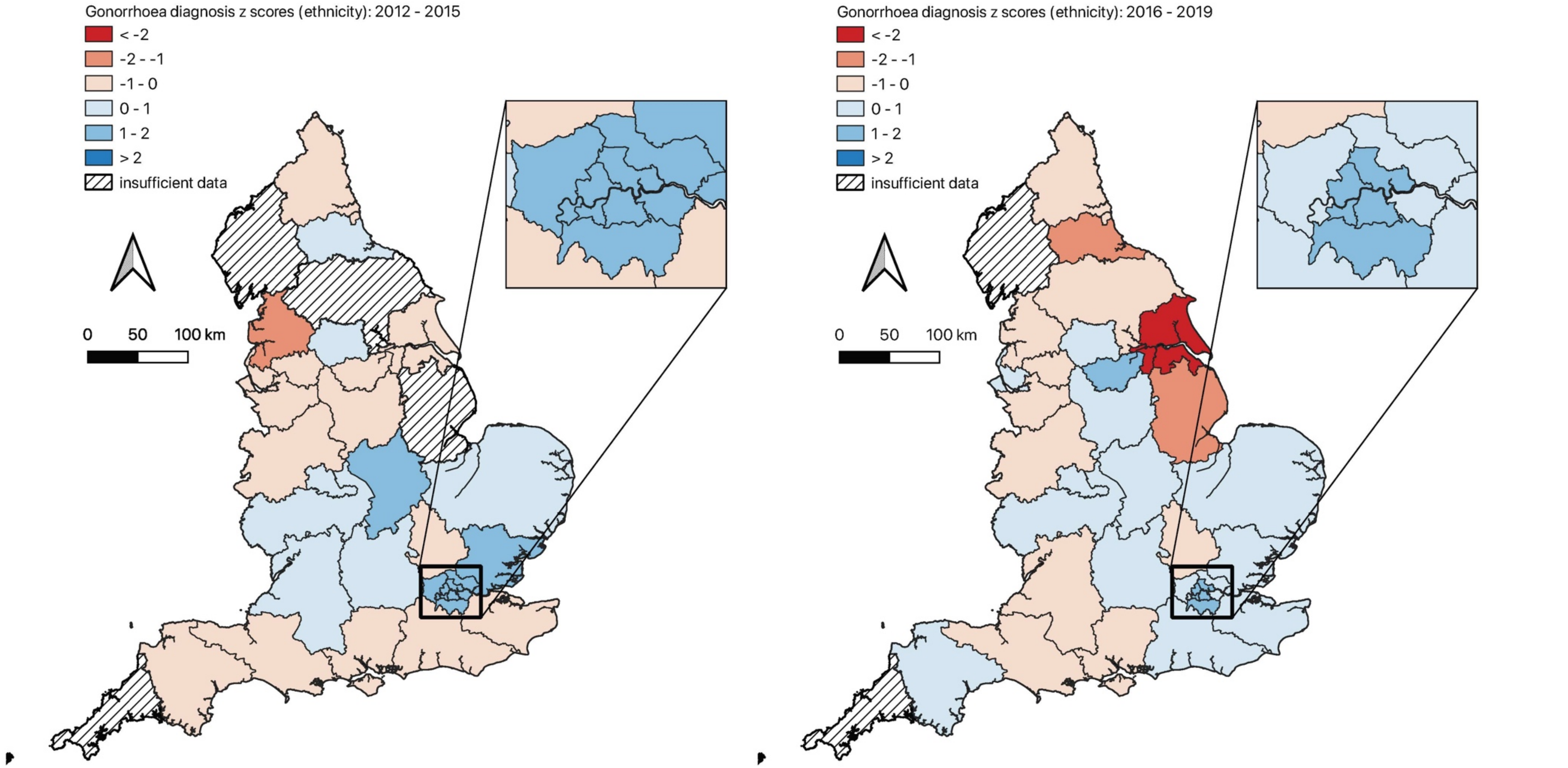


Figure 8.4: z-scores for the $GPR_{diff}(e)$ among women aged 16 – 24 in England by NUTS2 region



8.4.3 Chlamydia

Raw scores (2012 – 2015)

Between 2012 and 2015, $cTPC_{diff}(d)$ ranged from 21.71 (testing rates higher in IMD quintile 1) in Surrey to -20.72 (testing rates higher in IMD quintile 5) in Lincolnshire (Table 8.9). When examining rates of diagnosis, chlamydia diagnosis rates were higher in the LSOAs within IMD quintile 1 every region: $CPR_{diff}(d)$ ranged from 37.55 in Inner London East to 0.22 in Cornwall. With regards to ethnicity, $CPR_{diff}(e)$ ranged from 71.95 in North Yorkshire to -99.87 in Lancashire.

When examining the national pattern of testing and diagnosis, testing rates in most regions were higher among women living in more deprived areas; 20 regions had higher testing rates among women living in more deprived areas, while 13 had higher testing rates among women living in less deprived areas. Diagnosis rates were higher among women living in more deprived areas in every region. With regards to ethnicity, however, seventeen regions had diagnosis rates that were higher among women of White ethnicity, compared to sixteen regions that had diagnosis rates that were higher among women of Black ethnicity.

Raw scores (2016 – 2019)

Between 2016 and 2019, there were similar regional disparities between the rates of chlamydia testing and diagnosis in different NUTS2 regions in England as those seen between 2012 and 2015 (Table 8.10). $cTPC_{diff}(d)$ ranged from 19.96 in North Yorkshire to -10.59 in West Yorkshire.

CPR_{diff}(d) ranged from 46.64 in Inner London East to 7.37 in Surrey. CPR_{diff}(e) ranged from 66.05 in Inner London East to -78.35 in Cumbria.

With regards to deprivation, the national pattern between 2016 and 2019 was similar to the pattern seen between 2012 and 2015. Testing rates were generally higher among women living in more deprived areas in most regions; 19 regions had higher testing rates among women living in more deprived areas, while 14 had higher testing rates among women living in less deprived areas. Diagnosis rates were universally higher among women living in more deprived areas. Unlike the pattern seen between 2012 and 2015, more regions had higher rates among women of Black ethnicity between 2016 and 2019 (21 regions had diagnosis rates that were higher among women of Black ethnicity, compared to 12 regions that had higher diagnosis rates among women of White ethnicity).

Table 8.9: $cTPC_{diff}$(d), CPR_{diff}(d) and CPR_{diff}(e) and corresponding z-scores (2012 -2015)

NUTS2 region	$cTPC_{diff}$ (d)	z-score	CPR_{diff} (d)	z-score	CPR_{diff} (e)	z-score
Tees Valley and Durham	16.42	1.25	18.78	-0.03	-29.39	-0.90
Northumberland and Tyne and Wear	12.09	0.83	17.88	-0.13	-34.08	-1.06
Cumbria	7.95	0.42	2.97	-1.83	-99.87	Insufficient data
Greater Manchester	-12.92	-1.62	17.05	-0.23	-14.77	-0.40
Lancashire	7.37	0.37	13.91	-0.59	-15.24	-0.42
Cheshire	8.93	0.52	21.94	0.33	11.53	0.50
Merseyside	-0.55	-0.41	14.56	-0.51	-14.82	-0.40
East Yorkshire and Northern Lincolnshire	17.95	1.40	6.68	-1.41	-15.67	-0.43
North Yorkshire	14.48	1.06	15.56	-0.40	71.95	2.56
South Yorkshire	11.23	0.74	23.93	0.55	-29.97	-0.92
West Yorkshire	-4.18	-0.76	14.94	-0.47	-11.85	-0.30
Derbyshire and Nottinghamshire	-5.81	-0.92	17.12	-0.22	-27.04	-0.82
Leicestershire, Rutland and Northamptonshire	-7.94	-1.13	18.59	-0.05	2.40	0.18
Lincolnshire	-20.72	-2.38	24.69	0.64	-20.95	-0.61
Herefordshire, Worcestershire and Warwickshire	0.03	-0.35	12.42	-0.76	-10.45	-0.25
Shropshire and Staffordshire	9.33	0.56	10.48	-0.98	-7.77	-0.16
West Midlands	-1.29	-0.48	27.36	0.94	2.70	0.19
East Anglia	10.01	0.62	35.59	1.88	24.44	0.94
Bedfordshire and Hertfordshire	-11.94	-1.52	28.85	1.11	-9.32	-0.22
Essex	2.88	-0.07	22.46	0.39	20.32	0.80
Inner London - West	-10.66	-1.40	25.59	0.74	32.00	1.19
Inner London - East	-4.17	-0.76	37.55	2.11	39.76	1.46
Outer London - East and North East	-4.52	-0.80	26.39	0.83	20.98	0.82
Outer London - South	-2.24	-0.57	36.66	2.00	27.16	1.03
Outer London - West and North West	-2.31	-0.58	25.44	0.73	15.36	0.63
Berkshire, Buckinghamshire and Oxfordshire	18.59	1.46	16.13	-0.33	2.35	0.18
Surrey, East and West Sussex	21.71	1.77	12.15	-0.79	3.12	0.21
Hampshire and Isle of Wight	5.13	0.15	22.94	0.44	-11.47	-0.29
Kent	6.72	0.30	15.49	-0.41	8.97	0.41
Gloucestershire, Wiltshire and Bath/Bristol area	3.62	0.00	14.13	-0.56	8.23	0.38
Dorset and Somerset	10.81	0.70	9.86	-1.05	16.56	0.67
Cornwall and Isles of Scilly	13.25	0.94	0.22	-2.14	-23.59	-0.70
Devon	10.46	0.67	20.75	0.19	-31.11	-0.96

$cTPC_{diff}$ (d) = tests per capita higher in IMD quintile 1
CPR_{diff} (d) = CPR higher in IMD quintile 1
CPR_{diff} (e) = CPR higher among Black Caribbean/Black other women

$cTPC_{diff}$ (d) = tests per capita higher in IMD quintile 5
CPR_{diff} (d) = CPR higher in IMD quintile 5
CPR_{diff} (e) = CPR higher among White British women

Table 8.10: $cTPC_{diff}$(d), CPR_{diff}(d) and CPR_{diff}(e) and corresponding z-scores (2016 -2019)

NUTS2 region	$cTPC_{diff}$ (d)	z-score	CPR_{diff} (d)	z-score	CPR_{diff} (e)	z-score
Tees Valley and Durham	6.86	0.94	44.51	1.67	-14.87	-0.88
Northumberland and Tyne and Wear	4.53	0.58	18.55	-0.52	-9.57	-0.69
Cumbria	-0.07	-0.12	16.00	-0.74	-78.35	-3.13
Greater Manchester	-10.18	-1.67	18.19	-0.55	5.67	-0.15
Lancashire	5.94	0.80	27.41	0.23	8.09	-0.07
Cheshire	3.22	0.38	24.70	0.00	-3.84	-0.49
Merseyside	0.59	-0.02	9.81	-1.26	15.02	0.18
East Yorkshire and Northern Lincolnshire	-0.23	-0.15	22.05	-0.23	10.25	0.01
North Yorkshire	19.96	2.94	12.80	-1.01	-16.43	-0.94
South Yorkshire	8.80	1.24	24.65	-0.01	15.03	0.18
West Yorkshire	-10.59	-1.73	13.51	-0.95	-21.77	-1.12
Derbyshire and Nottinghamshire	-7.97	-1.33	26.08	0.12	-0.08	-0.36
Leicestershire, Rutland and Northamptonshire	-6.37	-1.08	21.94	-0.23	36.50	0.94
Lincolnshire	1.95	0.19	10.64	-1.19	-45.68	-1.97
Herefordshire, Worcestershire and Warwickshire	3.71	0.46	17.94	-0.57	-8.21	-0.64
Shropshire and Staffordshire	6.37	0.87	7.93	-1.42	35.78	0.91
West Midlands	-9.27	-1.53	39.30	1.23	27.29	0.61
East Anglia	3.87	0.48	38.13	1.13	-3.48	-0.48
Bedfordshire and Hertfordshire	-6.57	-1.12	39.32	1.23	29.30	0.68
Essex	2.46	0.27	28.73	0.34	30.07	0.71
Inner London - West	-6.06	-1.04	32.54	0.66	42.96	1.17
Inner London - East	-3.28	-0.61	46.64	1.85	66.05	1.98
Outer London - East and North East	-3.53	-0.65	45.43	1.75	30.11	0.71
Outer London - South	-3.96	-0.72	39.99	1.29	56.52	1.65
Outer London - West and North West	-4.08	-0.73	34.29	0.81	30.79	0.74
Berkshire, Buckinghamshire and Oxfordshire	7.04	0.97	29.32	0.39	25.16	0.54
Surrey, East and West Sussex	5.82	0.78	7.37	-1.47	13.74	0.13
Hampshire and Isle of Wight	-2.82	-0.54	37.61	1.09	5.91	-0.14
Kent	5.90	0.79	11.35	-1.13	20.88	0.39
Gloucestershire, Wiltshire and Bath/Bristol area	0.99	0.04	19.17	-0.47	15.08	0.18
Dorset and Somerset	2.48	0.27	10.82	-1.18	28.14	0.64
Cornwall and Isles of Scilly	2.00	0.20	16.03	-0.73	-10.07	-0.71
Devon	6.14	0.83	23.03	-0.14	-6.08	-0.57

$cTPC_{diff}$ (d) = tests per capita higher in IMD quintile 1
CPR_{diff} (d) = CPR higher in IMD quintile 1
CPR_{diff} (e) = CPR higher among Black Caribbean/Black other women

$cTPC_{diff}$ (d) = tests per capita higher in IMD quintile 5
CPR_{diff} (d) = CPR higher in IMD quintile 5
CPR_{diff} (e) = CPR higher among White British women

IUSRH z-scores

$cTPC_{diff}$ (d)

z-scores for $cTPC_{diff}$ (d) between 2012 and 2015 ranged from 1.77 in Surrey to -2.38 in Lincolnshire (Table 8.9). Although there was not a strict geographical pattern of z-scores (Figure 8.5), most regions in the South and North of England had positive $cTPC_{diff}$ (d) z-scores (indicating that the balance of chlamydia tests leant toward more deprived areas when compared to the mean), while the majority of regions in London and the Midlands had negative $cTPC_{diff}$ (d) z-scores.

z-scores for $cTPC_{diff}$ (d) between 2016 and 2019 ranged from 2.94 in North Yorkshire to -1.73 in West Yorkshire (Figure 8.6). The relationship between raw scores and the mean changed in eight regions, with z-scores in Cumbria, East Yorkshire and Hampshire becoming negative (having been positive between 2012 and 2015), and z-scores in Greater Manchester, Lincolnshire, Herefordshire, Essex and Gloucestershire becoming positive (having been negative in between 2012 and 2015).

CPR_{diff}(d)

z-scores for CPR_{diff}(d) between 2012 and 2015 ranged from 2.11 in Inner London East to -2.14 in Cornwall (Table 8.9). Although there was, once again, no strict geographical pattern, the majority of regions in London and the East of England had positive z-scores, while the majority of regions in the rest of the country had negative z-scores.

z-scores for CPR_{diff}(d) between 2016 and 2019 ranged from 1.85 in Inner London East to -1.47 in Surrey (Table 8.10). The relationship between raw scores and the mean changed in eight regions, with z-scores in Cheshire, South Yorkshire, Lincolnshire and Devon becoming negative (having been positive between 2012 and 2015), and z-scores in Tees Valley, Lancashire, Derbyshire and Berkshire becoming positive (having been negative in between 2012 and 2015).

CPR_{diff}(e)

z-scores for CPR_{diff}(e) between 2012 and 2015 ranged from 2.56 in North Yorkshire to -1.06 in Northumberland (Table 8.9). The majority of regions in the South of England and the Midlands had positive z-scores, while the majority of regions in the North of England had negative z-scores (Figure 8.7).

z-scores for CPR_{diff}(e) between 2016 and 2019 ranged from 1.98 in Inner London East to -3.13 in Cumbria (Table 8.10). The relationship between raw scores and the mean changed in eight regions, with z-scores in Cheshire, North Yorkshire and East Anglia becoming negative (having been positive between 2012 and 2015), and z-scores in Merseyside, East Yorkshire, South Yorkshire, Shropshire and Bedfordshire becoming positive (having been negative in between 2012 and 2015).

Figure 8.5: z-scores for $cTPC_{diff}(d)$ among women aged 16 – 24 in England by NUTS2 region

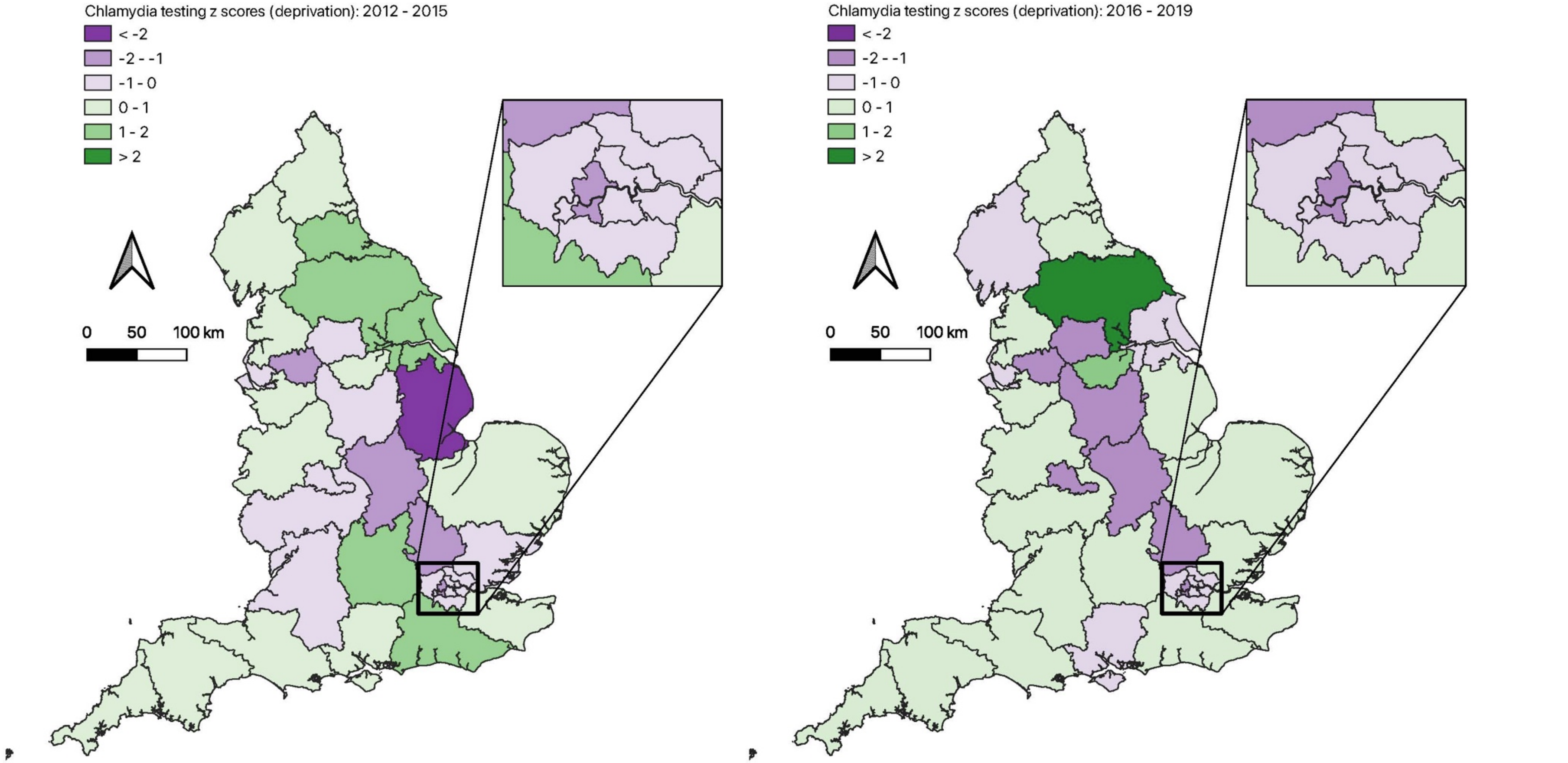


Figure 8.6: z-scores for the CPR_{diff}(d) among women aged 16 – 24 in England by NUTS2 region

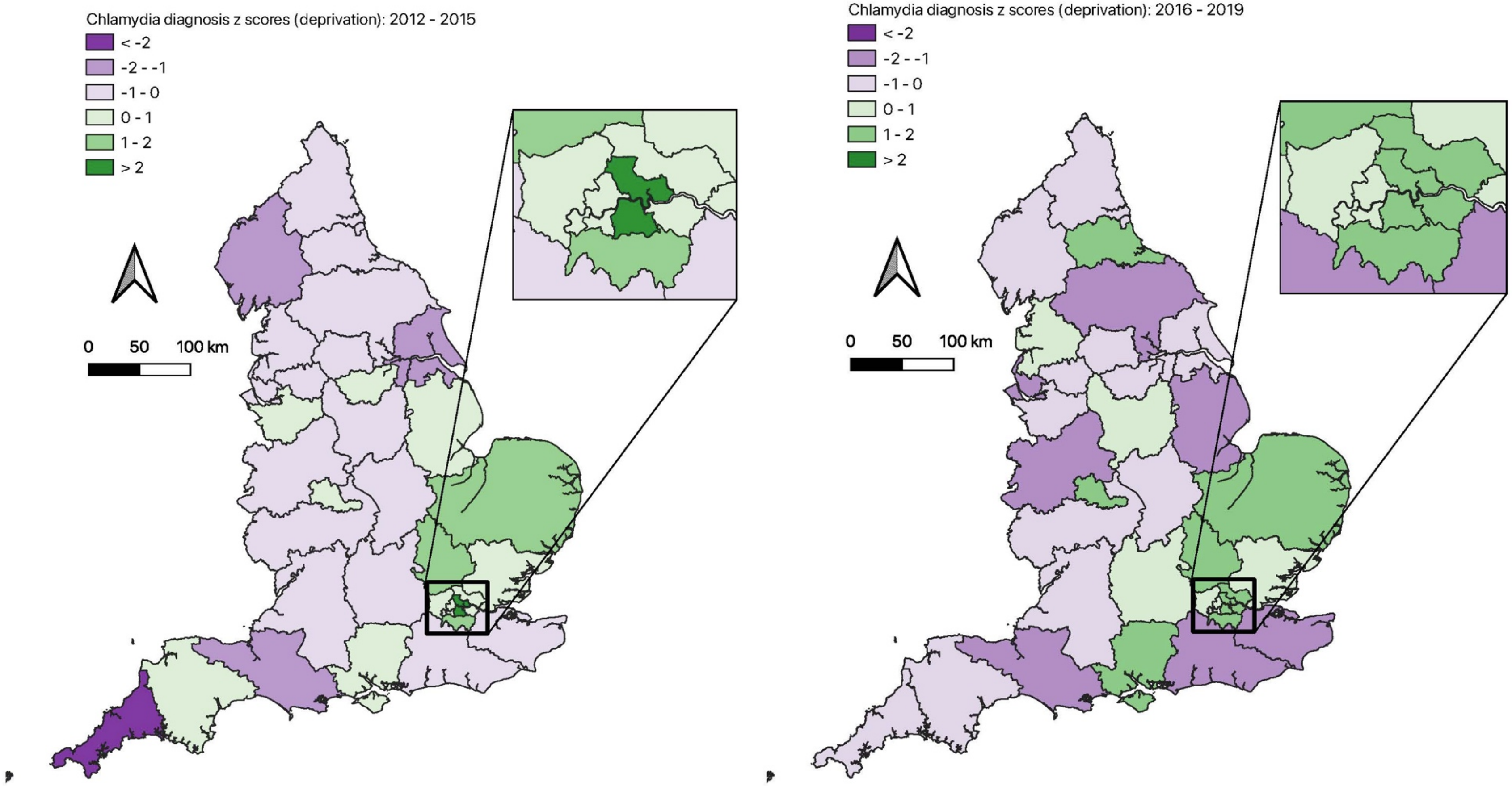
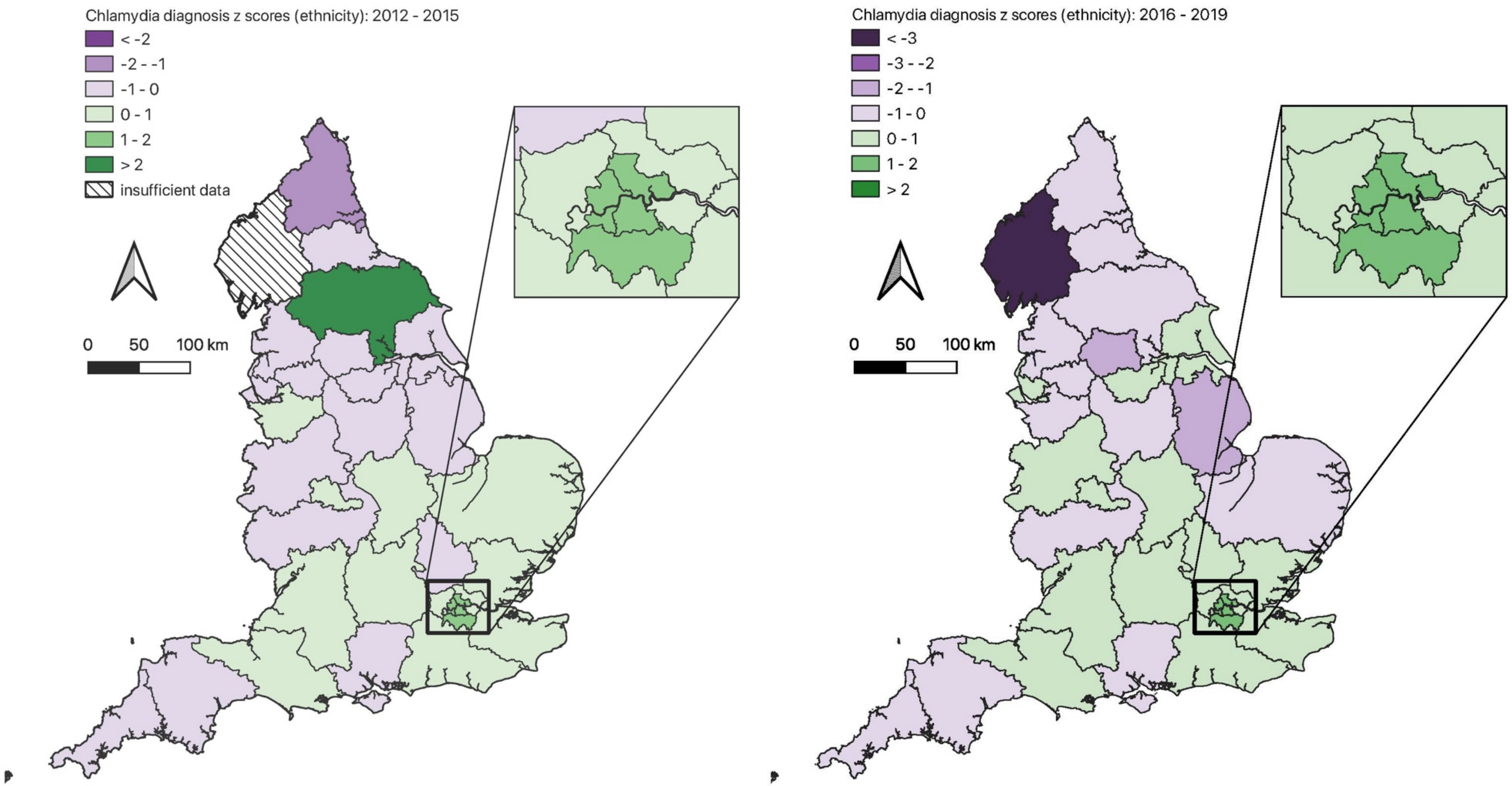


Figure 8.7: z-scores for the CPR$_{diff}$(e) among women aged 16 – 24 in England by NUTS2 region



8.4.4 Abortion

Raw scores (2012 – 2015)

Between 2012 and 2015, APC_{diff}(d) ranged from 3.77 in Devon to -2.54 in Inner London West (Table 8.11). When examining rates of repeat abortion, repeat abortion rates were higher in more deprived areas in every region but one – RAR_{diff}(d) ranged from 145.61 in Outer London South, to -16.74 in Cornwall. RAR_{diff}(e) ranged from 132.6 in East Yorkshire, to -228.7 in Cumbria.

When examining the national pattern of abortion and repeat abortion, 18 regions had higher abortion rates among women living in more deprived areas, while 15 regions had higher abortion rates among women living in less deprived areas. Repeat abortion rates were higher among women living in more deprived areas in almost every region – only Cornwall had higher rates of repeat abortion among women living in less deprived areas. Most regions had higher rates of repeat abortion among women of Black ethnicity — six regions (Tees Valley, Cumbria, Shropshire, Hampshire, Cornwall and Devon) had repeat abortion rates that were higher among women of White ethnicity.

Raw scores (2016 – 2019)

Between 2016 and 2019, there were similar regional disparities between the rates of abortion and repeat abortion in different NUTS2 regions in England as those seen between 2012 and 2015 (Table 8.12). APC_{diff}(d) ranged from 3.53 in Devon to -2.43 in West Midlands. RAR_{diff}(d) ranged from 175.13 in Inner London East to 15.36 in Lincolnshire. RAR_{diff}(e) ranged from 162.44 in Lincolnshire to -69.5 in Merseyside.

The national pattern between 2016 and 2019 was also similar to that seen between 2012 and 2015. Seventeen regions had higher abortion rates among women living in more deprived areas, while 16 regions had higher abortion rates among women living in less deprived areas. Repeat abortion rates were universally higher among women living in more deprived areas. Seven regions (Cheshire, Merseyside, East Yorkshire, North Yorkshire, Surrey, Hampshire and Gloucestershire) had higher repeat abortion rates among women of White ethnicity, while the remaining 26 regions had higher repeat abortion rates among women of Black ethnicity.

Table 8.11: APC_{diff}(d), RAR_{diff}(d) and RAR_{diff}(e) and corresponding z-scores (2012 -2015)

NUTS2 region	APC_{diff} (d)	z-score	RAR_{diff} (d)	z-score	RAR_{diff} (e)	z-score
Tees Valley and Durham	0.40	0.24	50.23	-0.33	-143.64	-2.51
Northumberland and Tyne and Wear	1.42	0.90	22.89	-1.18	22.25	-0.35
Cumbria	0.56	0.35	85.51	0.76	-228.66	-3.62
Greater Manchester	-2.22	-1.45	54.76	-0.19	88.83	0.52
Lancashire	0.09	0.04	66.30	0.17	22.52	-0.35
Cheshire	1.20	0.76	58.56	-0.08	77.36	0.37
Merseyside	-0.36	-0.25	65.64	0.14	104.24	0.72
East Yorkshire and Northern Lincolnshire	0.12	0.06	57.05	-0.12	132.60	1.09
North Yorkshire	2.21	1.42	47.42	-0.42	28.46	-0.27
South Yorkshire	2.50	1.60	78.98	0.56	32.96	-0.21
West Yorkshire	-1.00	-0.66	31.67	-0.91	93.51	0.58
Derbyshire and Nottinghamshire	-2.06	-1.35	38.94	-0.68	38.71	-0.14
Leicestershire, Rutland and Northamptonshire	-1.74	-1.14	53.93	-0.22	70.81	0.28
Lincolnshire	-0.74	-0.49	57.82	-0.10	119.14	0.91
Herefordshire, Worcestershire and Warwickshire	-0.55	-0.37	33.99	-0.84	79.99	0.40
Shropshire and Staffordshire	2.32	1.49	57.23	-0.12	-22.89	-0.94
West Midlands	-0.27	-0.19	82.12	0.66	50.77	0.02
East Anglia	0.95	0.60	16.02	-1.40	105.32	0.73
Bedfordshire and Hertfordshire	-2.44	-1.60	64.98	0.12	19.15	-0.39
Essex	1.33	0.85	56.37	-0.14	118.94	0.91
Inner London - West	-2.54	-1.66	118.37	1.78	96.31	0.61
Inner London - East	-1.62	-1.06	134.21	2.27	85.58	0.47
Outer London - East and North East	-1.35	-0.89	71.81	0.34	82.06	0.43
Outer London - South	0.19	0.11	142.61	2.54	115.20	0.86
Outer London - West and North West	-1.30	-0.86	84.70	0.74	80.24	0.40
Berkshire, Buckinghamshire and Oxfordshire	0.24	0.14	74.32	0.41	125.44	0.99
Surrey, East and West Sussex	0.52	0.32	25.71	-1.10	70.60	0.28
Hampshire and Isle of Wight	-1.11	-0.74	49.98	-0.34	-3.81	-0.69
Kent	2.13	1.36	90.85	0.93	100.70	0.67
Gloucestershire, Wiltshire and Bath/Bristol area	0.30	0.18	27.25	-1.05	85.57	0.47
Dorset and Somerset	0.05	0.02	56.96	-0.12	42.44	-0.09
Cornwall and Isles of Scilly	-0.21	-0.15	-16.74	-2.41	-47.70	-1.26
Devon	3.77	2.42	71.75	0.33	-21.36	-0.92

APC_{diff} (d) = abortions per capita higher in IMD quintile 1
RAR_{diff} (d) = RAR higher in IMD quintile 1
RAR_{diff} (e) = RAR higher among Black Caribbean/Black other women

APC_{diff} (d) = abortions per capita higher in IMD quintile 5
RAR_{diff} (d) = RAR higher in IMD quintile 5
RAR_{diff} (e) = RAR higher among White British women

Table 8.12: APC_{diff}(d), RAR_{diff}(d) and RAR_{diff}(e) and corresponding z-scores (2016 -2019)

NUTS2 region	APC_{diff} (d)	z-score	RAR_{diff} (d)	z-score	RAR_{diff} (e)	z-score
Tees Valley and Durham	1.17	0.63	41.26	-1.05	4.86	-0.56
Northumberland and Tyne and Wear	1.62	0.92	96.85	0.63	13.22	-0.40
Cumbria	-0.24	-0.24	38.51	-1.14	16.92	-0.32
Greater Manchester	-2.22	-1.46	50.59	-0.77	2.21	-0.61
Lancashire	-0.29	-0.27	82.00	0.18	55.88	0.45
Cheshire	0.36	0.13	53.88	-0.67	-41.46	-1.48
Merseyside	0.59	0.28	105.85	0.91	-69.50	-2.03
East Yorkshire and Northern Lincolnshire	0.38	0.14	108.31	0.98	-14.58	-0.95
North Yorkshire	2.60	1.52	86.16	0.31	-57.61	-1.80
South Yorkshire	2.16	1.25	91.53	0.47	100.13	1.32
West Yorkshire	-1.61	-1.08	44.67	-0.95	78.73	0.90
Derbyshire and Nottinghamshire	-2.15	-1.42	35.15	-1.24	25.22	-0.16
Leicestershire, Rutland and Northamptonshire	-1.36	-0.93	86.81	0.33	51.28	0.36
Lincolnshire	0.04	-0.07	15.36	-1.84	162.44	2.56
Herefordshire, Worcestershire and Warwickshire	-0.03	-0.11	76.46	0.02	12.06	-0.42
Shropshire and Staffordshire	2.58	1.51	90.32	0.44	29.90	-0.07
West Midlands	-2.43	-1.59	60.01	-0.48	31.59	-0.03
East Anglia	2.12	1.22	56.76	-0.58	58.28	0.50
Bedfordshire and Hertfordshire	-1.95	-1.29	39.78	-1.10	62.94	0.59
Essex	1.69	0.96	89.34	0.41	41.38	0.16
Inner London - West	-1.04	-0.73	132.13	1.70	102.00	1.36
Inner London - East	-0.74	-0.55	175.13	3.01	80.30	0.93
Outer London - East and North East	-1.50	-1.02	58.81	-0.52	40.11	0.14
Outer London - South	0.07	-0.05	84.27	0.25	104.77	1.41
Outer London - West and North West	-1.05	-0.74	89.29	0.40	88.00	1.08
Berkshire, Buckinghamshire and Oxfordshire	-0.27	-0.26	67.46	-0.26	55.12	0.43
Surrey, East and West Sussex	0.49	0.21	70.85	-0.15	22.17	-0.22
Hampshire and Isle of Wight	-1.66	-1.12	39.98	-1.09	-23.60	-1.12
Kent	3.03	1.78	69.21	-0.20	-15.16	-0.96
Gloucestershire, Wiltshire and Bath/Bristol area	0.66	0.32	80.41	0.13	22.43	-0.21
Dorset and Somerset	0.56	0.25	55.35	-0.62	-29.39	-1.24
Cornwall and Isles of Scilly	-0.34	-0.30	136.79	1.84	65.44	0.64
Devon	3.53	2.09	97.32	0.65	20.75	-0.25

APC_{diff} (d) = abortions per capita higher in IMD quintile 1
RAR_{diff} (d) = RAR higher in IMD quintile 1
RAR_{diff} (e) = RAR higher among Black Caribbean/Black other women

APC_{diff} (d) = abortions per capita higher in IMD quintile 5
RAR_{diff} (d) = RAR higher in IMD quintile 5
RAR_{diff} (e) = RAR higher among White British women

IUSRH z-scores

APC_{diff} (d)

z-scores for APC_{diff}(d) between 2012 and 2015 ranged from 2.42 in Devon to -1.66 in Inner London West (Table 8.11). There was no strict geographical pattern of z-scores (Figure 8.8), however the majority of regions the North and South of England had negative APC_{diff}(d) z-scores, while the majority of regions in London and the Midlands had negative APC_{diff}(d) z-scores.

z-scores for APC_{diff} (d) between 2016 and 2019 ranged from 2.09 in Devon to -1.59 in West Midlands (Figure 8.9). The relationship between raw scores and the mean changed in five regions, with z-scores in Cumbria, Lancashire, Outer London South and Berkshire becoming negative (having been positive between 2012 and 2015), and the z-score for Merseyside becoming positive (having been negative in between 2012 and 2015).

RAR_{diff}(d)

z-scores for RAR_{diff}(d) between 2012 and 2015 ranged from 2.54 in Outer London South to -2.41 in Cornwall (Table 8.11). Although there was, once again, no strict geographical pattern, regions that had positive z-scores, were clustered around London and the surrounding areas, while the majority of regions in the rest of the country had negative z-scores.

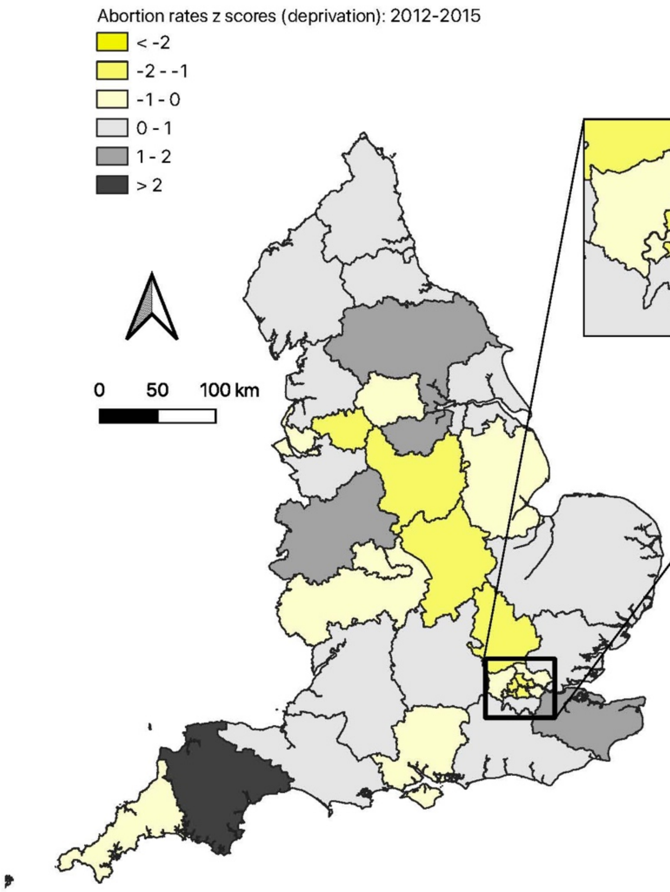
z-scores for RAR_{diff}(d) between 2016 and 2019 ranged from 3.01 in Inner London East to -1.84 in Lincolnshire (Table 8.12). The relationship between raw scores and the mean changed in fifteen regions, with z-scores in Cumbria, East Anglia, Essex, Outer London East, Berkshire and Kent becoming negative (having been positive between 2012 and 2015), and z-scores in Northumberland, East Yorkshire, North Yorkshire, Leicestershire, Herefordshire, Shropshire, Essex, Gloucestershire and Cornwall becoming positive (having been negative in between 2012 and 2015).

RAR_{diff}(e)

z-scores for RAR_{diff}(e) between 2012 and 2015 ranged from 1.09 in East Yorkshire to -3.62 in Cumbria (Table 8.11). The majority of regions in London and the South East of England had positive z-scores, while the majority of regions in the North and South West of England had negative z-scores (Figure 8.10).

z-scores for RAR_{diff}(e) between 2016 and 2019 ranged from 2.56 in Lincolnshire to -2.03 in Merseyside (Table 8.12). The relationship between raw scores and the mean changed in thirteen regions, with z-scores in Greater Manchester, Cheshire, Merseyside, East Yorkshire, Herefordshire, West Midlands, Surrey, Kent and Gloucestershire becoming negative (having been positive between 2012 and 2015), and z-scores in Lancashire, South Yorkshire, Bedfordshire and Cornwall becoming positive (having been negative in between 2012 and 2015).

Figure 8.8: z-scores for APC_{diff}(d) among women aged 16 – 24 in England by NUTS2 region



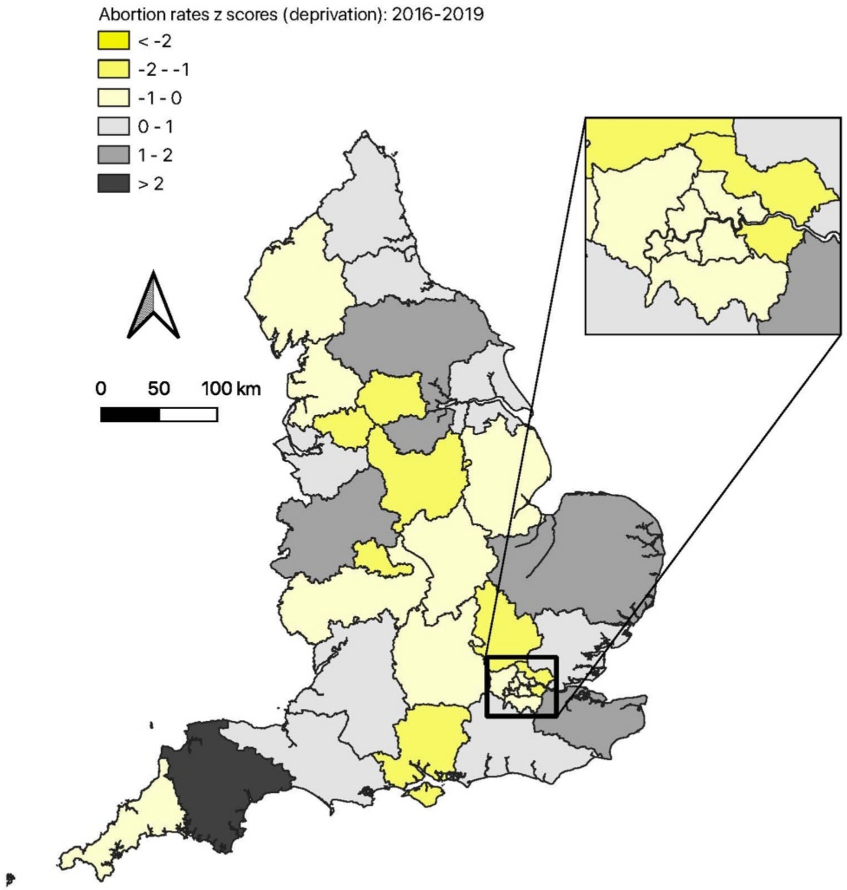


Figure 8.9: z-scores for the $RAR_{diff}(d)$ among women aged 16 – 24 in England by NUTS2 region

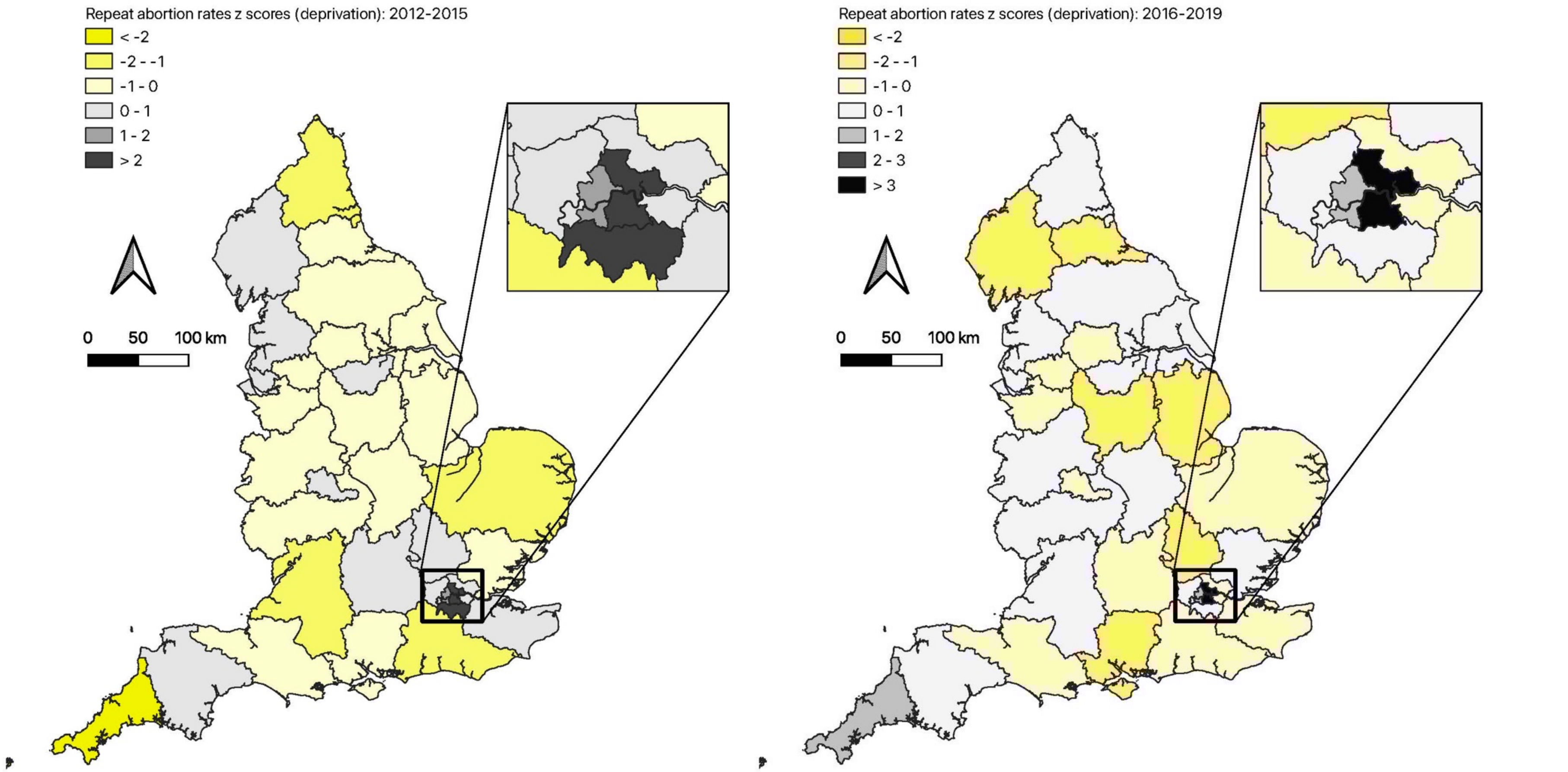
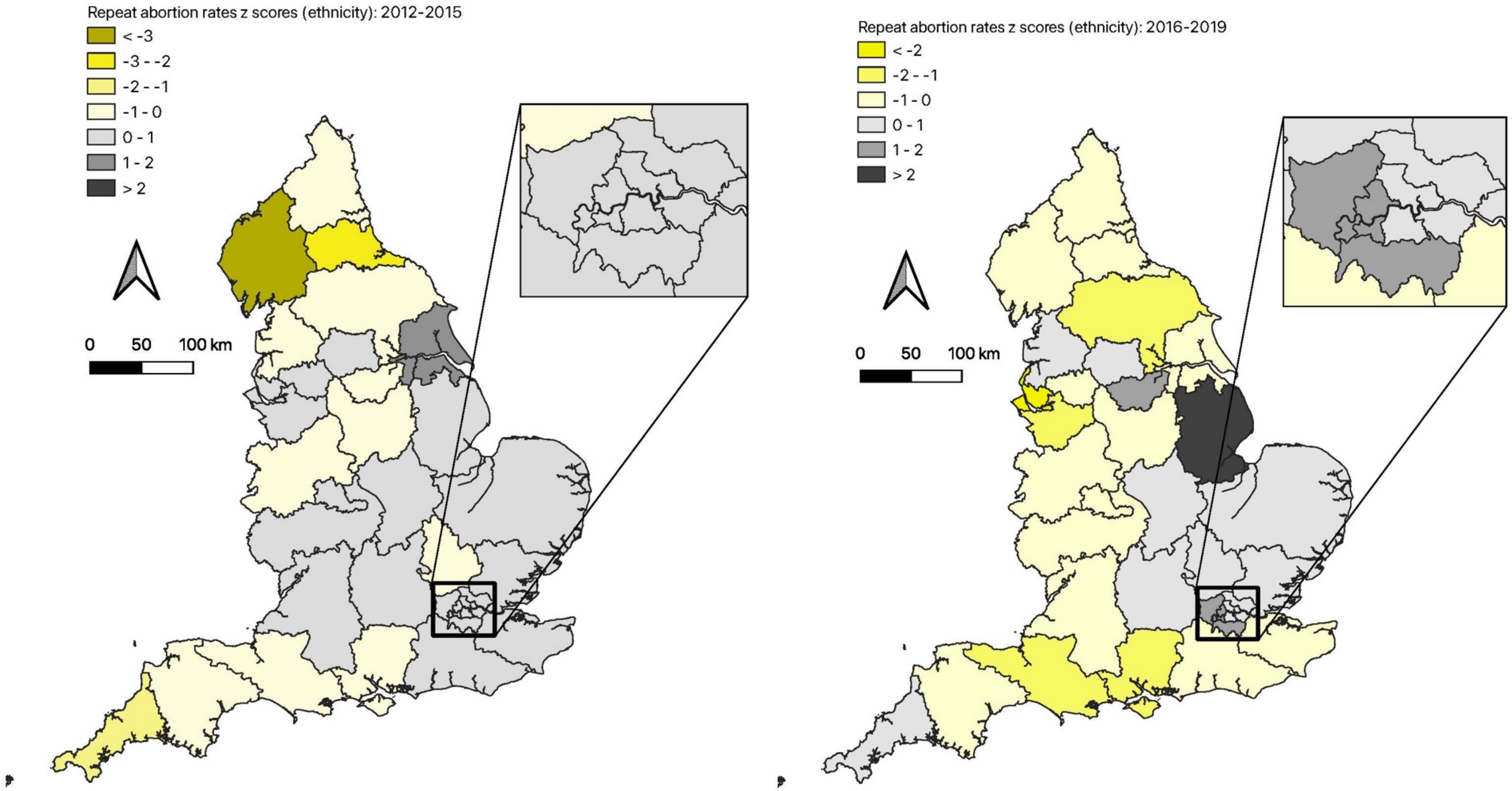


Figure 8.10: z-scores for the $RAR_{diff}(e)$ among women aged 16 – 24 in England by NUTS2 region



8.4.5 IUSRH domain cumulative z-scores

2012 – 2015

Service use

In the service use domain, Inner London West had the lowest cumulative z-score (-5.81), indicating that the balance of testing and abortion rates in this region leant towards IMD quintile 5 (when compared to all other NUTS2 regions in England). Devon had the highest cumulative z-score (4.78), indicating that the balance of testing and abortion rates leant towards IMD quintile 1 (when compared to all other NUTS2 regions in England) (Table 8.13).

While there wasn't a strict geographical pattern, lower service use scores (indicating a balance of testing and abortion rates that leant towards the least deprived areas) were clustered around London and the Midlands, while higher service use scores (indicating a balance of testing and abortion rates that leant towards the most deprived areas) were clustered around the North and West of England (Figure 8.11).

Outcomes (deprivation)

In the outcomes (deprivation) domain, Surrey had the lowest cumulative z-score (-2.82), indicating that the balance of diagnoses and repeat abortions leant towards the least deprived areas. Outer London South had the highest cumulative z-score (7.24), indicating that the balance of diagnoses and repeat abortions leant towards the most deprived areas (Table 8.13).

Lower outcome (deprivation) scores (indicating a balance of diagnosis and repeat abortion rates that leant towards the least deprived areas) were clustered around the North West and South West regions, while higher outcome (deprivation) scores (indicating a balance of diagnosis and repeat abortion rates that leant towards the most deprived areas) were clustered around London and the East of England (Figure 8.11).

Outcomes (ethnicity)

In the outcomes (ethnicity) domain, Tees Valley had the lowest cumulative z-score (-3.18), indicating that the balance of diagnoses and repeat abortions leant towards the White British population. Outer London South had the highest cumulative z-score (3.87), indicating that the balance of diagnoses and repeat abortions leant towards the Black population (Table 8.13).

Once again, lower outcome (ethnicity) scores (indicating a balance of diagnosis and repeat abortion rates that leant towards the White British population) were clustered around the North West and South West regions, while higher outcome (ethnicity) scores (indicating a balance of diagnosis and repeat abortion rates that leant towards the Black population) were clustered around London and the East of England (Figure 8.11).

Table 8.13: IUSRH domain scores (2012 – 2015)

NUTS2 Code	Cumulative score: Service use (deprivation)	Rank of NUTS2 region	Cumulative score: Outcomes (deprivation)	Rank of NUTS2 region	Cumulative score: Outcomes (ethnicity)	Rank of NUTS2 region
UKC1	1.36	19	0.30	22	-3.18	1
UKC2	2.44	26	0.05	18	-2.23	4
UKD1	2.78	28	-2.42	2		Insufficient data
UKD3	-5.13	2	-0.98	9	0.07	14
UKD4	0.04	16	-0.73	12	-2.58	2
UKD6	1.44	21	-0.34	16	0.46	16
UKD7	-1.60	10	-1.63	7	-0.31	10
UKE1	1.51	22	-1.86	4	-0.12	11
UKE2	3.05	31	-1.83	5		Insufficient data
UKE3	3.30	32	2.30	28	-1.42	5
UKE4	-2.17	8	-0.68	13	0.74	19
UKF1	-3.23	4	-0.44	15	-1.12	8
UKF2	-2.75	6	0.09	19	1.93	23
UKF3	-3.02	5	0.27	21		Insufficient data
UKG1	-1.55	11	-1.20	8	0.35	15
UKG2	2.81	29	-0.74	10	-1.23	7
UKG3	-0.89	13	3.41	31	0.65	17
UKH1	1.88	25	0.68	23	1.84	22
UKH2	-4.69	3	1.57	26	-0.69	9
UKH3	0.95	17	-0.10	17	3.11	26
UKI3	-5.81	1	2.61	30	3.42	27
UKI4	-2.52	7	2.55	29	3.45	28
UKI5	-1.83	9	2.22	27	2.31	25
UKI6	-0.40	15	7.24	32	3.87	29
UKI7	-1.44	12	1.51	25	2.15	24
UKJ1	1.70	24	1.47	24	1.81	21
UKJ2	2.74	27	-2.82	1	-0.05	13
UKJ3	-0.75	14	-0.73	11	-1.26	6
UKJ4	2.86	30	0.13	20	0.65	18
UKK1	1.20	18	-1.82	6	1.74	20
UKK2	1.53	23	-2.07	3	-0.10	12
UKK3	1.42	20		Insufficient data		Insufficient data
UKK4	4.78	33	-0.58	14	-2.24	3

Table 8.14: IUSRH domain scores (2016 – 2019)

NUTS2 Code	Cumulative score: Service use (deprivation)	Rank of NUTS2 region	Cumulative score: Outcomes (deprivation)	Rank of NUTS2 region	Cumulative score: Outcomes (ethnicity)	Rank of NUTS2 region
UKC1	2.38	27	2.00	27	-3.03	3
UKC2	1.50	24	0.26	20	-1.75	7
UKD1	0.34	19	-2.75	2		Insufficient data
UKD3	-4.51	2	-1.28	10	-1.30	8
UKD4	-0.01	15	0.67	22	-0.15	13
UKD6	0.61	20	-2.06	5	-2.82	4
UKD7	-0.47	14	-0.74	13	-1.77	6
UKE1	0.09	16	1.46	25	-3.03	2
UKE2	6.81	33	-1.79	8	-3.13	1
UKE3	4.00	30	0.14	19	2.52	27
UKE4	-3.78	5	-1.81	7	0.18	16
UKF1	-4.08	3	-0.42	15	0.43	17
UKF2	-2.48	6	0.29	21	1.62	26
UKF3	0.17	17	-3.90	1	-1.11	9
UKG1	0.17	18	-1.14	11	-0.68	11
UKG2	3.46	29	-0.91	12	0.48	18
UKG3	-4.91	1	2.21	29	1.46	25
UKH1	2.53	28	1.53	26	0.61	19
UKH2	-3.86	4	0.82	23	1.13	22
UKH3	1.56	25	0.83	24	1.07	21
UKI3	-2.47	7	2.73	31	4.30	29
UKI4	-1.91	9	4.98	33	4.48	30
UKI5	-1.71	10	2.31	30	1.35	24
UKI6	-1.05	13	4.36	32	4.81	31
UKI7	-1.59	12	2.13	28	2.68	28
UKJ1	0.69	21	-0.10	18	1.16	23
UKJ2	1.96	26	-2.61	3	0.62	20
UKJ3	-2.42	8	-0.37	16	-2.20	5
UKJ4	4.01	31	-1.87	6	-0.14	14
UKK1	1.03	22	-0.60	14	-0.26	12
UKK2	1.24	23	-2.48	4	-0.89	10
UKK3	-1.62	11	-1.64	9		Insufficient data
UKK4	4.35	32	-0.25	17	-0.05	15

2016 – 2019

Service use

In the service use domain, West Midlands had the smallest cumulative z-score (-4.91). North Yorkshire had the highest cumulative z-score (6.8) (Table 8.14).

Lower service use scores were clustered around London and the Midlands, while higher service use scores were clustered around the North and West of England (Figure 8.12).

Outcomes (deprivation)

In the outcomes (deprivation) domain, Lincolnshire had the smallest cumulative z-score (-3.90). Inner London East had the highest cumulative z-score (4.98) (Table 8.14).

Lower outcome (deprivation) scores were clustered around the North West and South West regions, while higher outcome (deprivation) scores were clustered around the London and the East of England (Figure 8.12).

Outcomes (ethnicity)

In the outcomes (ethnicity) domain, North Yorkshire had the smallest cumulative z-score (-3.13). Outer London South had the highest cumulative z-score (4.81) (Table 8.14).

Lower outcome (ethnicity) scores were clustered around the North West and South West regions, while higher outcome (ethnicity) scores were clustered around the London and the East of England (Figure 8.12).

Figure 8.11: cumulative z-scores of the IUSRH among women aged 16 – 24 in England by NUTS2 region: 2012 - 2015

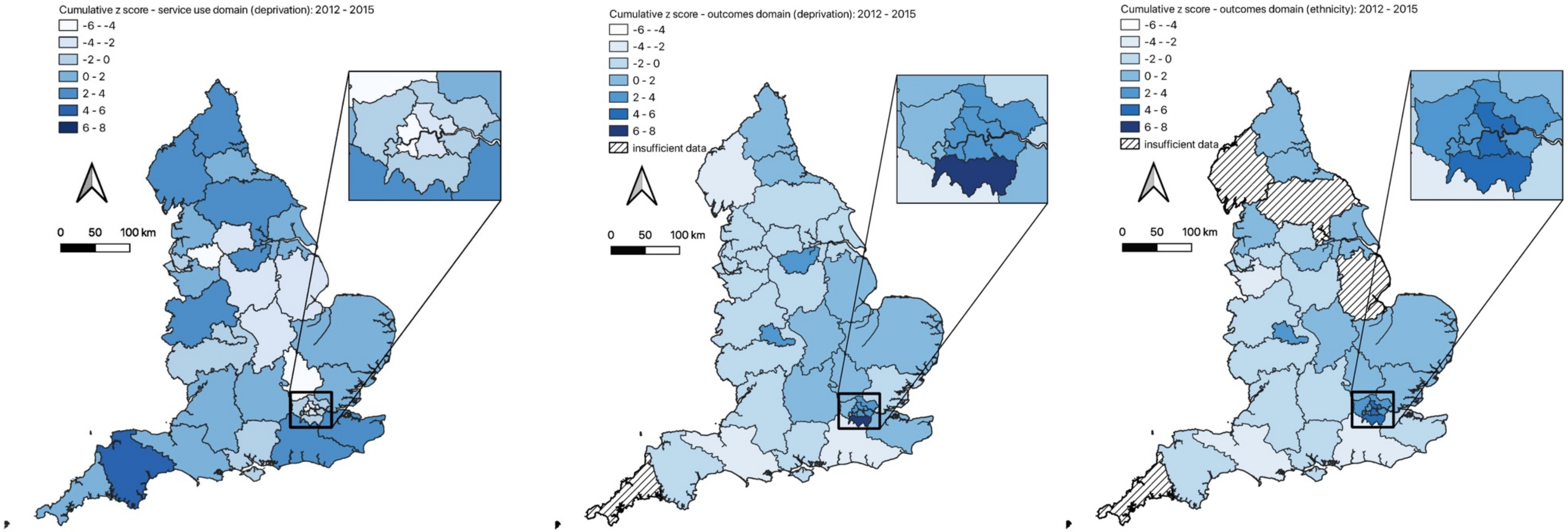
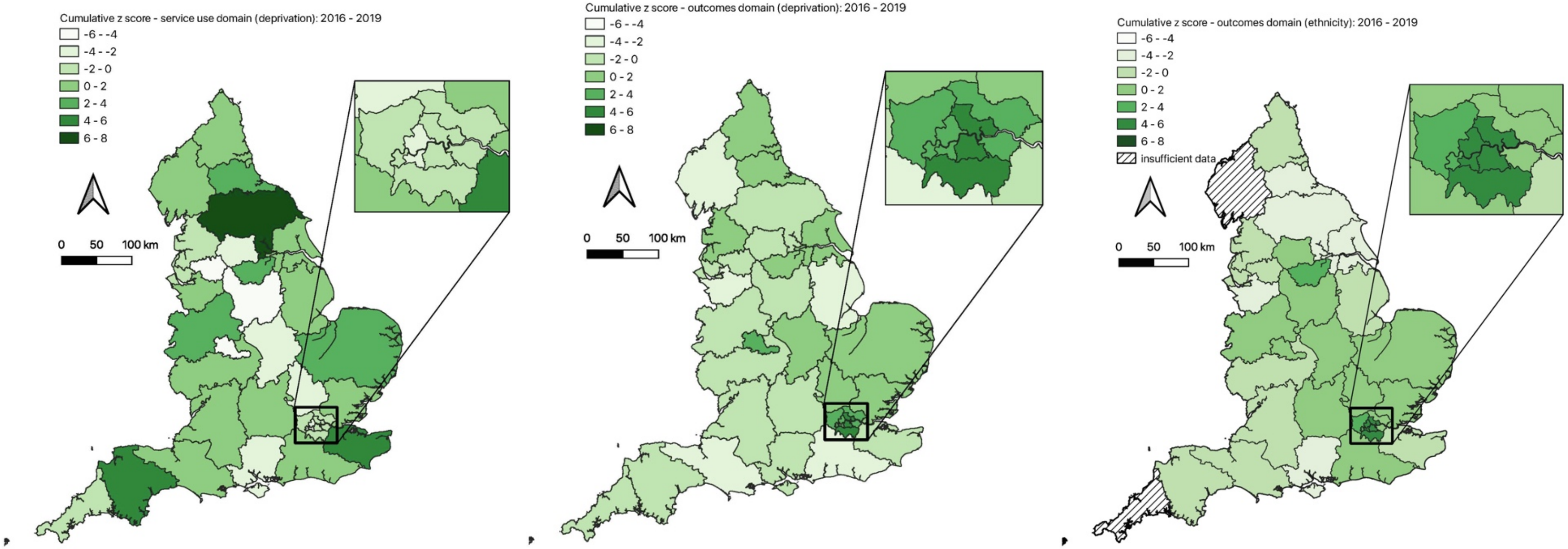


Figure 8.12: cumulative z-scores of the IUSRH among women aged 16 – 24 in England by NUTS2 region: 2016 - 2019



8.5 Discussion

8.5.1 Key findings

Creating the IUSRH allowed me to examine geographical patterns of outcome inequality within SRH among women aged 16-24. The transformation of outcome data into z-scores created a comparable value for each NUTS2 region, which could then be used to assess the way that inequalities varied between regions.

In Chapters 5, 6 and 7, I outlined analyses of gonorrhoea, chlamydia and abortion-related outcomes among women aged 16-24 in England. These analyses all reached similar conclusions: women living in more deprived areas had higher rates of gonorrhoea and chlamydia testing, gonorrhoea and chlamydia diagnosis, and abortion and repeat abortion, when compared to women living in less deprived areas. Similarly, women who reported their ethnicity as Black Caribbean or Black other had higher rates of gonorrhoea and chlamydia testing, gonorrhoea and chlamydia diagnosis, and abortion and repeat abortion, when compared to women who reported their ethnicity as White British. Examination of both the raw scores and the z-scores within the IUSRH indicated that these relationships are not uniform across all regions within England. Although some relationships (e.g. the relationship between repeat abortion and deprivation) displayed a reasonably uniform pattern across all regions (in this case, repeat abortions were almost universally higher in more deprived LSOAs) other relationships varied significantly between regions. The relationship between demographic factors and outcomes also varied within regions – for example, there were several regions in which rates of gonorrhoea and chlamydia testing were higher in IMD quintile 5, while rates of gonorrhoea and chlamydia diagnosis were higher in IMD quintile 1. These regional differences were also seen during analysis of the cumulative z-scores within the IUSRH – when regions were ranked based on scores within service use domains, these ranks were often different to those within the two outcome domains.

These regional analyses allow for comparison of SRH-related outcomes within different regions, and give an indication of the different patterns of inequality within each area.

8.5.2 Using the IUSRH

Case studies

In developing the IUSRH, my aim was to create a tool that could be used to identify patterns of unmet need within SRH at the regional level. The target users of this indicator would be public health professionals, particularly those whose remit involves addressing inequalities within SRH. In order to illustrate the potential utility of the IUSRH, I have created three case studies, each outlining the way in which the domain scores, z-scores and raw scores within the IUSRH could be used to enhance understanding of unmet need within SRH at the regional level. Each case study uses IUSRH data from 2016 – 2019.

Example 1: Bedfordshire and Hertfordshire (NUTS2 code UKH2)

For outcomes between 2016 and 2019, the service use (deprivation) score for Bedfordshire and Hertfordshire was -3.86, and the ranking was 4. This indicates that, compared to most other regions in the country, the balance of gonorrhoea and chlamydia tests and abortions leans towards less deprived areas in Bedfordshire and Hertfordshire. This is in stark contrast to the outcomes (deprivation) score and the outcomes (ethnicity) score, which were 0.82 (rank 23) and 1.13 (rank 24) respectively. This indicates that, compared to most other regions in the country, the balance of gonorrhoea and chlamydia diagnoses and repeat abortions leans towards more deprived areas and Black populations.

To investigate these patterns further, one can use the individual raw scores. With regards to gonorrhoea, the $gTPC_{diff}(d)$ was -5.11 while the $GPR_{diff}(d)$ was 14.73 and the $GPR_{diff}(e)$ was 5.42. While testing rates in this region are higher in less deprived areas, diagnosis rates are higher in more deprived areas and among Black populations. With regards to chlamydia, the $cTPC_{diff}(d)$ was -6.57 while the $CPR_{diff}(d)$ was 39.32 and the $CPR_{diff}(e)$ was 29.30. Once again, while testing rates are higher in less deprived areas, diagnosis rates are higher in more deprived areas and among Black populations. Both of these results indicate that, although service access is higher among less deprived populations, likelihood of diagnosis is higher among more deprived and Black populations, which may indicate unmet testing need among certain vulnerable groups.

With regards to abortion, the $APC_{diff}(d)$ was -1.95, while the $RAR_{diff}(d)$ was 39.78 and the $RAR_{diff}(e)$ was 62.94. While abortion rates are higher in less deprived areas, repeat abortion rates are higher in more deprived areas and among Black populations. This indicates that, although abortion access is higher among less deprived populations, abortions among more deprived and Black populations are more likely to be repeat abortions, which may mean that the reproductive health needs of certain populations may be more complex, and may not be adequately addressed within existing services.

Example 2: Outer London South (NUTS2 code UKI6)

For outcomes between 2016 and 2019, the service use (deprivation) score for Outer London South was -1.05, and the ranking was 13. This indicates that, compared to many other regions in the country, the balance of gonorrhoea and chlamydia tests and abortions leans towards less deprived areas. In a similar way to the previous example, this is in stark contrast to the outcomes (deprivation) score and the outcomes (ethnicity) score, which were 4.36 (rank 32) and 4.81 (rank 33) respectively. This indicates that, compared to almost every other region in the country, the balance of gonorrhoea and chlamydia diagnoses and repeat abortions leans towards more deprived areas and Black populations.

To investigate these patterns further, one can use the individual raw scores. With regards to gonorrhoea, the $gTPC_{diff}(d)$ was -1.83 while the $GPR_{diff}(d)$ was 29.38 and the $GPR_{diff}(e)$ was 25.46. While testing rates in this region are higher in less deprived areas, diagnosis rates are higher in more deprived areas and among Black populations. With regards to chlamydia, the $cTPC_{diff}(d)$ was -3.96, while the $CPR_{diff}(d)$ was 39.99 and the $CPR_{diff}(e)$ was 56.52. Once again, while testing rates are higher in less deprived areas, diagnosis rates are higher in more deprived areas and among Black populations. Both of these results indicate that, although service access is higher among less deprived populations, likelihood of diagnosis is higher among more deprived and Black populations, which may indicate unmet testing need among certain groups.

With regards to abortion, the $APC_{diff}(d)$ was 0.07 while the $RAR_{diff}(d)$ was 84.27 and the $RAR_{diff}(e)$ was 104.77. Abortion rates and repeat abortion rates are both higher in more deprived areas, and repeat abortion rates are higher among Black populations. This indicates that both abortions and repeat abortions are more prevalent among more deprived and Black communities, potentially indicating upstream unmet need (such as unmet need for contraception) and the need for targeted services.

In addition, the fact that Outer London South has particularly low rankings for both outcomes (deprivation) and outcomes (ethnicity) may indicate that more support for vulnerable populations within this region is warranted at a national level.

Example 3: Kent (NUTS 2 code UKJ4)

For outcomes between 2016 and 2019, the service use (deprivation) score for Kent was 4.01, and the ranking was 31. This indicates that, compared to most other regions in the country, the balance of gonorrhoea and chlamydia tests and abortions leans towards more deprived areas. This is in contrast to the outcomes (deprivation) score and the outcomes (ethnicity) score, which were -1.87 (rank 6) and -0.14 (rank 15) respectively. This indicates that, compared to most other regions in the country, the balance of gonorrhoea and chlamydia diagnoses and repeat abortions leans towards less deprived areas and White populations.

To investigate these patterns further, one can use the individual raw scores. With regards to gonorrhoea, the $gTPC_{diff}(d)$ was 3.00, the $GPR_{diff}(d)$ was 6.42 and the $GPR_{diff}(e)$ was 11.49. Testing rates and diagnosis rates in this region are higher in more deprived areas and diagnosis rates are higher among Black populations. With regards to chlamydia, the $cTPC_{diff}(d)$ was 5.90, the $CPR_{diff}(d)$ was 11.35 and the $CPR_{diff}(e)$ was 20.88. Once again, testing rates and diagnosis rates in this region are higher in more deprived areas and diagnosis rates are higher among Black populations. Both of these results indicate that both service access and risk of diagnosis is higher among more deprived and Black populations, which may indicate ongoing need for targeted interventions in certain communities (and may point towards success of existing measures aiming to promote testing among those who are most at risk).

With regards to abortion, the $APC_{diff}(d)$ was 3.03, while the $RAR_{diff}(d)$ was 69.21 and the $RAR_{diff}(e)$ was -15.16. Abortion rates and repeat abortion rates are both higher in more deprived areas, and repeat abortion rates are higher among White populations. This indicates that both abortions and repeat abortions are more prevalent among more deprived populations, potentially indicating upstream unmet need (such as unmet need for contraception) and the need for targeted services. The increased rate of repeat abortion among White populations, may also indicates a need for targeted services within this population, and may require examination of certain at-risk subgroups. Alternatively, given the fact that repeat abortion is more prevalent among Black populations in most other regions, this may be the indicator of successful targeted interventions aiming to prevent repeat abortion among the Black community in Kent.

Strengths and limitations

Although I have outlined the potential utility of the IUSRH, it is important to also outline its limitations. Although the IUSRH is an indicator of unmet need, it is a measure of disparity. It is therefore important to recognise that the IUSRH is not designed to be used in isolation. While the IUSRH provides information about disparities at a certain level, conclusions cannot be drawn without an understanding of regional service use, population needs and policy design. In addition, the way in which the scores within the IUSRH are calculated mean that inferences can neither be made at the individual level, nor extrapolated to the wider population (i.e. people who are not cisgender women aged 16-24). Overall, the IUSRH is likely to work best when used alongside other (currently non-existent) indicators of unmet need, that use measures other than disparity as a marker of unmet need, and potentially use data and outcomes that are more relevant to other populations.

Another challenge is the fact that an indicator of a concept as potentially nebulous as unmet need is difficult to validate, particularly given that no other indicators of unmet need currently exist. While assessment of correlation between the IUSRH and an indicator of a similar concept, such as deprivation, would be useful, the inclusion of IMD scores within the calculation of the IUSRH mean that this sort of analysis would be impossible. This is, however, a common challenge when developing an indicator of a concept that does not have a strict definition. In line with the validation methods used during the development of the IMD[179] and the Health Index for England[69], I have therefore concentrated on internal consistency as a form of validation. One aim of the analyses that were outlined in Chapters 5, 6 and 7 was to ensure that I measured unmet need using the most appropriate methods.

Another potential limitation is the omission of certain sections of the population of interest in the calculation of IUSRH scores. For example, the deprivation differences are calculated using the difference between outcomes in IMD quintiles 1 and 5 (omitting outcomes in quintiles 2,3 and 4), and the ethnicity differences are calculated using the differences between outcomes in the White British and Black Caribbean/Black Other populations. This decision was made as a way of highlighting the starkest outcome inequalities within the population. For example, the utilisation of a measure that incorporated all five quintiles of the IMD (such as the Slope Index of Inequality) would have given an indication of the average change in outcome between each IMD quintile but obscured the large outcome differences between the most and least deprived sections of the population. Although this was the most intuitive choice for a measure of unmet need, by choosing the populations with the most disparate outcomes I have potentially obscured other patterns of disparity at the regional level (for instance, trends in outcomes among ethnicities other than Black Caribbean, Black Other and White British). This is another reason for which the IUSRH is designed to be only one indicator of unmet need at the regional level, one that would ideally be used alongside other indicators that contain alternative measures of unmet need.

Overall, the strength of the IUSRH is that it is the first indicator to examine patterns of disparity within sexual and reproductive outcomes among young women in England. The IUSRH transforms these patterns of inequality into comparable figures, which allows for evaluation of outcomes within different regions, and identification of potential areas of unmet need.

9 SUMMARY AND DISCUSSION

9.1 Key findings

Systematic review

My systematic review revealed several gaps in the published literature surrounding unmet need within SRH. While the majority of studies attempting to measure unmet need within SRH over the past decade have focused on unmet need for contraception, most of these studies were cross-sectional analyses of national-level datasets that were populated using data collected via household questionnaires. Although studies examining unmet need within sexual health and SRH displayed significantly more breadth (with regards to both methodology and population) than those investigating unmet need solely within reproductive health, they were far fewer in number, and were predominantly focused on populations within high-income countries. Overall, I found that there were few longitudinal analyses examining unmet need within SRH, and that unmet reproductive health need within high income countries and unmet sexual health need (more generally) were two topics that had been particularly under-investigated.

Since I undertook my literature review in 2019, the landscape surrounding unmet need within the academic literature has begun to shift. There is now more discourse surrounding unmet need within both sexual health and reproductive health (particularly within high income countries), and those investigating unmet need within SRH are using innovative methods of data collection and analysis. A 2021 analysis of unmet need for abortion services within the United States used spatial epidemiology techniques to analyse the correlation between abortion access and geographical availability of abortion services[218], while a 2020 analysis of unmet need for sexual health services in Australia used modelling techniques to estimate expected chlamydia prevalence among people aged 15-29, the results of which were then compared to routinely collected datasets outlining chlamydia prevalence within this population[219]. The Natsal-Covid study, carried out in 2021, used an online questionnaire to assess unmet need for condoms during the Covid-19 pandemic[220]. Multiple studies over the past three years have used a range of methods to assess unmet need for pre-exposure HIV prophylaxis (PrEP)[221–224], a vital component of the ongoing push to globally eradicate new HIV infections[225]. Overall, the work within this thesis mirrors developments within the published literature surrounding our understanding of unmet need within SRH.

Qualitative Delphi exercise

The second part of this project was a qualitative Delphi exercise exploring the perspectives of professionals working in sexual and/or reproductive health on the topic of unmet need within SRH. The participants' responses, and the themes that emerged once the responses had been analysed, were invaluable to the creation of the IUSRH. Respondents found unmet need within SRH to be a challenging concept to define and measure, but agreed that an understanding of unmet need was an important part of SRH service design. Many respondents felt that certain, more vulnerable, populations were most likely to experience unmet need within reproductive health, and that an understanding of the needs of these populations was particularly important. There was also discussion of the involvement of stakeholders within investigations of unmet need within SRH, with many respondents feeling that this was a key part of understanding the complex range of unmet needs within a population.

These findings are not unique to this study. In 2019, the House of Commons Health and Social Care committee conducted a focus group as part of a larger report on sexual health services. The participants in this focus group were professionals working in different areas of sexual health who were drawn from across the country. Many of the themes observed within my qualitative Delphi exercise arose within this discussion: participants expressed concern about service provision, particularly in the wake of funding cuts, and discussed geographical disparity with regards to service availability. In particular, the group felt that funding cuts were having a significant impact on outreach services, exacerbating unmet need within the most vulnerable communities. Participants were quoted as feeling that there was “lots of unmet need in communities who are at risk, because they are not part of the clinic population, and are therefore slipping through the net”[226].

As a result of this Delphi exercise, I made outcome inequality the foundation of the IUSRH. When considering the utility of the IUSRH, I also aimed to create a tool that would aid those commissioning, designing, and funding SRH services.

Quantitative and spatial analyses

The IUSRH was created using two data extracts, one comprising data on all chlamydia and gonorrhoea tests performed on women in England aged 16-24 between 2012 and 2019 (created using the GUMCAD and CTAD datasets held by PHE) and one comprising data on all abortions and repeat abortions undergone by women in England aged 16-24 between 2012 and 2019 (created using the abortion dataset held by DHSC). As discussed in Chapter 1, these outcomes were chosen to reflect the sexual and reproductive outcomes that are most relevant to the population of interest (women aged 16-24 in England).

Prior to the creation of the IUSRH, regression analyses of both data extracts were carried out to aid a better understanding of the patterns of inequality that the IUSRH was aiming to measure. With consideration of both the results of the Delphi exercise and the constraints of the available datasets, I decided to focus on two independent variables, deprivation and ethnicity. Examination of the relationship between these two variables and a range of SRH outcomes revealed a pattern that persisted across analyses. Rates of testing and diagnosis (for both chlamydia and gonorrhoea) and rates of abortion and repeat abortion were higher in more deprived areas when compared to less deprived areas. Similarly, rates of testing and diagnosis (for both chlamydia and gonorrhoea) and rates of abortion and repeat abortion were higher among Black women when compared to White women.

The IUSRH was subsequently created as a method of quantifying these disparities at a regional level, in order to identify geographical patterns of unmet need. The IUSRH provides three pieces of information for each region. A region's raw score indicates the size and direction of a certain disparity (e.g. whether abortion rates are higher in the most or least deprived IMD quintile within a region, and the size of the gap between rates in the most deprived quintile and rates in the least deprived quintile). A region's z-score compares a region's raw score to the national mean, and indicates how far the raw score was from the mean (e.g. whether more abortions occur in less/more deprived areas (when compared to the average), and the size of the gap between the rate difference in the region and the mean rate difference for England). A region's domain score and rank compares a cumulative z score for one region (e.g. the combined size of the gap between outcomes in the most and least deprived areas of the region) with all other regions in England. As outlined within the case studies in Chapter 8, these three scores (when used in combination) can be used as a tool to assess patterns of unmet need within a region.

A particular challenge that I was faced with when I created the IUSRH was the creation of the cumulative domains. A key strength of composite indicators is their ability to combine multiple different indicators to create a quantitative measure of an otherwise nebulous concept. The multivariable analyses in this project indicated that there was enough of a difference between the relationships represented within the IUSRH that combining certain indicators (e.g. gonorrhoea diagnosis rates, chlamydia diagnosis rates and repeat abortion rates) would create a domain measure that contained a breadth of information. The concern, however, was that these indicators were so different that combining them would make domain measures particularly difficult to interpret. For example, increased gonorrhoea testing within this population is likely to have different implications to increased chlamydia testing, due to the activity of the NCSP. Similarly, increased abortion rates could be seen as a 'negative' outcome (resulting from poor access to contraception, for example), while increased STI testing could be seen as a 'positive' outcome (potentially indicating an increase in service use).

This challenge was addressed by making the values within the IUSRH resistant to this form of interpretation. The indicator focuses entirely on inequalities – measuring the gap between outcomes in historically better served and historically underserved populations. Each value within the IUSRH indicates the direction and the size of the disparity, without any implication that a certain direction or size of disparity is a preferable outcome. The cumulative domains have also been created with this approach in mind. The 'service use' domain within the IURSH, for example, comprises a combination of z scores for gonorrhoea testing rates, chlamydia testing rates and abortion rates. This combination was not chosen in order to imply that trends in these three rates should have the same interpretation, but was chosen because these outcomes have been shown – through both the regression analyses within this project and the raw IURSH scores – to display similar patterns of inequality with regards to relationships to deprivation and ethnicity.

Most importantly, none of the values within the IUSRH are designed to be interpreted independently. As outlined in the case studies within Chapter 8, the domain scores for a region are most useful when interpreted together (e.g. a region with a high service use score and low outcome scores may have different patterns of inequality than a region with a low service use score and high outcome scores). Similarly, further interpretation of the domain scores is made possible using the z-scores and the raw scores, which cumulatively provide information about the patterns of inequality within a region, and the way in which a certain region compares to other regions with regards to inequalities within SRH. Used in this way, the IUSRH is a single quantitative tool that can be used alongside other measures to assess regional patterns of unmet need.

9.2 Future research

The aim of this project was to create a tool that could be used to aid in the understanding of unmet need within SRH among women aged 16-24 in England at the regional level. The IUSRH has the potential to be used within several areas of public health, particularly with regards to the design, commissioning and evaluation of SRH services at the local level. The IUSRH within this thesis, however, is merely a proof of concept. To fully understand the utility and potential of this tool, the work within this thesis would need to act a starting point for further research. This research could include:

- **Qualitative research**

A wide range of qualitative research would support the further development of the IUSRH. In particularly, focus groups and structured interviews involving stakeholders may shed light on other outcomes that correlate with unmet need, and that could potentially be included in future versions of the IUSRH. In addition, qualitative work could inform the drivers of some of the regional patterns seen within the IUSRH.

- **Spatial epidemiology**

The version of the IUSRH within this thesis has been created at the NUTS2 level, largely due to the nature of the datasets used to create the IUSRH (as discussed in Chapter 8). As most public health departments exist at the LA level, further investigation would be needed to address whether the IUSRH could be meaningfully interpreted at this geographical level, as a way of assessing its utility within local government.

Outside of its use as a planning tool, other spatial analyses could give further breadth to the interpretation of the IUSRH. Analyses of the correlation between IUSRH scores and spatial characteristics such as density of SRH services could aid in the understanding of some of the patterns of inequality displayed within the IUSRH. Spatial analyses also could be used to identify service planning characteristics shared by areas that have similar patterns of inequality (as identified using the IUSRH). The concept of 'statistical neighbours', which allows LAs to directly compare service expenditure with other LAs that share certain characteristics, has already been developed by DHSC as a way of evaluating adult social care[227] – a similar concept could allow the IUSRH to identify service-related drivers of unmet need.

- **Ethnicity**

The design of the IUSRH within this thesis concentrates on the disparity between White British and Black Caribbean/Black other populations as an ethnicity-related outcome. The quantitative analyses within this thesis, however, revealed a much more nuanced relationship between ethnicity and sexual and reproductive outcomes – one that was too complex to be encapsulated within the IUSRH. Further investigation of the relationship between ethnicity and sexual and reproductive outcomes is required, particularly at the regional level, to better understand the different outcomes experienced by people of different ethnicities.

- **Other populations**

The IUSRH within this thesis focuses on a single population (women aged 16-24 in England), however the methodology of its creation is designed to have utility across a much broader range of people. Further investigation is required to understand the outcomes that are likely to be relevant to other populations, and the way in which the IUSRH could be used to assess patterns of unmet need within SRH more broadly.

9.3 Conclusion

Women aged 16-24 in England have a complex range of SRH needs. The disparity in outcome that is linked to both deprivation and ethnicity indicates that, for some of the most vulnerable women, these needs are often unmet. The analyses within this thesis aim to shed a light on these disparities, and the Index of Unmet Need within Sexual and Reproductive Health aims to quantify these disparities at a regional level, to aid in the identification of geographical patterns of unmet need. It is hoped that this tool will contribute to our overall understanding of unmet need within SRH, giving those working in SRH the opportunity to appropriately address drivers of unmet need and to create services and interventions that reduce inequalities.

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APPENDICES

APPENDIX 1: SUMMARY TABLE FOR PAPERS INCLUDED IN SYSTEMATIC REVIEW

This appendix is a list of all the papers included within the literature review undertaken as part of this project. The results of the literature review are discussed in **Chapter 2**.

REPRODUCTIVE HEALTH

Study ID	Country	Country income status	Topic	Population	Type of study	Methods	Definition of unmet need
Abdella 2013	Ethiopia	Low	Abortion	Women seeking treatment for abortion complications	Cross-sectional	Medical records review and interviews with healthcare providers	Inability of a health service to provide appropriate abortion services to women seeking treatment
Abeje 2016	Ethiopia	Low	Contraception	Married/in union women of reproductive age (not defined) on ART	Cross-sectional	Questionnaire	Women who desired to either terminate childbearing or to postpone their next birth for 2 years and were not using any form of contraception
Acacio-Claro 2010	Philippines	Low income	Contraception	Married/in union women of reproductive age (not defined)	Cross-sectional	Questionnaire	Women who desired to either terminate childbearing or to postpone their next birth for 2 years and were not using any form of contraception
Acera 2017	Spain	High income	Cervical screening	Women aged 30 — 70	Cohort	Medical records review	No record of cervical screening in the past 3.5 years
Achwoka 2018	Kenya	Lower-middle income	Contraception	Women attending maternal/child health clinic for immunization visits	Cross-sectional	Questionnaire	Women who desired to either terminate childbearing or to postpone their next birth for 2 years and were not using any form of modern contraception

Study ID	Country	Country income status	Topic	Population	Type of study	Methods	Definition of unmet need
Adebowale 2014	Burkina Faso	Low income	Contraception	Married women aged 15 – 49	Cross-sectional	Questionnaire	Women who desired to either terminate childbearing or to postpone their next birth for 2 years and were not using any form of modern contraception
Adedini 2015	Nigeria	Lower-middle income	Contraception	Women aged 15 — 49	Cross-sectional	Questionnaire	Women who desired to either terminate childbearing or to postpone their next birth for 2 years and were not using any form of modern contraception
Ahmed 2013	Pakistan	Lower-middle income	Contraception	Women aged 15 — 49	Cross-sectional	Questionnaire	Women who desired to either terminate childbearing or to postpone their next birth for 2 years and were not using any form of modern contraception
Ajong 2016	Cameroon	Lower-middle income	Contraception	Sexually active, in union women aged 15 — 49	Cross-sectional	Questionnaire	Women whose current pregnancy was unwanted/mistimed OR Women who desired to either terminate childbearing or to postpone their next birth for 2 years and were not using any form of modern contraception

Study ID	Country	Country income status	Topic	Population	Type of study	Methods	Definition of unmet need
Akintade 2011	Lesotho	Lower-middle income	Contraception	Female undergraduate students	Cross-sectional	Questionnaire	Sexually active respondents who were not using any form of contraceptive and did not want to become pregnant
Alaba 2015	Nigeria	Lower-middle income	Contraception	Women aged 15 – 49	Cross-sectional	Questionnaire	Women who desired to either terminate childbearing or to postpone their next birth for 2 years and were not using any form of contraception
Ali 2013	Sudan	Low income	Contraception	Ever-married women aged 15 – 49	Cross-sectional	Questionnaire	Women who desired to either terminate childbearing or to postpone their next birth for 2 years and were not using any form of contraception
Aptekman 2014	Canada	High income	Contraception	Married/in union women aged 15 – 49	Cross-sectional	Questionnaire	Women who desired to either terminate childbearing or to postpone their next birth for 2 years and were not using any form of contraception
Asad 2019	Vietnam	Lower-middle income	Contraception	Married/in union women aged 15 – 49	Cross-sectional	Questionnaire	Women who desired to either terminate childbearing or to postpone their next birth for 2 years and were not using any form of contraception

Study ID	Country	Country income status	Topic	Population	Type of study	Methods	Definition of unmet need
Asif 2019	Pakistan	Lower-middle income	Contraception	Married women aged 15 – 49	Cross-sectional	Questionnaire	Women who desired to either terminate childbearing or to postpone their next birth for 2 years and were not using any form of contraception
Atchison 2019	Ethiopia, Nigeria, Tanzania	Low income	Contraception	Married women aged 15 — 19	Cross-sectional	Questionnaire	Women who desired to either terminate childbearing or to postpone their next birth for 2 years and were not using any form of modern contraception
Atiglo 2018	Ghana	Lower-middle income	Contraception	Women aged 15 — 24 who were fecund, non-pregnant and had ever had sex	Cross-sectional	Questionnaire	Women who desired to either terminate childbearing or to postpone their next birth for 2 years and were not using any form of contraception
Atiglo 2019	Ghana	Lower-middle income	Contraception	In union women aged 15 — 49	Cross-sectional	Questionnaire	Women who desired to either terminate childbearing or to postpone their next birth for 2 years and were not using any form of contraception

Study ID	Country	Country income status	Topic	Population	Type of study	Methods	Definition of unmet need
Austin 2015	Nigeria	Lower-middle income	Contraception	Married women aged 15 — 49	Cross-sectional	Questionnaire	Women who desired to either terminate childbearing or to postpone their next birth for 2 years and were not using any form of contraception
Ayuningtyas 2015	Indonesia	Upper-middle income	Contraception	Married women aged 15 - 49	Cross-sectional	Questionnaire	Women who desired to either terminate childbearing or to postpone their next birth for 2 years and were not using any form of contraception
Bamgboye 2016	Nigeria	Lower-middle income	Contraception	Women aged 15 - 49	Cross-sectional	Questionnaire	Women who desired to either terminate childbearing or to postpone their next birth for 2 years and were not using any form of contraception
Banougnin 2018	Benin	Lower-middle income	Contraception	Married women aged 15 - 49	Cross-sectional	Questionnaire	Women who desired to either terminate childbearing or to postpone their next birth for 2 years and were not using any form of contraception

Study ID	Country	Country income status	Topic	Population	Type of study	Methods	Definition of unmet need
Bawah 2019	Ghana	Lower-middle income	Contraception	Married women aged 15 - 49	Cross-sectional	Questionnaire	Women who desired to either terminate childbearing or to postpone their next birth for 2 years and were not using any form of contraception
Bellizi 2015	Multiple countries	Low income	Contraception	Women aged 15 - 49	Cross-sectional	Questionnaire	Women who desired to either terminate childbearing or to postpone their next birth for 2 years and were not using any form of contraception
Bhanderi 2010	India	Upper-middle income	Reproductive morbidity	Ever-married women aged 15 - 49	Cross-sectional	Questionnaire	Women with reproductive morbidity who: (1) sought care from a qualified medical practitioner but did not complete treatment (2) sought treatment from an unqualified practitioner (3) engaged in home remedy (4) did not seek any treatment.
Bishwajit 2017	Bangladesh	Low income	Contraception	Mothers aged between 13 and 49	Cross-sectional	Questionnaire	Women who desired to either terminate childbearing or to postpone their next birth for 2 years and were not using any form of contraception

Study ID	Country	Country income status	Topic	Population	Type of study	Methods	Definition of unmet need
Borges 2018	Brazil	Upper-middle income	Contraception	Pregnant women aged 15 — 44	Longitudinal	Questionnaire	Discordance between contraceptive method preference reported during pregnancy and method used after pregnancy
Bose 2019	Multiple countries	Low income	Contraception	Women aged 15 – 49	Cross-sectional	Questionnaire	Women who desired to either terminate childbearing or to postpone their next birth for 2 years and were not using any form of contraception
Brandao 2019	Mozambique	Low income	Cervical screening	Women aged 15 – 64	Cross-sectional	Questionnaire	Women who had not taken up routine cervical screening
Callahan 2014	Bangladesh	Low income	Contraception	Married women under the age of 50	Longitudinal	Questionnaire	Disparity between reported contraceptive intention in 2006 and contraceptive use in 2009
Cammock 2017	New Zealand	High income	Contraception	Women over the age of 18 who identified as iTaukei	Cross-sectional	Questionnaire	Women who desired to either terminate childbearing or to postpone their next birth for 2 years and were not using any form of contraception
Canfell 2015	Australia	High income	HPV vaccination (catch up programme)	Women aged 26 — 29	Cross-sectional	Questionnaire	Uptake of catch up HPV vaccine

Study ID	Country	Country income status	Topic	Population	Type of study	Methods	Definition of unmet need
Cannon 2018	USA	High income	Contraception	Women 18 - 50	Cross-sectional	Questionnaire	Women who wanted to use a form of contraception in the past year, but didn't see a health care provider
Casterline 2014	Multiple countries	Lower-middle income	Contraception	Women aged 15 - 49	Cross-sectional	Questionnaire	Women who desired to either terminate childbearing or to postpone their next birth for 2 years and were not using any form of contraception
Chauhan 2018	India	Lower-middle income	Contraception	Currently married women who had at least one living child below 10 years of age	Cross-sectional	Questionnaire	Women who desired to either terminate childbearing or to postpone their next birth for 2 years and were not using any form of contraception
Cornford 2015	UK	High income	Contraception	Women who were receiving treatment for opioid addiction	Cohort	Medical records review	Disparity in contraceptive use and rate of TOP among study population when compared to general population
Creanga 2011	Multiple countries	Low income	Contraception	Women aged 15 - 49	Cross-sectional	Questionnaire	Women who desired to either terminate childbearing or to postpone their next birth for 2 years and were not using any form of contraception

Study ID	Country	Country income status	Topic	Population	Type of study	Methods	Definition of unmet need
Darroch 2013	Global	All	Contraception	Women aged 15 – 49	Cross-sectional	Modelling	Women who desired to either terminate childbearing or to postpone their next birth for 2 years and were not using any form of modern contraception
de Pokomandy 2019	Canada	High income	Cervical screening	Women living with HIV aged 16 or older	Cross-sectional	Questionnaire	Pap smear >1 year ago
Decat 2011	China	Upper-middle income	Contraception	Women aged 18 – 29	Cross-sectional	Questionnaire	Women who desired to either terminate childbearing or to postpone their next birth for 2 years and were not using any form of modern contraception
DeGraff 2015	Sri Lanka	Lower-middle income	Contraception	Ever-married women aged 15 – 49	Cross-sectional	Questionnaire	Women who desired to either terminate childbearing or to postpone their next birth for 2 years and were not using any form of contraception OR women whose current/most recent pregnancy was unwanted or mistimed.
Delbiso 2014	Ethiopia	Low income	Contraception	Married women aged 15 – 49	Cross-sectional	Questionnaire	*Unmet need referenced in paper but never defined*

Study ID	Country	Country income status	Topic	Population	Type of study	Methods	Definition of unmet need
Deyessa 2017	Ethiopia	Low income	Contraception	Married women aged 15 – 49	Cross-sectional	Questionnaire	Pregnancy in the past five years that was either wanted later or not wanted at all.
Doctor 2013	Nigeria	Lower-middle income	Contraception	Women aged 15 – 49	Cross-sectional	Questionnaire	Women who desired to either terminate childbearing or to postpone their next birth for 2 years and were not using any form of contraception
Doherty 2018	Botswana	Low income	Contraception	Pregnant women over 18	Cross-sectional	Questionnaire	Current pregnancy was unintended, but was not using a form of contraception at the time of conception
Dulli 2016	Rwanda	Low income	Contraception	Women who were at least 6 months post-partum	Cluster RCT	Questionnaire	Women who desired to either terminate childbearing or to postpone their next birth for 2 years and were not using any form of modern contraception
Edietah 2018	Cameroon	Lower-middle income	Contraception	Women aged 15 – 49 in a union	Cross-sectional	Questionnaire	Women who desired to either terminate childbearing or to postpone their next birth for 2 years and were not using any form of contraception

Study ID	Country	Country income status	Topic	Population	Type of study	Methods	Definition of unmet need
Elweshahi 2017	Egypt	Lower-middle income	Contraception	Women attending infant MMR immunization visits	Cross-sectional	Questionnaire	Women who desired to either terminate childbearing or to postpone their next birth for 2 years and were not using any form of contraception
Embafrash 2019	Ethiopia	Low income	Contraception	Postpartum married women aged 15 – 49 in their first year after delivery	Cross-sectional	Questionnaire	Women who desired to either terminate childbearing or to postpone their next birth for 2 years and were not using any form of contraception
Ettarh 2012	Kenya	Lower-middle income	Contraception	Women aged 15 – 49	Cross-sectional	Questionnaire	Women who desired to either terminate childbearing or to postpone their next birth for 2 years and were not using any form of contraception
Fagbamigbe 2018	Nigeria	Lower-middle income	Contraception	Married/in union women aged 15 – 49	Cross-sectional	Questionnaire	Women who desired to either terminate childbearing or to postpone their next birth for 2 years and were not using any form of contraception

Study ID	Country	Country income status	Topic	Population	Type of study	Methods	Definition of unmet need
Feyissa 2014	Ethiopia	Low income	Contraception	Married/in union women aged 15 – 49	Cross-sectional	Questionnaire	Women who desired to either terminate childbearing or to postpone their next birth for 2 years and were not using any form of contraception
Ganle 2016	Ghana	Lower-middle income	Abortion	Women aged 15 – 49	Cross-sectional	Questionnaire	History of abortion outside of a medical facility
Geary 2016	UK	High income	Contraception	Heterosexually active men and women aged 16 – 24	Cross-sectional	Questionnaire	Discordance between actual and preferred source of contraceptive access in the past year
Gelagay 2015	Ethiopia	Low income	Contraception	Married women of reproductive age attending for care at ART clinic	Cross-sectional	Questionnaire	History of unintended pregnancy or current contraceptive method use that is discordant with reported preferred method
Genet 2015	Ethiopia	Low income	Contraception	Married women aged 15 – 49	Cross-sectional	Questionnaire	Women who desired to either terminate childbearing or to postpone their next birth for 2 years and were not using any form of contraception OR women whose current/most recent pregnancy was unwanted or mistimed.

Study ID	Country	Country income status	Topic	Population	Type of study	Methods	Definition of unmet need
Hailemariam 2011	Ethiopia	Low income	Contraception	Married women aged 15 - 49	Cross-sectional	Questionnaire	Women who desired to either terminate childbearing or to postpone their next birth for 2 years and were not using any form of contraception
Hellstrom 2019	Sweden	High income	Contraception	Women aged 16 - 49	Cross-sectional	Questionnaire	Non-contracepting respondents who were not attempting to get pregnant, were not infertile or who did not have exclusively same sex partners.
Hossain 2016	USA	High income	Contraception	Men aged 15 - 44 who have ever had sex	Cross-sectional	Questionnaire	Fecund men who did not use contraception during last sex with a fecund female partner and don't want more children/want to delay for 24 months/partner's current pregnancy was unwanted or mistimed
Islam 2016	Bangladesh	Low income	Contraception	Married women aged 13–24 years	Cross-sectional	Questionnaire	Women who desired to either terminate childbearing or to postpone their next birth for 2 years and were not using any form of contraception

Study ID	Country	Country income status	Topic	Population	Type of study	Methods	Definition of unmet need
Jain 2014	Pakistan	Lower-middle income	Contraception	Married women	Longitudinal	Questionnaire	Women who desired to either terminate childbearing or to postpone their next birth for 2 years and were not using any form of contraception OR women whose current/most recent pregnancy was unwanted or mistimed.
Jhangri 2012	Uganda	Low income	Contraception	Women aged 18 – 44 years, married or cohabitating with a partner,	Cross-sectional	Questionnaire	Women who desired to either terminate childbearing or to postpone their next birth for 2 years and were not using any form of contraception
Johnson 2012	Ghana	Lower-middle income	Contraception	Married/in union women aged 15 – 49	Cross-sectional	Small area estimation techniques	Women who desired to either terminate childbearing or to postpone their next birth for 2 years and were not using any form of contraception
Juarez 2018	Mexico	Upper-middle income	Contraception	Women aged 15 - 49	Cross-sectional	Questionnaire	*Unmet need referenced in paper but never defined*

Study ID	Country	Country income status	Topic	Population	Type of study	Methods	Definition of unmet need
Khalil 2017	Saudi Arabia	High income	Contraception	Married women aged 15 – 49 years, who were living with their husbands and have at least one child	Cross-sectional	Questionnaire	Women who desired to either terminate childbearing or to postpone their next birth for 2 years and were not using any form of contraception
Khan 2009	Madagascar	Low income	Contraception	Sex workers aged 15 – 55 years	Cross-sectional	Questionnaire	Participants who reported that pregnancy prevention was moderately or very important but used no contraception at last sex
Leon 2014	India	Upper-middle income	Contraception	Married women of reproductive age	Cross-sectional	Questionnaire	Pregnant women who had wanted their last child later or had not wanted more children at all and nonpregnant women who were not using family planning despite their not wanting a child in the next two years and being at risk of pregnancy
Letamo 2014	Botswana	Upper-middle income	Contraception	Married/in union women aged 15 – 49	Cross-sectional	Questionnaire	Women who desired to either terminate childbearing or to postpone their next birth for 2 years and were not using any form of contraception

Study ID	Country	Country income status	Topic	Population	Type of study	Methods	Definition of unmet need
Leyser-Whalen 2011	USA	High income	Contraception	Women aged 16 - 24	Cross-sectional	Questionnaire	Women who had previously been using contraception who reported an inability to access contraception during Hurricane Ike
Liauw 2016	Canada	High income	Contraception	Incarcerated women aged 18 - 49	Cross-sectional	Questionnaire	Women were not trying to conceive and were sexually active with a male partner in the three months prior to incarceration
Lim 2014	China	Upper-middle income	Contraception	Women aged 15 - 20 who reported transactional sex in the past 6 months	Cross-sectional	Questionnaire	Not wanting to get pregnant and not currently using either modern contraception or condoms consistently in the past month
Long 2019	Kenya	Lower-middle income	Contraception	Women 18 or over who had recently engaged in transactional sex	Cross-sectional	Questionnaire	Not using a modern non-barrier contraceptive method and not currently trying to become pregnant

Study ID	Country	Country income status	Topic	Population	Type of study	Methods	Definition of unmet need
Lutalo 2018	Uganda	Low income	Contraception	Women aged 15 - 49	Longitudinal	Questionnaire	Unmet need for contraception: Women who desired to either terminate childbearing or to postpone their next birth for 2 years and were not using any form of contraception Unfulfilled need for contraception: non-pregnant women with unmet need for contraception who planned to use a method of contraception in the future but at follow-up either reported an unwanted pregnancy during the inter-survey period or still had an unmet need for contraception at the subsequent survey.
Machiyama 2014	Ghana	Lower-middle income	Contraception	Women aged 15 — 49	Cross-sectional	Questionnaire	Women who desired to either terminate childbearing or to postpone their next birth for 2 years and were not using any form of contraception

Study ID	Country	Country income status	Topic	Population	Type of study	Methods	Definition of unmet need
Mahoro 2018	Rwanda	Low income	Contraception	Married women aged 15 — 49	Cross-sectional	Questionnaire	Women who desired to either terminate childbearing or to postpone their next birth for 2 years and were not using any form of contraception
Malqvist 2018	Nepal	Lower-middle income	Contraception	Married/in union women aged 15 — 49	Cross-sectional	Questionnaire	Women who desired to either terminate childbearing or to postpone their next birth for 2 years and were not using any form of contraception
Mehata 2014	Nepal	Lower-middle income	Contraception	Women aged 15 – 49 years who had a birth in the last 24 months	Cross-sectional	Questionnaire	Women who desired to either terminate childbearing or to postpone their next birth for 2 years and were not using any form of contraception
Mekonnen 2011	Ethiopia	Low income	Contraception	Women aged 15 - 49	Cross-sectional	Questionnaire	Discordance between reported contraceptive use and reported interest in using contraceptives

Study ID	Country	Country income status	Topic	Population	Type of study	Methods	Definition of unmet need
Mochache 2018	Kenya	Lower-middle income	Contraception	Married in/union women aged 18 – 45	Cross-sectional	Questionnaire	Women who desired to either terminate childbearing or to postpone their next birth for 2 years and were not using any form of contraception OR women whose current/most recent pregnancy was unwanted or mistimed.
Mohanty 2009	India	Lower-middle income	Contraception	Currently married women 15 – 39	Longitudinal	Questionnaire	Women who desired to either terminate childbearing or to postpone their next birth for 2 years and were not using any form of contraception
Moore 2015	Multiple countries	Low income	Contraception	Women aged 15 – 49 years who had a birth in the last 23 months	Cross-sectional	Questionnaire	Women who desired to either terminate childbearing or to postpone their next birth for 2 years and were not using any form of contraception

Study ID	Country	Country income status	Topic	Population	Type of study	Methods	Definition of unmet need
Moreau 2019	46 countries	Low and middle income	Contraception	Women aged 15 — 49	Cross-sectional	Questionnaire	Fecund, non-pregnant, non-contracepting women who are not under 3 months postpartum, have had sexual intercourse in the last 3 months (or with unknown timing of last sex) and wish to avoid a birth in the next year (or have unknown pregnancy intentions).
Muhoza 2009	Rwanda	Low income	Contraception	Women aged 15 - 49 in a union	Cross-sectional	Questionnaire	Women who desired to either terminate childbearing or to postpone their next birth for 2 years and were not using any form of contraception OR women whose current/most recent pregnancy was unwanted or mistimed.
Nyauchi 2014	Kenya	Lower-middle income	Contraception	Non-pregnant women aged 15 - 49	Cross-sectional	Questionnaire	Women who desired to either terminate childbearing or to postpone their next birth for 2 years and were not using any form of contraception

Study ID	Country	Country income status	Topic	Population	Type of study	Methods	Definition of unmet need
Nzokirishaka 2018	Burundi	Low income	Contraception	Married women aged 15 - 49	Cross-sectional	Questionnaire	Women who desired to either terminate childbearing or to postpone their next birth for 2 years and were not using any form of contraception OR women whose current/most recent pregnancy was unwanted or mistimed.
Oginni 2015	Nigeria	Low income	Contraception	Women aged 15 — 49	Longitudinal	Questionnaire	Women who desired to either terminate childbearing or to postpone their next birth for 2 years and were not using any form of contraception
Ozedemir 2019	Turkey	Upper-middle income	Contraception	Married women aged 15 - 49	Cross-sectional	Questionnaire	Women who desired to either terminate childbearing or to postpone their next birth for 2 years and were not using any form of contraception

Study ID	Country	Country income status	Topic	Population	Type of study	Methods	Definition of unmet need
Pack 2014	Liberia	Low income	Contraception	Sexually experienced women aged 14 - 25	Cross-sectional	Questionnaire	Non-pregnant women who were sexually active within the last four weeks, did not self-report as infecund, had undecided pregnancy intentions or did not desire to have a child for at least two years or until after a major life event (such as marriage), and did not use a modern contraceptive method at last sex. OR Pregnant women who reported their current pregnancy was unwanted or mistimed.
Paregallo 2011	Haiti	Low income	Contraception	Women aged 15 - 49	Cross-sectional	Questionnaire	Women who desired to either terminate childbearing or to postpone their next birth for 2 years and were not using any form of contraception
Pasha 2015	Multiple countries	Low and middle income	Contraception	Women who were 42 days post partum	Cross-sectional	Questionnaire	Women who desired to either terminate childbearing or to postpone their next birth for 2 years and were not using any form of contraception

Study ID	Country	Country income status	Topic	Population	Type of study	Methods	Definition of unmet need
Patra 2015	India	Upper-middle income	Contraception	Ever-married women aged 15 — 49	Cross-sectional	Questionnaire	Women who desired to either terminate childbearing or to postpone their next birth for 2 years and were not using any form of contraception
Pearson 2014	Multiple countries	Low income	Contraception	Women aged 15 — 49 and their partners	Cross-sectional	Questionnaire	Couples who desired to either terminate childbearing or to postpone their next birth for 2 years and were not using any form of contraception
Potter 2014	USA	High income	Contraception	Postpartum women aged 18 – 44 who wanted to delay childbearing for at least 24 months	Cohort	Questionnaire	Discordance between method used six months post partum and the method participants reported wanting to use postpartum
Prasad 2016	India	Upper-middle income	Contraception	Women aged 15 - 49	Cross-sectional	Questionnaire	Women who desired to either terminate childbearing or to postpone their next birth for 2 years and were not using any form of contraception

Study ID	Country	Country income status	Topic	Population	Type of study	Methods	Definition of unmet need
Prusty 2014	India	Upper-middle income	Contraception	Ever-married women aged 15 - 49	Cross-sectional	Questionnaire	Women who desired to either terminate childbearing or to postpone their next birth for 2 years and were not using any form of contraception
Raben 2018	The Netherlands	High income	Contraception	Women aged 15 - 49	Cohort	Medical records review	Disparity in discussion and prescription of contraception between refugees, other migrants and women born in the Netherlands
Rai 2017	India	Lower-middle income	Contraception	Married women aged 15 - 49	Cross-sectional	Questionnaire	Women who desired to either terminate childbearing or to postpone their next birth for 2 years and were not using any form of contraception OR women whose current/most recent pregnancy was unwanted or mistimed.
Raj 2013	India	Lower-middle income	Contraception	Currently married women 15-49	Cross-sectional	Questionnaire	Women who desired to either terminate childbearing or to postpone their next birth for 2 years and were not using any form of contraception.

Study ID	Country	Country income status	Topic	Population	Type of study	Methods	Definition of unmet need
Rucinski 2018	South Africa	Upper-middle income	Contraception	Non-pregnant, HIV-positive women aged 18–35	Cohort	Questionnaire	Women who were married, in union or sexually active in the previous three months, not currently trying to become pregnant and not using a non-barrier modern contraceptive method
Sinai 2017	Mali and Benin	Low income	Contraception	Married women of reproductive age	Cross-sectional	Questionnaire	Perceived met need: women who were using an ineffective contraceptive method. Perceived no need: women who thought that they were not fecund, despite being physiologically fecund. Perceived unmet need: Women who realised that they were at risk of pregnancy, wished to not become pregnant, and yet were not using a method of contraception. Unmet need: Women who did not wish to become pregnant, considered themselves fertile, and did not belong to any other category.

Study ID	Country	Country income status	Topic	Population	Type of study	Methods	Definition of unmet need
Siswanto 2017	Indonesia	Upper-middle income	Contraception	Married women aged 15 — 49 who are up to 24 months postpartum	Cross-sectional	Questionnaire	Women who desired to either terminate childbearing or to postpone their next birth for 2 years and were not using any form of contraception
Solanke 2019	Nigeria	Lower-middle income	Contraception	Married women aged 15 — 49	Cross-sectional	Questionnaire	Women who desired to either terminate childbearing or to postpone their next birth for 2 years and were not using any form of contraception
Sultan 2010	Egypt	Lower-middle income	Contraception	Currently married women 15 — 49	Cross-sectional	Questionnaire	Women who desired to either terminate childbearing or to postpone their next birth for 2 years and were not using any form of contraception OR women whose current/most recent pregnancy was unwanted or mistimed.

Study ID	Country	Country income status	Topic	Population	Type of study	Methods	Definition of unmet need
Sulthana 2015	India	Lower-middle income	Contraception	Married women aged 15 - 45	Cross-sectional	Questionnaire	*Unmet need referenced in paper but never defined*
Tadele 2019	Ethiopia	Low income	Contraception	Non-pregnant women aged 15 - 49	Cross-sectional	Questionnaire	Women who desired to either terminate childbearing or to postpone their next birth for 2 years and were not using any form of contraception
Takele 2012	Ethiopia	Low income	Contraception	Married women of reproductive age (not defined)	Cross-sectional	Questionnaire	Women who desired to either terminate childbearing or to postpone their next birth for 2 years and were not using any form of modern contraception
Tegegn 2017	Ethiopia	Low income	Contraception	Women up to one year postpartum	Cross-sectional	Questionnaire	Women who desired to either terminate childbearing or to postpone their next birth for 2 years and were not using any form of modern contraception

Study ID	Country	Country income status	Topic	Population	Type of study	Methods	Definition of unmet need
Uddin 2016	Bangladesh	Low income	Contraception	Married women aged 15 — 49 and their spouses	Cross-sectional	Questionnaire	Women who desired to either terminate childbearing or to postpone their next birth for 2 years and were not using any form of modern contraception
Verma 2014	India	Upper-middle income	Contraception	Fecund married women aged 15 — 49	Cross-sectional	Questionnaire	Women who desired to either terminate childbearing or to postpone their next birth for 2 years and were not using any form of modern contraception
Wafula 2015	Kenya	Lower-middle income	Contraception	Married women aged 15 – 49	Cross-sectional	Questionnaire	Women who desired to either terminate childbearing or to postpone their next birth for 2 years and were not using any form of modern contraception

Study ID	Country	Country income status	Topic	Population	Type of study	Methods	Definition of unmet need
Wai 2019	Myanmar	Lower-middle income	Contraception	Currently married women 18-49	Cross-sectional	Questionnaire	Women who desired to either terminate childbearing or to postpone their next birth for 2 years and were not using any form of contraception OR women whose current/most recent pregnancy was unwanted or mistimed.
Wang 2019	Nigeria	Lower-middle income	Contraception	Women aged 15 - 49	Cross-sectional	Questionnaire	*Unmet need referenced in paper but never defined*
Wanyenze 2015	Uganda	Low income	Contraception	Men and women living with HIV	Cross-sectional	Questionnaire	Women who desired to either terminate childbearing or to postpone their next birth for 2 years and were not using any form of contraception OR women whose current/most recent pregnancy was unwanted or mistimed.

Study ID	Country	Country income status	Topic	Population	Type of study	Methods	Definition of unmet need
Wasnik 2013	India	Upper-middle income	Contraception	Married women of reproductive age (not defined)	Cross-sectional	Questionnaire	Women who desired to either terminate childbearing or to postpone their next birth for 2 years and were not using any form of contraception
Workie 2017	Ethiopia	Low income	Contraception	Women aged 15 — 49	Cross-sectional	Questionnaire	Women who desired to either terminate childbearing or to postpone their next birth for 2 years and were not using any form of contraception OR women whose current/most recent pregnancy was unwanted or mistimed.
Wulifan 2017	Burkina Faso	Low income	Contraception	Currently pregnant women	Cross-sectional	Questionnaire	Women who desired to either terminate childbearing or to postpone their next birth for 2 years and were not using any form of contraception OR women whose current/most recent pregnancy was unwanted or mistimed.

Study ID	Country	Country income status	Topic	Population	Type of study	Methods	Definition of unmet need
Wulifan 2019	Ghana	Lower-middle income	Contraception	Married women aged 15 – 49 years	Cross-sectional	Questionnaire	Women who desired to either terminate childbearing or to postpone their next birth for 2 years and were not using any form of contraception OR women whose current/most recent pregnancy was unwanted or mistimed.
Yadav 2009	India	Upper-middle income	Contraception	Married women aged 15 – 44 and their spouses	Cross-sectional	Questionnaire	Disparity between contraceptive preferences and current contraceptive behavior (for both spouses)
Yaya 2018	Angola	Low income	Contraception	Married women aged 15 – 49	Cross-sectional	Questionnaire	Women who desired to either terminate childbearing or to postpone their next birth for 2 years and were not using any form of contraception
Yigzaw 2015	Ethiopia	Low income	Contraception	Women aged 15 – 49	Cross-sectional	Questionnaire	Women who desired to either terminate childbearing or to postpone their next birth for 2 years and were not using any form of contraception

Study ID	Country	Country income status	Topic	Population	Type of study	Methods	Definition of unmet need
Yotebieng 2015	DRC	Low income	Contraception	Women living with HIV	Cross-sectional	Questionnaire	Women who desired to either terminate childbearing or to postpone their next birth for 2 years and were not using any form of contraception

SEXUAL HEALTH

Study ID	Country	Country income status	Topic	Population	Type of study	Methods	Definition of unmet need
Besney 2018	Canada	High income	STI testing and Pap smear	Incarcerated women	Longitudinal	Comparison pre/post implementation of a womens' healthcare centre	Change in demand for STI testing and cervical screening after implementation of an intervention
Bowring 2019	Cameroon	Lower-middle income	Sexual health services	Female sex workers and men who have sex with men who are over 18	Cross-sectional	Questionnaire	No HIV testing in the past year and/or untreated STI symptoms in the past 12 months
Chapman 2018	USA	High income	Sexual health communication	Women who had been treated with radiotherapy for gynaecological cancers	Cross-sectional	Questionnaire	No record of patient/provider sexual health discussion
Dave 2011	UK	High income	Sexual health services	Three groups: men <25, women < 25, men >25	Cross-sectional	Questionnaire	Discordance in time between contacting service and appointment (comparing all three groups), differential risk of acute STI diagnosis (comparing all three groups)

Study ID	Country	Country income status	Topic	Population	Type of study	Methods	Definition of unmet need
Dunne 2018	UK	High income	SRH service use	Patients at seven GUM clinics	Cross-sectional	Questionnaire	Patients who had been turned away from clinic
Fakoya 2018	Multiple countries	High income	HIV prevention services	People who were HIV-positive, 18 years or older, foreign-born residents and diagnosed within five years of recruitment	Cross-sectional	Questionnaire	Having received a negative HIV test prior to diagnosis
Ghimire 2011	Nepal	Lower-middle income	Sexual health services	Female sex workers aged 17 - 46	Cross-sectional	Questionnaire	Never having visited a health centre for treatment despite symptoms of STIs
Geressu 2012	UK	High income	Sexual health services	All new patients at seven GUM clinics	Cross-sectional	Questionnaire	Provider delay: delay between first contact with a health service and accessing care Patient delay: delay between start of symptoms and seeking care

Study ID	Country	Country income status	Topic	Population	Type of study	Methods	Definition of unmet need
Golden 2017	Canada	High income	STI testing	Patients admitted to adolescent psychiatric unit	Cross-sectional	Medical records review	Lack of sexual health information recorded in medical records during admission
Kyagba 2014	Uganda	Low income	Sexual health services	Undergraduate university students	Cross-sectional	Questionnaire	Perceiving need for sexual health services within the last three months but not accessing them
Tanton 2017	UK	High income	Sexual health services	Men and women aged 16–74 years resident in Britain	Cross-sectional	Questionnaire	Not accessing sexual health services in the past year, despite reporting unsafe sex during this period

Sexual and Reproductive Health

Study ID	Country	Country income status	Topic	Population	Type of study	Methods	Definition of unmet need
Ama 2013	Botswana	Upper-middle income	SRH service use	Women over 50	Cross-sectional	Questionnaire	Declared need for SRH services (exact definition not well described)
Hall 2012	USA	High income	SRH service use	Women under 25	Cross-sectional	Questionnaire	Disparity in SRH service use among sexually active women with higher and lower religious participation
Javadnoori 2018	Iran	Upper-middle income	SRH service use	Men aged 20 - 60	Cross-sectional	Questionnaire	Not accessing sexual and reproductive health services despite perceived need
Sun 2014	China	Upper-middle income	Sexual and reproductive	Women aged 50 - 64	Cross-sectional	Questionnaire	Lack of IUD removal after menopause, not seeking treatment for symptoms of reproductive tract infection
van Rie 2018	South Africa	Upper-middle income	Sexual and reproductive	Adults over the age of 15	Cross-sectional	Questionnaire	Women who were sexually active, had no reproductive intentions and were not using contraception Women who reported never having had a Pap smear Men and women who reported untreated STI symptoms

APPENDIX 2: DELPHI RECRUITMENT MATERIALS AND QUESTIONNAIRE

This appendix contains all the materials used to recruit and collect data for the qualitative Delphi exercise carried out as part of this project. The results of the qualitative Delphi exercise are discussed in **Chapter 3**.

RECRUITMENT EMAIL

Hi,

I am a clinical fellow at University College London, and I am currently recruiting professionals working within the field of sexual and/or reproductive health to take part in a qualitative Delphi exercise. The aim of this project is to explore the concept of unmet need within sexual and reproductive health, and I intend to use the results of this Delphi exercise to inform the creation of an indicator of unmet need.

If you are currently working within any area or sexual and/or reproductive health (including public health and/or academia) in England, I would very much appreciate your participation in this research.

Attached you will find a copy of our participant information sheet providing you with further information. If you are interested, please click the link below to sign up. I would also appreciate it if you would consider forwarding this email to anyone else that you think might be interested in participating.

Many thanks, and best wishes,

Dr Danielle Solomon

Participant Information Sheet

UCL Research Ethics Committee Approval ID Number: 19369/002

Title of Study: Measuring unmet need in sexual and reproductive health among women under the age of 25

Department: Institute for Global Health

Name and Contact Details of the Researcher:

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Name and Contact Details of the Data Protection Officer:

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Thank you for your interest in this research study. Before you decide whether or not to take part, it is important for you to understand why the research is being done and what participation will involve. Please take time to read the following information carefully and discuss it with others if you wish. If there is anything that is not clear or if you would like more information, please contact Danielle Solomon (details above).

1. What is the project's purpose?

When designing and evaluating health policies, there is a particular challenge that often arises; how do we work out the number of people who need healthcare but haven't received it? Although a lot of data is collected regarding use of healthcare services, by definition, this data often excludes the people who aren't receiving the services that they require – a concept known as unmet need.

This project aims to investigate how people who are working in all areas of sexual and reproductive health (SRH) think about the concept of unmet need. It is part of a larger piece of research that is examining the concept of unmet need through the lens of sexual and reproductive health, attempting to ascertain whether we can calculate levels of unmet need across England using the data that we already have available.

2. Why have I been chosen?

You have been approached to take part in this project because, as someone who works in the field of sexual and/or reproductive health, you have knowledge and experience that is likely to be valuable within this project.

3. What will happen to me if I take part?

This study uses a method known as the qualitative Delphi technique, which is a questionnaire that takes place in three rounds. If you choose to take part then you will be asked to provide your email address, which will be used to send you a link to a questionnaire. There will be one questionnaire per round for a total of three rounds, over a period of about three months.

The first questionnaire will ask you to respond to three questions about unmet need. After this round, the answers everyone has given will be analysed and turned into several statements about unmet need. In the second round, you will be sent all of these statements, and you will be given the opportunity to modify them as you see fit. In the third round, you will be sent the finalised version of each statement, and asked to rate how much you agree with the statement. The nature of the study means that we need participants to take part in all three rounds to ensure that the results are as robust as possible. We will notify you by email about the start of each round, which will include a link to the questionnaire. We plan to send reminders by email during each round if we have not had a completed questionnaire submitted by you after approximately two weeks. All of your responses, in all three rounds, will be entirely anonymous.

4. Do I have to take part?

It is up to you to decide whether or not to take part. If you do decide to take part you will be able to keep a copy of this information sheet. If you decide to fill out and submit a questionnaire, this will be taken as consent to participate in this research, and your responses to that questionnaire will not be able to be removed from the study analysis. However, you can withdraw at any time prior to submitting the questionnaire. You do not have to give a reason. In addition, you are able to withdraw from the study without completing all three rounds of questionnaires; however, you will not be able to withdraw any responses that you have previously submitted, as all submissions are anonymous.

5. What are the possible benefits of taking part?

By taking part in this research, you will be helping the study team create a measure of unmet need within sexual and reproductive health that can be used to identify and investigate gaps in SRH provision and improve outcomes, particularly among vulnerable populations. As this is likely to be of professional interest to the participants in this part of the study, the results of this work will be disseminated directly to everyone who takes part in the questionnaire.

6. What are the possible disadvantages and risks of taking part?

Completing the questionnaires will take up some of your time, but probably no more than about 20 minutes for each questionnaire. It is unlikely, but if any of the questionnaires bring up something that you find sensitive or upsetting you can choose not to respond.

7. Will my taking part in this project be kept confidential?

All questionnaires will be completed anonymously; the researcher will not know who has completed each questionnaire. Although email addresses will be used to send the details of each round of the questionnaire to participants, these email addresses will be in no way connected to participant responses. Direct quotes may be taken from responses and used in future publications, but these will remain completely anonymous. All data from questionnaires will be kept on an online server protected by UCL, and on a password protected and encrypted hard drive. Your data will not be used for anything other than this research project.

8. Who is organising and funding this research?

This project has been developed by Danielle Solomon, a PhD student at University College London. This Delphi exercise will form part of her PhD thesis. Danielle's PhD is being funded by the Wellcome Trust.

9. Who has reviewed the study?

This study has been reviewed and approved by the UCL Research Ethics Committee.

10. Contact for further information

For further information, or if you have any complaints or concerns, please contact Danielle Solomon (details above) or ethics@ucl.ac.uk .

ROUND 1 QUESTIONNAIRE

Conceptualising unmet need within sexual health – Delphi Round 1

Thank you for participating in this project, which aims to to investigate how people who are working in all areas of sexual and reproductive health (SRH) think about the concept of unmet need.

This study uses a method known as the qualitative Delphi technique, which is a questionnaire that takes place in three rounds. There will be one questionnaire per round for a total of three rounds, over a period of about three months. This is the first questionnaire.

You will be asked six questions. The first three questions are multiple choice questions about your area of work. The second three questions are open questions about unmet need in sexual and reproductive health - you will be asked to type an answer. This questionnaire should not take more than 10 - 15 minutes.

For any more information, or if you have any questions, please consult the participant information sheet or contact danielle.solomon@ucl.ac.uk.

Conceptualising unmet need within sexual health – Delphi Round 1

About you

Although all responses to this questionnaire are anonymous, we would appreciate you giving us a bit of information about your professional expertise.

* 1. Which area of sexual and reproductive health do you work in (select at least one)?

- [ ] Patient-facing sexual health (e.g. clinician, pharmacist, health advisor)
- [ ] Public health within sexual health (e.g. commissioner, policy maker)
- [ ] Academic within sexual health
- [ ] Patient-facing reproductive health (e.g. clinician, pharmacist, health advisor)
- [ ] Public health within reproductive health (e.g. commissioner, policy maker)
- [ ] Academic within reproductive health

* 2. Which region of England do you work in (select at least one)?

- [ ] London
- [ ] North East England
- [ ] North West England
- [ ] Yorkshire
- [ ] East Midlands
- [ ] West Midlands
- [ ] South East England
- [ ] East of England
- [ ] South West England
- [ ] Outside of England, but within the UK
- [ ] Outside of the UK

* 3. In which region are the patients, service users or populations that you work with predominantly based?

- [ ] London
- [ ] North East England
- [ ] North West England
- [ ] Yorkshire
- [ ] East Midlands
- [ ] West Midlands
- [ ] South East England
- [ ] East of England
- [ ] South West England
- [ ] Outside of England, but within the UK
- [ ] Outside of the UK

Conceptualising unmet need within sexual health – Delphi Round 1

Unmet need in sexual and reproductive health

In this section, we would like to ask you about the concept of unmet need. There are three open-ended prompts - although they are questions, there are no right or wrong answers! Feel free to go into as much detail as you like, even if you think you're going off topic.
Please do not include any identifiable information in your response.

* 4. Within the context of sexual and reproductive health (SRH), how would you describe the concept of unmet need?

* 5. Is an understanding of unmet need useful within SRH, and if so, how?

* 6. How would you measure unmet need in sexual and reproductive health?

ROUND 2 QUESTIONNAIRE

UCL

Conceptualising unmet need within sexual health – Delphi Round 2

Thank you for participating in this project, which aims to to investigate how people who are working in all areas of sexual and reproductive health (SRH) think about the concept of unmet need.

This study uses a method known as the qualitative Delphi technique, which is a questionnaire that takes place in three rounds. There will be one questionnaire per round for a total of three rounds, over a period of about three months. This is the **second** questionnaire. You are welcome to take part in this stage of the project, even if you were unable to complete the first questionnaire

You will be presented with 19 statements which have been created using the responses to Round 1 of this questionnaire. The statements fall into four categories:

- Causes of unmet need
- Markers of unmet need
- Methods for measuring unmet need
- Responding to unmet need

You will be asked to comment on each statment. You are welcome to say why you agree or disagree with the statement, or elaborate on the statement to add more detail.

To help understand the ways in which you can respond to statements, please find a worked example below (*modified from Sekayi, D., & Kennedy, A. (2017). Qualitative Delphi Method: A Four Round Process with a Worked Example. The Qualitative Report, 22(10), 2755-2763*). In this example, respondents have been asked about the process of writing a dissertation, and have been presented with statements created using their responses to the first round of the Delphi exercise.

Statement: I felt confident in my ability and intellect before I entered the program, but the constant criticism throughout the process led to feelings of inadequacy.

Response from participant 1: *Add "relatively" before "confident"*

Response from participant 2: *It wasn't just the constant criticism throughout the process that made me feel inadequate; I found other elements of the structure of the program demeaning. At one point, for example, I had to quit my job to have any real chance of finishing since an internship was required.*

Response from participant 3: *The cohort structure was supportive, on the one hand, but made me feel inadequate when I struggled and had to retake one of the classes with a different cohort. Because of the structure, everyone knew I was not in their cohort; they were nice enough, but I felt small.*

This section should take no more than 15 minutes to complete.

For any more information, or if you have any questions, please consult the participant information sheet or contact danielle.solomon@ucl.ac.uk.

Conceptualising unmet need within sexual health – Delphi Round 2

Causes of unmet need

In this section, we would like to ask you to respond to five statements about the causes of unmet need within sexual and reproductive health. These statements have been created using the responses that we received during the first round of the Delphi exercise.
Please do not include any identifiable information in your response.

* 1. Unmet need within sexual and reproductive healthcare is most prevalent among specific groups within the population.

* 2. Healthcare funding has had an impact on unmet need within sexual and reproductive health.

* 3. The Covid-19 pandemic had an impact on unmet need within sexual and reproductive health.

* 4. Rural and urban areas have different patterns of unmet need within sexual and reproductive health.

* 5. Service providers and service users both have unmet needs within sexual and reproductive health.

Conceptualising unmet need within sexual health – Delphi Round 2

Markers of unmet need

In this section, we would like to ask you to respond to two statements about the markers of unmet need within sexual and reproductive health. These statements have been created using the responses that we received during the first round of the Delphi exercise.

Please do not include any identifiable information in your response.

* 6. Certain health outcomes are a marker of upstream unmet need.

* 7. If one population group has worse health outcomes than another population group, this is a marker of unmet need.

Conceptualising unmet need within sexual health – Delphi Round 2

Methods for measuring unmet need

In this section, we would like to ask you to respond to eight statements about measuring unmet need within sexual and reproductive health. These statements have been created using the responses that we received during the first round of the Delphi exercise.

Please do not include any identifiable information in your response.

* 8. Measuring unmet need is challenging.

* 9. Questionnaires are a useful tool for measuring unmet need within sexual and reproductive health

* 10. Service evaluation is a useful tool for measuring unmet need within sexual and reproductive health.

* 11. Qualitative interviews are a useful tool for measuring unmet need within sexual and reproductive health

* 12. Monitoring outcomes within SRH is a useful tool for measuring unmet need within sexual and reproductive health.

* 13. Monitoring service use is a useful tool for measuring unmet need within sexual and reproductive health

* 14. Unmet need for sexual and reproductive health can be measured by looking at factors outside of healthcare.

* 15. Finding and measuring an ‘at-risk’ section of the population is part of measuring unmet need within sexual and reproductive health.

Conceptualising unmet need within sexual health – Delphi Round 2

Responding to unmet need

In this section, we would like to ask you to respond to three statements about responding to unmet need within sexual and reproductive health. These statements have been created using the responses that we received during the first round of the Delphi exercise.

Please do not include any identifiable information in your response.

* 16. Measuring unmet need could lead to a change in service design.

* 17. Measuring unmet need could have an impact on service commissioning.

* 18. Resolving unmet need has the potential to improve sexual and reproductive outcomes.

APPENDIX 3: GONORRHOEA TESTING AND DIAGNOSIS RATES IN ENGLAND BY IMD AND ETHNICITY AMONG WOMEN BETWEEN THE AGES OF 16 AND 24 (2012 - 2019)

This appendix outlines the gonorrhoea testing and diagnosis rates (by IMD and ethnicity) for women aged 16 – 24 in England between 2012 and 2019 (broken down by year. This appendix also outlines the testing and diagnosis rate ratios comparing different levels of deprivation and different ethnicities within this population during this time period. The analyses used to create these data are discussed in **Chapter 5**.

GONORRHOEA TESTING AND DIAGNOSIS RATES IN ENGLAND BY IMD AMONG WOMEN BETWEEN THE AGES OF 16 AND 24 (2012 - 2019)

2012					
IMD	Gonorrhoea tests	Gonorrhoea diagnoses	Population	Tests per 1000 population	GPR
1	41678	916	363731	115.1	22.0
2	46893	895	360483	128.1	19.1
3	43454	677	361111	119.1	15.6
4	39028	518	333629	111.9	13.3
5	33541	403	308009	108.8	12.0
6	29317	290	286571	104.0	9.9
7	27880	244	278269	101.4	8.8
8	26319	190	268676	98.8	7.2
9	25035	212	265677	96.3	8.5
10	24187	163	245480	100.6	6.7
2013					
IMD	Gonorrhoea tests	Gonorrhoea diagnoses	Population	Tests per 1000 population	GPR
1	46267	962	348520	129.8	20.8
2	51940	1002	336146	143.5	19.3
3	47163	710	312331	131.1	15.1
4	42018	576	306633	122.1	13.7
5	36032	495	299238	117.2	13.7
6	31444	334	294977	112.0	10.6
7	30033	262	294265	109.6	8.7
8	28587	235	290670	107.4	8.2
9	27115	242	283810	104.4	8.9
10	26009	171	282325	108.0	6.6
2014					
IMD	Gonorrhoea tests	Gonorrhoea diagnoses	Population	Tests per 1000 population	GPR
1	49163	1113	341007	139.0	22.6
2	53338	1122	319635	149.4	21.0
3	48764	810	314988	136.0	16.6
4	43720	579	311507	127.3	13.2
5	37622	447	298992	123.3	11.9
6	33700	383	296673	120.7	11.4
7	31160	297	295429	114.0	9.5
8	29474	266	288395	111.0	9.0
9	28079	206	291645	108.4	7.3
10	25947	190	276773	107.8	7.3
2015					
IMD	Gonorrhoea tests	Gonorrhoea diagnoses	Population	Tests per 1000 population	GPR
1	46793	1050	334492	132.8	22.4
2	52250	982	323922	146.5	18.8
3	48240	778	313192	134.5	16.1
4	43459	545	302139	126.8	12.5
5	37039	453	302015	121.6	12.2
6	33147	330	294559	119.4	10.0
7	30844	274	290721	113.5	8.9
8	29290	282	294843	111.6	9.6
9	27514	217	282460	106.7	7.9
10	26038	175	284946	108.6	6.7

2016					
IMD	Gonorrhoea tests	Gonorrhoea diagnoses	Population	Tests per 1000 population	GPR
1	44680	965	322771	133.4	21.6
2	51087	898	319753	149.2	17.6
3	52202	751	317086	151.4	14.4
4	47427	590	306508	143.2	12.4
5	40209	504	297043	131.1	12.5
6	37181	367	289932	125.8	9.9
7	32555	292	293066	119.2	9.0
8	31802	239	280505	121.3	7.5
9	28765	243	284676	116.0	8.4
10	27335	172	277455	108.9	6.3
2017					
IMD	Gonorrhoea tests	Gonorrhoea diagnoses	Population	Tests per 1000 population	GPR
1	46339	1208	313427	140.9	26.1
2	53144	1179	323938	158.0	22.2
3	53335	1011	307227	156.9	19.0
4	48157	751	300876	147.1	15.6
5	41258	588	288194	136.5	14.3
6	38955	461	291125	133.6	11.8
7	34711	431	286323	128.9	12.4
8	33391	349	280171	129.1	10.5
9	30708	314	279215	126.1	10.2
10	29536	258	276904	118.2	8.7
2018					
IMD	Gonorrhoea tests	Gonorrhoea diagnoses	Population	Tests per 1000 population	GPR
1	50434	1448	314354	155.6	28.7
2	58396	1463	311725	176.9	25.1
3	59017	1297	294579	175.2	22.0
4	54273	1034	302450	167.1	19.1
5	47308	776	292647	157.8	16.4
6	44743	669	296847	153.8	15.0
7	39612	518	279633	148.0	13.1
8	38241	501	282574	149.8	13.1
9	35188	448	272098	145.8	12.7
10	33543	317	272393	134.7	9.5
2019					
IMD	Gonorrhoea tests	Gonorrhoea diagnoses	Population	Tests per 1000 population	GPR
1	52881	1821	311430	165.1	34.4
2	62835	1898	311169	192.5	30.2
3	64131	1617	292675	193.3	25.2
4	59333	1324	293982	184.4	22.3
5	51864	1113	286122	174.5	21.5
6	48583	910	290499	167.2	18.7
7	43306	780	284029	163.4	18.0
8	40918	668	276471	162.3	16.3
9	38296	647	238991	160.2	16.9
10	35776	492	249021	143.7	13.8

Ratio of gonorrhoea testing and diagnosis rates among women aged 16 – 24 in England by IMD (2012 - 2019)

2012		
IMD Decile	**Testing rate ratio (CI)**	**Diagnosis rate ratio (CI)**
1	1.000	1.000
2	**1.113 (1.098 – 1.127)**	**0.868 (0.792 – 0.952)**
3	**1.035 (1.021 – 1.049)**	**0.709 (0.642 – 0.783)**
4	**0.972 (0.959 – 0.986)**	**0.604 (0.542 – 0.673)**
5	**0.945 (0.931 – 0.959)**	**0.547 (0.486 – 0.615)**
6	**0.904 (0.890 – 0.917)**	**0.450 (0.394 – 0.514)**
7	**0.881 (0.868 – 0.894)**	**0.398 (0.346 – 0.459)**
8	**0.858 (0.845 – 0.871)**	**0.328 (0.281- 0.384)**
9	**0.836 (0.823 – 0.849)**	**0.385 (0.332 – 0.447)**
10	**0.874 (0.860 – 0.888)**	**0.307 (0.260 – 0.362)**
2013		
IMD Decile	**Testing rate ratio (CI)**	**Diagnosis rate ratio (CI)**
1	1.000	1.000
2	**1.106 (1.092 – 1.120)**	**0.928 (0.849 – 1.014))**
3	1.010 (0.997 – 1.023)	**0.724 (0.657 – 0.798)**
4	**0.941 (0.929 – 0.954)**	**0.659 (0.595 – 0.731)**
5	**0.903 (0.891 – 0.916)**	**0.661 (0.593 – 0.736)**
6	**0.863 (0.851 – 0.876)**	**0.511 (0.451 – 0.579)**
7	**0.845 (0.833 – 0.857)**	**0.420 (0.366 – 0.481)**
8	**0.828 (0.816 – 0.840)**	**0.395 (0.343 – 0.456)**
9	**0.804 (0.792 – 0.816)**	**0.429 (0.373 – 0.494)**
10	**0.832 (0.819 – 0.845)**	**0.316 (0.269 – 0.372)**
2014		
IMD Decile	**Testing rate ratio (CI)**	**Diagnosis rate ratio (CI)**
1	1.000	1.000
2	**1.075 (1.062 – 1.088)**	0.929 (0.855 – 1.010)
3	**0.978 (0.966 – 0.991)**	**0.734 (0.670 – 0.803)**
4	**0.916 (0.904 – 0.927)**	**0.585 (0.529 – 0.647)**
5	**0.887 (0.875 – 0.899)**	**0.525 (0.470 – 0.586)**
6	**0.869 (0.857 – 0.881)**	**0.502 (0.447 – 0.564)**
7	**0.820 (0.809 – 0.832)**	**0.421 (0.370 – 0.456)**
8	**0.799 (0.787 – 0.810)**	**0.399 (0.349 – 0.456)**
9	**0.780 (0.769 – 0.792)**	**0.324 (0.279 – 0.376)**
10	**0.776 (0.764 – 0.787)**	**0.323 (0.277 – 0.377)**
2015		
IMD Decile	**Testing rate ratio (CI)**	**Diagnosis rate ratio (CI)**
1	1.000	1.000
2	**1.103 (1.089 – 1.117)**	**0.838 (0.768 – 0.914)**
3	1.012 (1.000 – 1.025)	**0.719 (0.655 – 0.789)**
4	**0.954 (0.942 – 0.967)**	**0.559 (0.504 – 0.620)**
5	**0.916 (0.903 – 0.928)**	**0.545 (0.488 – 0.609)**
6	**0.899 (0.886 – 0.912)**	**0.444 (0.392 – 0.502)**
7	**0.855 (0.842 – 0.867)**	**0.396 (0.347 – 0.452)**
8	**0.840 (0.828 – 0.853)**	**0.429 (0.376 – 0.489)**
9	**0.803 (0.791 – 0.815)**	**0.351 (0.304 – 0.407)**
10	**0.818 (0.805 – 0.830)**	**0.300 (0.255 – 0.351)**

2016		
IMD Decile	**Testing rate ratio (CI)**	**Diagnosis rate ratio (CI)**
1	1.000	1.000
2	**1.118 (1.104 – 1.133)**	**0.814 (0.743 – 0.891)**
3	**1.135 (1.120 – 1.149)**	**0.666 (0.606 – 0.733)**
4	**1.073 (1.059 – 1.087)**	**0.576 (0.520 – 0.638)**
5	**0.982 (0.969 – 0.996)**	**0.580 (0.521 – 0.646)**
6	**0.943 (0.930 – 0.956)**	**0.457 (0.405 – 0.515)**
7	**0.893 (0.881 – 0.906)**	**0.415 (0.364 – 0.473)**
8	**0.909 (0.896 – 0.922)**	**0.348 (0.302 – 0.401)**
9	**0.870 (0.857 – 0.883)**	**0.391 (0.340 – 0.450)**
10	**0.816 (0.804 – 0.828)**	**0.291 (0.248 – 0.343)**
2017		
IMD Decile	**Testing rate ratio (CI)**	**Diagnosis rate ratio (CI)**
1	1.000	1.000
2	**1.121 (1.107 – 1.135)**	**0.851 (0.785 – 0.922)**
3	**1.114 (1.100 – 1.128)**	**0.727 (0.669 – 0.790)**
4	**1.044 (1.031 – 1.058)**	**0.598 (0.546 – 0.655)**
5	**0.969 (0.956 – 0.982)**	**0.547 (0.495 – 0.603)**
6	**0.948 (0.936 – 0.961)**	**0.454 (0.408 – 0.505)**
7	**0.915 (0.903 – 0.928)**	**0.476 (0.427 – 0.532)**
8	**0.916 (0.904 – 0.929)**	**0.401 (0.356 – 0.452)**
9	**0.895 (0.882 – 0.908)**	**0.392 (0.346 – 0.444)**
10	**0.839 (0.827 – 0.851)**	**0.335 (0.293 – 0.383)**
2018		
IMD Decile	**Testing rate ratio (CI)**	**Diagnosis rate ratio (CI)**
1	1.000	1.000
2	**1.137 (1.123 – 1.150)**	**0.873 (0.811 – 0.938)**
3	**1.126 (1.113 – 1.139)**	**0.765 (0.710 – 0.825)**
4	**1.074 (1.061 – 1.087)**	**0.664 (0.613 – 0.719)**
5	**1.014 (1.002 – 1.027)**	**0.571 (0.524 – 0.623)**
6	0.988 (0.976 – 1.001)	**0.521 (0.475 – 0.571)**
7	**0.951 (0.939 – 0.964)**	**0.455 (0.412 – 0.504)**
8	**0.962 (0.950 – 0.975)**	**0.456 (0.412 – 0.505)**
9	**0.937 (0.924 – 0.950)**	**0.443 (0.399 – 0.493)**
10	**0.865 (0.853 – 0.877)**	**0.329 (0.291 – 0.372)**
2019		
IMD Decile	**Testing rate ratio (CI)**	**Diagnosis rate ratio (CI)**
1	1.000	1.000
2	**1.166 (1.153 – 1.180)**	**0.877 (0.823 – 0.935)**
3	**1.171 (1.157 – 1.184)**	**0.732 (0.685 – 0.783)**
4	**1.117 (1.104 – 1.130)**	**0.648 (0.604 – 0.696)**
5	**1.057 (1.044 – 1.070)**	**0.623 (0.578 – 0.671)**
6	**1.013 (1.000 – 1.025)**	**0.544 (0.502 – 0.589)**
7	0.990 (0.977 – 1.002)	**0.523 (0.481 – 0.569)**
8	**0.983 (0.971 – 0.996)**	**0.474 (0.434 – 0.518)**
9	**0.971 (0.958 – 0.983)**	**0.491 (0.449 – 0.539)**
10	**0.870 (0.859 – 0.882)**	**0.399 (0.362 – 0.441)**

GONORRHOEA DIAGNOSIS RATES IN ENGLAND BY ETHNICITY AMONG WOMEN BETWEEN THE AGES OF 16 AND 24 (2012 - 2019)

2012			
Ethnicity	Gonorrhoea tests	Gonorrhoea diagnoses	GPR
Asian Bangladeshi	1226	10	8.2
Asian Indian	2973	25	8.4
Asian Pakistani	1528	17	11.1
Asian Chinese	1406	11	7.8
Asian other	4348	48	11.0
Black African	11621	200	17.2
Black Caribbean	15147	434	28.7
Black other	15841	410	25.9
White British	233573	2766	11.8
White Irish	2262	24	10.6
White Other	23485	281	12.0
2013			
Ethnicity	**Gonorrhoea tests**	**Gonorrhoea diagnoses**	**GPR**
Asian Bangladeshi	1129	14	12.4
Asian Indian	3231	31	9.6
Asian Pakistani	1642	17	10.4
Asian Chinese	1546	16	10.3
Asian other	4639	49	10.6
Black African	12916	225	17.4
Black Caribbean	14888	405	27.2
Black other	16938	466	27.5
White British	257799	3056	11.9
White Irish	2413	30	12.4
White Other	25054	356	14.2
2014			
Ethnicity	**Gonorrhoea tests**	**Gonorrhoea diagnoses**	**GPR**
Asian Bangladeshi	1070	13	12.1
Asian Indian	3281	30	9.1
Asian Pakistani	1764	20	11.3
Asian Chinese	1631	11	6.7
Asian other	5323	62	11.6
Black African	13508	247	18.3
Black Caribbean	14445	492	34.1
Black other	17108	500	29.2
White British	271036	3263	12.0
White Irish	2317	24	10.4
White Other	25550	369	14.4

Highest annual GPR

Lowest annual GPR

2015			
Ethnicity	**Gonorrhoea tests**	**Gonorrhoea diagnoses**	**GPR**
Asian Bangladeshi	1302	21	16.1
Asian Indian	3616	35	9.7
Asian Pakistani	1916	16	8.4
Asian Chinese	1862	11	5.9
Asian other	5654	60	10.6
Black African	13700	225	16.4
Black Caribbean	13247	352	26.6
Black other	16825	409	24.3
White British	263572	3292	12.5
White Irish	2600	25	9.6
White Other	26468	296	11.2
2016			
Ethnicity	**Gonorrhoea tests**	**Gonorrhoea diagnoses**	**GPR**
Asian Bangladeshi	1270	5	3.9
Asian Indian	3896	29	7.4
Asian Pakistani	2219	22	9.9
Asian Chinese	2113	17	8.0
Asian other	6575	67	10.2
Black African	14748	238	16.1
Black Caribbean	13411	373	27.8
Black other	17693	405	22.9
White British	273705	3190	11.7
White Irish	2627	26	9.9
White Other	26975	280	10.4
2017			
Ethnicity	**Gonorrhoea tests**	**Gonorrhoea diagnoses**	**GPR**
Asian Bangladeshi	1271	17	13.4
Asian Indian	4041	36	8.9
Asian Pakistani	2447	30	12.3
Asian Chinese	2253	19	8.4
Asian other	7152	90	12.6
Black African	15891	347	21.8
Black Caribbean	13733	429	31.2
Black other	18084	571	31.6
White British	278478	4072	14.6
White Irish	2482	28	11.3
White Other	27202	304	11.2
2018			
Ethnicity	**Gonorrhoea tests**	**Gonorrhoea diagnoses**	**GPR**
Asian Bangladeshi	1402	27	19.3
Asian Indian	4936	61	12.4
Asian Pakistani	2775	30	10.8
Asian Chinese	2671	18	6.7
Asian other	8370	106	12.7
Black African	18136	443	24.4
Black Caribbean	15738	616	39.1
Black other	20181	673	33.3
White British	301186	5211	17.3
White Irish	2802	42	15.0
White Other	30171	420	13.9

Highest annual GPR   Lowest annual GPR

2019			
Ethnicity	**Gonorrhoea tests**	**Gonorrhoea diagnoses**	**GPR**
Asian Bangladeshi	1742	27	15.5
Asian Indian	5636	99	17.6
Asian Pakistani	3304	71	21.5
Asian Chinese	3052	41	13.4
Asian other	9487	150	15.8
Black African	20642	524	25.4
Black Caribbean	17654	766	43.4
Black other	22196	861	38.8
White British	320694	7017	21.9
White Irish	3118	51	16.4
White Other	33693	578	17.2

Highest annual GPR

Lowest annual GPR

Ratio of gonorrhoea diagnosis rates among women aged 16 – 24 in England by ethnicity (2012 - 2019)

2012	
Ethnicity	**Rate ratio (CI)**
Asian Bangladeshi	0.689 (0.330 – 1.269)
Asian Indian	0.710 (0.459 – 1.050)
Asian Pakistani	0.939 (0.546 – 1.507)
Asian Chinese	0.661 (0.329 – 1.184)
Asian other	0.932 (0.686 – 1.239)
Black African	**1.453 (1.253 – 1.678)**
Black Caribbean	**2.420 (2.182 – 2.678)**
Black other	**2.186 (1.965 – 2.425)**
White British	1.000
White Irish	0.896 (0.573 – 1.336)
White Other	1.010 (0.891 -1.143)
2013	
Ethnicity	**Rate ratio (CI)**
Asian Bangladeshi	1.046 (0.571 – 1.758)
Asian Indian	0.809 (0.549 – 1.151)
Asian Pakistani	0.873 (0.508 – 1.401)
Asian Chinese	0.873 (0.498 – 1.420)
Asian other	0.891 (0.658 – 1.181)
Black African	**1.470 (1.278 – 1.683)**
Black Caribbean	**2.290 (2.064 – 2.546)**
Black other	**2.321 (2.101 – 2.559)**
White British	1.000
White Irish	1.049 (0.706 – 1.500)
White Other	1.199 (1.071 – 1.338)
2014	
Ethnicity	**Rate ratio (CI)**
Asian Bangladeshi	1.009 (0.537 – 1.728)
Asian Indian	0.759 (0.512 – 1.086)
Asian Pakistani	0.942 (0.574 – 1.457)
Asian Chinese	0.560 (0.279 – 1.003)
Asian other	0.967 (0.740 – 1.244)
Black African	**1.519 (1.329 – 1.729)**
Black Caribbean	**2.830 (2.568 – 3.111)**
Black other	**2.428 (2.205 – 2.667)**
White British	1.000
White Irish	0.860 (0.550 – 1.282)
White Other	**1.200 (1.074 – 1.336)**
2015	
Ethnicity	**Rate ratio (CI)**
Asian Bangladeshi	1.291 (0.798 – 1.977)
Asian Indian	0.775 (0.539 – 1.080)
Asian Pakistani	0.669 (0.382 – 1.087)
Asian Chinese	**0.473 (0.236 – 0.847)**
Asian other	0.850 (0.647 – 1.097)
Black African	**1.315 (1.144 – 1.505)**
Black Caribbean	**2.127 (1.901 – 2.375)**
Black other	**1.946 (1.752 – 2.158)**
White British	1.000
White Irish	0.770 (0.497 – 1.139)
White Other	0.895 (0.792 – 1.009)

Highest rate ratio | Reference | Lowest rate ratio

2016	
Ethnicity	**Rate ratio (CI)**
Asian Bangladeshi	**0.338 (0.110 – 0.789)**
Asian Indian	**0.639 (0.427 – 0.919)**
Asian Pakistani	0.851 (0.532 – 1.290)
Asian Chinese	0.690 (0.402 – 1.107)
Asian other	0.874 (0.676 – 1.113)
Black African	**1.385 (1.209 – 1.580)**
Black Caribbean	**2.386 (2.138 – 2.657)**
Black other	**1.964 (1.767 – 2.179)**
White British	1.000
White Irish	0.849 (0.554 – 1.247)
White Other	0.891 (0.785 – 1.007)
2017	
Ethnicity	**Rate ratio (CI)**
Asian Bangladeshi	0.915 (0.532 – 1.466)
Asian Indian	**0.609 (0.426 – 0.844)**
Asian Pakistani	0.838 (0.565 – 1.199)
Asian Chinese	**0.577 (0.347 – 0.902)**
Asian other	0.861 (0.690 – 1.060)
Black African	1.493 (1.334 – 1.667)
Black Caribbean	2.136 (1.930 – 2.360)
Black other	**2.159 (1.975 – 2.358)**
White British	1.000
White Irish	0.772 (0.512 – 1.117)
White Other	**0.764 (0.678 – 0.859)**
2018	
Ethnicity	**Rate ratio (CI)**
Asian Bangladeshi	1.113 (0.733 – 1.621)
Asian Indian	**0.714 (0.546 – 0.919)**
Asian Pakistani	**0.625 (0.421 – 0.893)**
Asian Chinese	**0.390 (0.231 – 0.616)**
Asian other	**0.732 (0.598 – 0.887)**
Black African	**1.411 (1.278 – 1.556)**
Black Caribbean	**2.262 (2.078 – 2.460)**
Black other	**1.927 (1.776 – 2.089)**
White British	1.000
White Irish	0.866 (0.624 – 1.173)
White Other	**0.805 (0.727 – 0.889)**
2019	
Ethnicity	**Rate ratio (CI)**
Asian Bangladeshi	0.708 (0.466 – 1.032)
Asian Indian	**0.803 (0.652 – 0.979)**
Asian Pakistani	0.982 (0.766 – 1.240)
Asian Chinese	**0.614 (0.440 – 0.834)**
Asian other	**0.723 (0.611 – 0.850)**
Black African	**1.160 (1.060 – 1.268)**
Black Caribbean	**1.983 (1.838 – 2.137)**
Black other	**1.773 (1.650 – 1.903)**
White British	1.000
White Irish	**0.748 (0.556 – 0.984)**
White Other	**0.784 (0.719 – 0.854)**

Highest rate ratio   Reference   Lowest rate ratio

APPENDIX 4: CHLAMYDIA TESTING AND DIAGNOSIS RATES IN ENGLAND BY IMD AND ETHNICITY AMONG WOMEN BETWEEN THE AGES OF 16 AND 24 (2012 - 2019)

This appendix outlines the chlamydia testing and diagnosis rates (by IMD and ethnicity) for women aged 16 – 24 in England between 2012 and 2019 (broken down by year. This appendix also outlines the testing and diagnosis rate ratios comparing different levels of deprivation and different ethnicities within this population during this time period. The analyses used to create these data are discussed in **Chapter 6.**

CHLAMYDIA TESTING AND DIAGNOSIS RATES IN ENGLAND BY IMD AMONG WOMEN BETWEEN THE AGES OF 16 AND 24 (2012 - 2019)

IMD	Chlamydia tests	Chlamydia diagnoses	Population	Tests per 1000 population	CPR
2012					
1	175544	15030	362071	484.8	85.6
2	167662	13683	366115	457.9	81.6
3	150207	11567	364893	411.6	77.0
4	134852	10050	348744	386.7	74.5
5	101364	7333	308346	328.7	72.3
6	91251	6074	281790	323.8	66.6
7	90864	6054	274955	330.5	66.6
8	88455	5793	266451	332.0	65.5
9	87901	5560	260093	338.0	63.3
10	66704	4067	240535	277.3	61.0
2013					
IMD	Chlamydia tests	Chlamydia diagnoses	Population	Tests per 1000 population	CPR
1	163958	14727	356505	459.9	89.8
2	158713	13440	361988	438.4	84.7
3	143962	11494	359757	400.2	79.8
4	129828	10083	344044	377.4	77.7
5	104899	7800	307341	341.3	74.4
6	94818	6848	280637	337.9	72.2
7	92440	6440	273927	337.5	69.7
8	87251	5995	266112	327.9	68.7
9	79672	5463	259779	306.7	68.6
10	67899	4401	240889	281.9	64.8
2014					
IMD	Chlamydia tests	Chlamydia diagnoses	Population	Tests per 1000 population	CPR
1	150511	13818	353706	425.5	91.8
2	156341	13461	357092	437.8	86.1
3	140623	11270	358640	392.1	80.1
4	131477	9867	343550	382.7	75.0
5	104951	7828	305067	344.0	74.6
6	96512	6940	279113	345.8	71.9
7	90593	6281	273254	331.5	69.3
8	88168	6122	265515	332.1	69.4
9	77466	5237	258941	299.2	67.6
10	67342	4368	240644	279.8	64.9
2015					
IMD	Chlamydia tests	Chlamydia diagnoses	Population	Tests per 1000 population	CPR
1	137045	12679	352231	389.1	92.5
2	140738	12038	356534	394.7	85.5
3	128923	10479	358707	359.4	81.3
4	119183	9214	342863	347.6	77.3
5	100489	7535	304494	330.0	75.0
6	93860	6730	277559	338.2	71.7
7	86863	6056	271703	319.7	69.7
8	84729	5708	262428	322.9	67.4
9	75607	5050	257914	293.1	66.8
10	65445	4087	239745	273.0	62.4

2016					
IMD	Chlamydia tests	Chlamydia diagnoses	Population	Tests per 1000 population	CPR
1	121696	11966	334821	363.5	98.3
2	124723	11952	342341	364.3	95.8
3	120595	10387	344738	349.8	86.1
4	108231	9139	331258	326.7	84.4
5	95210	7805	306687	310.4	82.0
6	93271	7158	295502	315.6	76.7
7	87507	6458	273071	320.5	73.8
8	77517	5603	262217	295.6	72.3
9	68235	4803	247896	275.3	70.4
10	64878	4470	251055	258.4	68.9
2017					
IMD	Chlamydia tests	Chlamydia diagnoses	Population	Tests per 1000 population	CPR
1	111058	12128	328931	337.6	109.2
2	111718	11369	336440	332.1	101.8
3	109269	10261	339899	321.5	93.9
4	103078	9107	327290	314.9	88.4
5	93486	8071	302215	309.3	86.3
6	90923	7371	291571	311.8	81.1
7	80314	6495	269184	298.4	80.9
8	71495	5647	258635	276.4	79.0
9	66440	5084	243578	272.8	76.5
10	61561	4545	249955	246.3	73.8
2018					
IMD	Chlamydia tests	Chlamydia diagnoses	Population	Tests per 1000 population	CPR
1	106026	11643	324099	327.1	109.8
2	111364	11486	330111	337.4	103.1
3	112450	11068	336830	333.8	98.4
4	103584	9532	324824	318.9	92.0
5	94879	8489	299746	316.5	89.5
6	91366	7858	290978	314.0	86.0
7	78963	6590	267573	295.1	83.5
8	71876	5857	255333	281.5	81.5
9	67243	5332	241298	278.7	79.3
10	64854	5016	249097	260.4	77.3
2019					
IMD	Chlamydia tests	Chlamydia diagnoses	Population	Tests per 1000 population	CPR
1	105153	11843	320305	328.3	112.6
2	114444	12085	326364	350.7	105.6
3	115134	11279	331821	347.0	98.0
4	107959	10023	321756	335.5	92.8
5	98840	8760	297196	332.6	88.6
6	94399	7930	290608	324.8	84.0
7	81058	6675	265052	305.8	82.3
8	73864	5800	252089	293.0	78.5

RATIO OF CHLAMYDIA TESTING AND DIAGNOSIS RATES AMONG WOMEN AGED 16 – 24 IN ENGLAND BY IMD (2012 - 2019)

2012		
IMD Decile	**Testing rate ratio (CI)**	**Diagnosis rate ratio (CI)**
1	1.000	1.000
2	**1.162 (1.146 – 1.178)**	**0.902 (0.865 – 0.940)**
3	**1.104 (1.089 – 1.120)**	**0.845 (0.810 – 0.882)**
4	**1.041 (1.026 – 1.056)**	**0.827 (0.791 – 0.864)**
5	**1.025 (1.010 – 1.040)**	**0.811 (0.774 – 0.849)**
6	0.987 (0.972 – 1.003)	**0.774 (0.737 – 0.813)**
7	**0.969 (0.954 – 0.985)**	**0.737 (0.701 – 0.775)**
8	**0.942 (0.927 – 0.958)**	**0.752 (0.715 – 0.791)**
9	**0.921 (0.906 – 0.936)**	**0.730 (0.693 – 0.769)**
10	**0.964 (0.948 – 0.980)**	**0.672 (0.637 – 0.709)**
2013		
IMD Decile	**Testing rate ratio (CI)**	**Diagnosis rate ratio (CI)**
1	1.000	1.000
2	**1.148 (1.132 – 1.163)**	**0.920 (0.884 – 0.958)**
3	**1.081 (1.066 – 1.096)**	**0.869 (0.834 – 0.906)**
4	**1.000 (0.986 – 1.014)**	**0.862 (0.826 – 0.900)**
5	0.990 (0.975 – 1.004)	**0.803 (0.767 – 0.840)**
6	**0.949 (0.935 – 0.964)**	**0.814 (0.776 – 0.853)**
7	**0.935 (0.921 – 0.950)**	**0.801 (0764 – 0.841)**
8	**0.912 (0.898 – 0.926)**	**0.780 (0.743 – 0.820)**
9	**0.893 (0.879 – 0.907)**	**0.766 (0.728 – 0.805)**
10	**0.927 (0.913 – 0.942)**	**0.700 (0.665 – 0.738)**
2014		
IMD Decile	**Testing rate ratio (CI)**	**Diagnosis rate ratio (CI)**
1	1.000	1.000
2	**1.095 (1.080 – 1.109)**	**0.899 (0.865 – 0.935)**
3	**1.029 (1.015 – 1.043)**	**0.833 (0.800 – 0.869)**
4	**0.957 (0.944 – 0.971)**	**0.803 (0.770 – 0.837)**
5	**0.952 (0.938 – 0.966)**	**0.777 (0.744 – 0.812)**
6	**0.938 (0.924 – 0.952)**	**0.776 (0.742 – 0.812)**
7	**0.887 (0.874 – 0.901)**	**0.729 (0.695 – 0.764)**
8	**0.863 (0.850 – 0.876)**	**0.734 (0.700 – 0.770)**
9	**0.846 (0.833 – 0.859)**	**0.724 (0.689 – 0.760)**
10	**0.844 (0.830 – 0.857)**	**0.665 (0.631 – 0.770)**
2015		
IMD Decile	**Testing rate ratio (CI)**	**Diagnosis rate ratio (CI)**
1	1.000	1.000
2	**1.122 (1.107 – 1.137)**	**0.909 (0.874 – 0.947)**
3	**1.055 (1.040 – 1.069)**	**0.856 (0.821 – 0.892)**
4	0.989 (0.975 – 1.003)	**0.822 (0.787 – 0.858)**
5	**0.973 (0.959 – 0.988)**	**0.820 (0.784 – 0.858)**
6	**0.969 (0.954 – 0.983)**	**0.776 (0.741 – 0.814)**
7	**0.921 (0.908 – 0.936)**	**0.749 (0.714 – 0.787)**
8	**0.904 (0.890 – 0.918)**	**0.740 (0.704 – 0.778)**
9	**0.866 (0.853 – 0.880)**	**0.717 (0.681 – 0.755)**
10	**0.884 (0.870 – 0.899)**	**0.660 (0.626 – 0.697)**

2016		
IMD Decile	**Testing rate ratio (CI)**	**Diagnosis rate ratio (CI)**
1	1.000	1.000
2	**1.109 (1.093 – 1.124)**	**0.904 (0.869 – 0.940)**
3	**1.133 (1.118 – 1.149)**	**0.805 (0.774 – 0.838)**
4	**1.079 (1.064 – 1.094)**	**0.792 (0.760 – 0.825)**
5	1.009 (0.994 – 1.023)	**0.780 (0.747 – 0.814)**
6	**0.983 (0.968 – 0.997)**	**0.748 (0.715 – 0.782)**
7	**0.943 (0.929 – 0.958)**	**0.731 (0.698 – 0.766)**
8	**0.958 (0.944 – 0.973)**	**0.698 (0.655 – 0.732)**
9	**0.913 (0.898 – 0.927)**	**0.686 (0.653 – 0.721)**
10	**0.874 (0.860 – 0.888)**	**0.676 (0.643 – 0.711)**
2017		
IMD Decile	**Testing rate ratio (CI)**	**Diagnosis rate ratio (CI)**
1	1.000	1.000
2	**1.092 (1.077 – 1.107)**	**0.899 (0.866 – 0.933)**
3	**1.098 (1.084 – 1.113)**	**0.834 (0.803 – 0.866)**
4	**1.031 (1.017 – 1.045)**	**0.802 (0.771 – 0.834)**
5	**0.971 (0.957 – 0.985)**	**0.775 (0.743 – 0.808)**
6	**0.965 (0.951 – 0.979)**	**0.721 (0.690 – 0.752)**
7	**0.940 (0.926 – 0.954)**	**0.752 (0.720 – 0.786)**
8	**0.927 (0.913 – 0.941)**	**0.729 (0.697 – 0.762)**
9	**0.912 (0.898 – 0.927)**	**0.699 (0.667 – 0.733)**
10	**0.877 (0.864 – 0.891)**	**0.666 (0.635 – 0.699)**
2018		
IMD Decile	**Testing rate ratio (CI)**	**Diagnosis rate ratio (CI)**
1	1.000	1.000
2	**1.047 (1.033 – 1.061)**	**0.927 (0.894 – 0.961)**
3	**1.043 (1.029 – 1.057)**	**0.877 (0.846 – 0.910)**
4	**0.966 (0.953 – 0.979)**	**0.838 (0.807 – 0.871)**
5	**0.909 (0.897 – 0.922)**	**0.825 (0.793 – 0.858)**
6	**0.908 (0.896 – 0.921)**	**0.761 (0.731 – 0.793)**
7	**0.883 (0.870 – 0.896)**	**0.758 (0.727 – 0.791)**
8	**0.866 (0.853 – 0.879)**	**0.732 (0.701 – 0.765)**
9	**0.847 (0.834 – 0.860)**	**0.724 (0.692 – 0.758)**
10	**0.801 (0.789 – 0.813)**	**0.666 (0.636 – 0.699)**
2019		
IMD Decile	**Testing rate ratio (CI)**	**Diagnosis rate ratio (CI)**
1	1.000	1.000
2	**1.033 (1.019 – 1.046)**	**0.935 (0.903 – 0.969)**
3	**1.028 (1.014 – 1.041)**	**0.848 (0.818 – 0.879)**
4	**0.963 (0.950 – 0.976)**	**0.837 (0.806 – 0.868)**
5	**0.903 (0.891 – 0.916)**	**0.783 (0.752 – 0.814)**
6	**0.891 (0.878 – 0.903)**	**0.733 (0.704 – 0.764)**
7	**0.869 (0.857 – 0.882)**	**0.747 (0.716 – 0.778)**
8	**0.832 (0.820 – 0.845)**	**0.685 (0.656 – 0.716)**
9	**0.829 (0.816 – 0.842)**	**0.709 (0.678- 0.741)**
10	**0.774 (0.763 – 0.786)**	**0.674 (0-644 – 0.706)**

CHLAMYDIA TESTING AND DIAGNOSIS RATES IN ENGLAND BY ETHNICITY AMONG WOMEN BETWEEN THE AGES OF 16 AND 24 (2012 - 2019)

2012			
Ethnicity	Chlamydia tests	Chlamydia diagnoses	CPR
Asian Bangladeshi	2164	95	43.9
Asian Indian	6589	251	38.1
Asian Pakistani	3511	148	42.2
Asian Chinese	2483	191	76.9
Asian other	7659	482	62.9
Black African	16634	1343	80.7
Black Caribbean	22733	2305	101.4
Black other	23125	2414	104.4
White British	361197	31500	87.2
White Irish	2933	253	86.3
White Other	67927	5028	74.0
2013			
Ethnicity	**Chlamydia tests**	**Chlamydia diagnoses**	**CPR**
Asian Bangladeshi	1828	79	43.2
Asian Indian	6576	277	42.1
Asian Pakistani	3478	148	42.6
Asian Chinese	2315	211	91.1
Asian other	7503	493	65.7
Black African	17244	1534	89.0
Black Caribbean	22005	2280	103.6
Black other	22959	2436	106.1
White British	367468	32624	88.8
White Irish	2549	215	84.3
White Other	83995	6598	78.6
2014			
Ethnicity	**Chlamydia tests**	**Chlamydia diagnoses**	**CPR**
Asian Bangladeshi	1855	93	50.1
Asian Indian	6257	287	45.9
Asian Pakistani	3701	169	45.7
Asian Chinese	2354	221	93.9
Asian other	8461	594	70.2
Black African	18683	1685	90.2
Black Caribbean	21075	2241	106.3
Black other	23674	2523	106.6
White British	391804	34393	87.8
White Irish	2528	202	79.9
White Other	84717	6741	79.6

Highest annual CPR

Lowest annual CPR

2015			
Ethnicity	**Chlamydia tests**	**Chlamydia diagnoses**	**CPR**
Asian Bangladeshi	2016	90	44.6
Asian Indian	5938	252	42.4
Asian Pakistani	3516	169	48.1
Asian Chinese	2546	246	96.6
Asian other	8526	612	71.8
Black African	18808	1744	92.7
Black Caribbean	19268	2047	106.2
Black other	23707	2429	102.5
White British	375698	31800	84.6
White Irish	2808	227	80.8
White Other	90904	7169	78.9
2016			
Ethnicity	**Chlamydia tests**	**Chlamydia diagnoses**	**CPR**
Asian Bangladeshi	1849	99	53.5
Asian Indian	6162	320	51.9
Asian Pakistani	3380	176	52.1
Asian Chinese	2711	254	93.7
Asian other	9115	680	74.6
Black African	18233	1925	105.6
Black Caribbean	17805	2049	115.1
Black other	22551	2580	114.4
White British	391122	35398	90.5
White Irish	3195	266	83.3
White Other	68038	5599	82.3
2017			
Ethnicity	**Chlamydia tests**	**Chlamydia diagnoses**	**CPR**
Asian Bangladeshi	1796	124	69.0
Asian Indian	6050	386	63.8
Asian Pakistani	3521	230	65.3
Asian Chinese	2986	315	105.5
Asian other	9536	809	84.8
Black African	18480	2091	113.1
Black Caribbean	17264	2108	122.1
Black other	22066	2674	121.2
White British	427209	41000	96.0
White Irish	3371	295	87.5
White Other	41577	3597	86.5
2018			
Ethnicity	**Chlamydia tests**	**Chlamydia diagnoses**	**CPR**
Asian Bangladeshi	1901	150	78.9
Asian Indian	6683	462	69.1
Asian Pakistani	3770	276	73.2
Asian Chinese	3292	304	92.3
Asian other	10392	889	85.5
Black African	21292	2640	124.0
Black Caribbean	19386	2683	138.4
Black other	24227	3182	131.3
White British	438443	42610	97.2
White Irish	3490	342	98.0
White Other	40759	3741	91.8

Highest annual CPR

Lowest annual CPR

2019			
Ethnicity	**Chlamydia tests**	**Chlamydia diagnoses**	**CPR**
Asian Bangladeshi	2281	217	95.1
Asian Indian	7358	530	72.0
Asian Pakistani	4365	323	74.0
Asian Chinese	3615	355	98.2
Asian other	11901	1063	89.3
Black African	24414	3062	125.4
Black Caribbean	21681	2964	136.7
Black other	26751	3287	122.9
White British	460655	44284	96.1
White Irish	3703	343	92.6
White Other	44019	4103	93.2

Highest annual CPR

Lowest annual CPR

Ratio of chlamydia diagnosis rates among women aged 16 – 24 in England by ethnicity (2012 - 2019)

2012	
Ethnicity	**Rate ratio (CI)**
Asian Bangladeshi	**0.503 (0.407 – 0.616)**
Asian Indian	**0.437 (0.384 – 0.495)**
Asian Pakistani	**0.483 (0.408 – 0.568)**
Asian Chinese	0.88 (0.761 – 1.017)
Asian other	**0.722 (0.658 – 0.790)**
Black African	**0.926 (0.876 – 0.978)**
Black Caribbean	**1.163 (1.114 – 1.213)**
Black other	**1.197 (1.148 – 1.248)**
White British	1.000
White Irish	0.989 (0.871 – 1.119)
White Other	**0.849 (0.824 – 0.874)**
2013	
Ethnicity	**Rate ratio (CI)**
Asian Bangladeshi	**0.487 (0.385 – 0.607)**
Asian Indian	**0.474 (0.420 - 0.534)**
Asian Pakistani	**0.479 (0.405 – 0.563)**
Asian Chinese	1.027 (0.892 – 1.175)
Asian other	**0.740 (0.676 – 0.809)**
Black African	1.002 (0.951 – 1.055)
Black Caribbean	**1.167 (1.118 – 1.218)**
Black other	**1.195 (1.146 – 1.245)**
White British	1.000
White Irish	0.950 (0.827 – 1.086)
White Other	**0.885 (0.862 – 0.909)**
2014	
Ethnicity	**Rate ratio (CI)**
Asian Bangladeshi	**0.571 (0.461 – 0.700)**
Asian Indian	**0.523 (0.464 – 0.587)**
Asian Pakistani	**0.520 (0.445 – 0.605)**
Asian Chinese	1.070 (0.933 – 1.221)
Asian other	**0.800 (0.736 – 0.877)**
Black African	1.027 (0.978 – 1.079)
Black Caribbean	**1.211 (1.160 – 1.264)**
Black other	**1.214 (1.166 – 1.264)**
White British	1.000
White Irish	0.910 (0.789 – 1.045)
White Other	**0.906 (0.883 – 0.930)**
2015	
Ethnicity	**Rate ratio (CI)**
Asian Bangladeshi	**0.527 (0.423 – 0.649)**
Asian Indian	**0.501 (0.441 – 0.568)**
Asian Pakistani	**0.568 (0.485 – 0.661)**
Asian Chinese	**1.142 (1.003 – 1.294)**
Asian other	**0.848 (0.782 – 0.919)**
Black African	**1.096 (1.043 – 1.150)**
Black Caribbean	**1.255 (1.200 – 1.313)**
Black other	**1.210 (1.161 – 1.262)**
White British	1.000
White Irish	0.955 (0.834 – 1.088)
White Other	**0.932 (0.908 – 0.956)**

Highest rate ratio   Reference   Lowest rate ratio

2016	
Ethnicity	**Rate ratio (CI)**
Asian Bangladeshi	**0.592 (0.481 – 0.720)**
Asian Indian	**0.574 (0.512 – 0.641)**
Asian Pakistani	**0.575 (0.493 – 0.667)**
Asian Chinese	1.035 (0.911 – 1.171)
Asian other	**0.824 (0.763 – 0.889)**
Black African	**1.167 (1.114 – 1.221)**
Black Caribbean	**1.272 (1.216 – 1.330)**
Black other	**1.264 (1.136 – 1.221)**
White British	1.000
White Irish	0.920 (0.812 – 1.037)
White Other	**0.909 (0.884 – 0.935)**
2017	
Ethnicity	**Rate ratio (CI)**
Asian Bangladeshi	**0.719 (0.598 – 0.858)**
Asian Indian	**0.665 (0.600 – 0.735)**
Asian Pakistani	**0.681 (0.595 – 0.775)**
Asian Chinese	1.099 (0.981 – 1.228)
Asian other	**0.884 (0.824 – 0.948)**
Black African	**1.179 (1.128 – 1.232)**
Black Caribbean	**1.272 (1.217 – 1.313)**
Black other	**1.262 (1.214 – 1.313)**
White British	1.000
White Irish	0.912 (0.810 – 1.023)
White Other	**0.901 (0.871 – 0.933)**
2018	
Ethnicity	**Rate ratio (CI)**
Asian Bangladeshi	**0.812 (0.687 – 0.953)**
Asian Indian	**0.711 (0.648 – 0.780)**
Asian Pakistani	**0.753 (0.667 – 0.848)**
Asian Chinese	0.950 (0.846 – 1.064)
Asian other	**0.880 (0.823 – 0.941)**
Black African	**1.276 (1.226 – 1.327)**
Black Caribbean	**1.424 (1.369 – 1.481)**
Black other	**1.351 (1.303 – 1.401)**
White British	1.000
White Irish	1.008 (0.904 – 1.122)
White Other	**0.944 (0.913 – 0.977)**
2019	
Ethnicity	**Rate ratio (CI)**
Asian Bangladeshi	0.990 (0.862 – 1.131)
Asian Indian	**0.749 (0.686 – 0.816)**
Asian Pakistani	**0.770 (0.688 – 0.859)**
Asian Chinese	1.022 (0.918 – 1.134)
Asian other	**0.929 (0.873 – 0.987)**
Black African	**1.305 (1.257 – 1.353)**
Black Caribbean	**1.422 (1.370 – 1.476)**
Black other	**1.278 (1.233 – 1.324)**
White British	1.000
White Irish	0.964 (0.904 – 1.122)
White Other	0.970 (0.939 – 1.001)

Highest rate ratio   Reference   Lowest rate ratio

APPENDIX 5: ABORTION RATES IN ENGLAND BY IMD AND ETHNICITY AMONG WOMEN BETWEEN THE AGES OF 16 AND 24 (2012 - 2019)

This appendix outlines the abortion and repeat abortion rates (by IMD and ethnicity) for women aged 16 – 24 in England between 2012 and 2019 (broken down by year. This appendix also outlines the abortion and repeat abortion rate ratios comparing different levels of deprivation and different ethnicities within this population during this time period. The analyses used to create these data are discussed in **Chapter 7.**

ABORTION RATES AND REPEAT ABORTION RATES IN ENGLAND BY IMD AMONG WOMEN BETWEEN THE AGES OF 16 AND 24 (2012 - 2019)

2012					
IMD	Abortions	Repeat abortions	Population	Abortions per 1000 population	RAR
1	12350	3779	362071	34.1	306.0
2	12068	3680	366115	33.0	304.9
3	10481	3113	364893	28.7	297.0
4	9001	2564	348744	25.8	284.9
5	7604	2058	308346	24.7	270.6
6	6523	1725	281790	23.1	264.4
7	5821	1500	274955	21.2	257.7
8	5720	1431	266451	21.5	250.2
9	4978	1167	260093	19.1	234.4
10	4208	960	240535	17.5	228.1
2013					
IMD	Abortions	Repeat abortions	Population	Abortions per 1000 population	RAR
1	12233	3744	356505	34.3	306.1
2	11794	3599	361988	32.6	305.2
3	10423	3027	359757	29.0	290.4
4	8744	2411	344044	25.4	275.7
5	7321	1996	307341	23.8	272.6
6	6314	1644	280637	22.5	260.4
7	5740	1464	273927	21.0	255.1
8	5346	1246	266112	20.1	233.1
9	4762	1205	259779	18.3	253.0
10	3897	853	240889	16.2	218.9
2014					
IMD	Abortions	Repeat abortions	Population	Abortions per 1000 population	RAR
1	11944	3642	353706	33.8	304.9
2	11257	3438	357092	31.5	305.4
3	10001	2928	358640	27.9	292.8
4	8480	2381	343550	24.7	280.8
5	7021	1871	305067	23.0	266.5
6	6327	1634	279113	22.7	258.3
7	5380	1361	273254	19.7	253.0
8	5065	1283	265515	19.1	253.3
9	4632	1111	258941	17.9	239.9
10	3801	862	240644	15.8	226.8
2015					
IMD	Abortions	Repeat abortions	Population	Abortions per 1000 population	RAR
1	11554	3516	352231	32.8	304.3
2	10995	3312	356534	30.8	301.2
3	9678	2751	358707	27.0	284.3
4	8273	2225	342863	24.1	268.9
5	6932	1792	304494	22.8	258.5
6	6051	1548	277559	21.8	255.8
7	5487	1324	271703	20.2	241.3
8	4895	1185	262428	18.7	242.1
9	4540	1073	257914	17.6	236.3
10	3667	805	239745	15.3	219.5

2016					
IMD	Abortions	Repeat abortions	Population	Abortions per 1000 population	RAR
1	10896	3376	334821	32.5	309.8
2	10284	3075	342341	30.0	299.0
3	9309	2685	344738	27.0	288.4
4	8014	2207	331258	24.2	275.4
5	6907	1828	306687	22.5	264.7
6	6065	1536	295502	20.5	253.3
7	5196	1246	273071	19.0	239.8
8	4859	1214	262217	18.5	249.8
9	4372	983	247896	17.6	224.8
10	3710	780	251055	14.8	210.2
2017					
IMD	Abortions	Repeat abortions	Population	Abortions per 1000 population	RAR
1	11093	3373	328931	33.7	304.1
2	10468	3095	336440	31.1	295.7
3	9484	2714	339899	27.9	286.2
4	8010	2123	327290	24.5	265.0
5	7035	1845	302215	23.3	262.3
6	6253	1575	291571	21.4	251.9
7	5479	1329	269184	20.4	242.6
8	4995	1219	258635	19.3	244.0
9	4499	1044	243578	18.5	232.1
10	3591	725	249955	14.4	201.9
2018					
IMD	Abortions	Repeat abortions	Population	Abortions per 1000 population	RAR
1	11230	3367	324099	34.6	299.8
2	10361	3082	330111	31.4	297.5
3	9387	2697	336830	27.9	287.3
4	8298	2234	324824	25.5	269.2
5	7026	1903	299746	23.4	270.9
6	6307	1604	290978	21.7	254.3
7	5405	1316	267573	20.2	243.5
8	5174	1296	255333	20.3	250.5
9	4571	1132	241298	18.9	247.6
10	3774	840	249097	15.2	222.6
2019					
IMD	Abortions	Repeat abortions	Population	Abortions per 1000 population	RAR
1	11347	3605	320305	35.4	317.7
2	10414	3190	326364	31.9	306.3
3	9454	2785	331821	28.5	294.6
4	8251	2319	321756	25.6	281.1
5	7035	1907	297196	23.7	271.1
6	6392	1680	290608	22.0	262.8
7	5433	1443	265052	20.5	265.6
8	5283	1355	252089	21.0	256.5

RATIO OF ABORTIONS RATES AND REPEAT ABORTION RATES AMONG WOMEN AGED 16 – 24 IN ENGLAND BY IMD (2012 - 2019)

	2012	
IMD Decile	**Abortion rate ratio (CI)**	**Repeat abortion rate ratio (CI)**
1	1.000	1.000
2	**0.966 (0.942 – 0.991)**	0.997 (.0952 – 1.043)
3	**0.842 (0.820 – 0.864)**	0.971 (0.926 – 1.018)
4	**0.757 (0.736 – 0.778)**	**0.931 (0.885 – 0.979)**
5	**0.723 (0.703 – 0.744)**	**0.884 (0.838 – 0.933)**
6	**0.679 (0.659 – 0.699)**	**0.864 (0.816 – 0.915)**
7	**0.621 (0.602 – 0.649)**	**0.842 (0.793 – 0.894)**
8	**0.629 (0.610 – 0.649)**	**0.818 (0.769 – 0.869)**
9	**0.561 (0.543 – 0.580)**	**0.766 (0.717 – 0.818)**
10	**0.513 (0.495 – 0.531)**	**0.746 (0.695 – 0.800)**
	2013	
IMD Decile	**Abortion rate ratio (CI)**	**Repeat abortion rate ratio (CI)**
1	1.000	1.000
2	**0.950 (0.926 – 0.974)**	0.997 (0.952 – 1.044)
3	**0.844 (0.823 – 0.867)**	**0.949 (0.905 – 0.995)**
4	**0.741 (0.721 – 0.761)**	**0.901 (0.856 – 0.948)**
5	**0.694 (0.674 – 0.715)**	**0.891 (0.844 – 0.941)**
6	**0.656 (0.636 – 0.676)**	**0.851 (0.803 – 0.902)**
7	**0.611 (0.592 – 0.630)**	**0.833 (0.784 – 0.885)**
8	**0.585 (0.567 – 0.605)**	**0.762 (0.714 – 0.812)**
9	**0.534 (0.517 – 0.552)**	**0.827 (0.775 – 0.882)**
10	**0.471 (0.455 – 0.489)**	**0.715 (0.664 – 0.770)**
	2014	
IMD Decile	**Abortion rate ratio (CI)**	**Repeat abortion rate ratio (CI)**
1	1.000	1.000
2	**0.934 (0.910 – 0.958)**	1.002 (0.956 – 1.049)
3	**0.826 (0.804 – 0.848)**	0.960 (0.915 – 1.008)
4	**0.731 (0.711 – 0.752)**	**0.921 (0.874 – 0.970)**
5	**0.682 (0.662 – 0.702)**	**0.874 (0.827 – 0.924)**
6	**0.671 (0.651 – 0.692)**	**0.847 (0.799 – 0.898)**
7	**0.583 (0.565 – 0.602)**	**0.830 (0.780 – 0.883)**
8	**0.565 (0.547 – 0.584)**	**0.831 (0.780 – 0.885)**
9	**0.530 (0.512 – 0.548)**	**0.787 (0.735 – 0.841)**
10	**0.468 (0.451 – 0.485)**	**0.744 (0.691 – 0.801)**
	2015	
IMD Decile	**Abortion rate ratio (CI)**	**Repeat abortion rate ratio (CI)**
1	1.000	1.000
2	**0.940 (0.916 – 0.965)**	0.990 (0.944 – 1.038)
3	**0.823 (0.801 – 0.845)**	**0.934 (0.889 – 0.982)**
4	**0.736 (0.715 – 0.757)**	**0.884 (0.838 – 0.932)**
5	**0.694 (0.674 – 0.715)**	**0.849 (0.803 – 0.899)**
6	**0.665 (0.644 – 0.686)**	**0.841 (0.792 – 0.892)**
7	**0.616 (0.596 – 0.636)**	**0.793 (0.744 – 0.845)**
8	**0.569 (0.550 – 0.588)**	**0.796 (0.745 – 0.850)**
9	**0.537 (0.519 – 0.555)**	**0.777 (0.725 – 0.832)**
10	**0.466 (0.449 – 0.484)**	**0.721 (0.668 – 0.779)**

2016		
IMD Decile	**Abortion rate ratio (CI)**	**Repeat abortion rate ratio (CI)**
1	1.000	1.000
2	**0.923 (0.899 – 0.948)**	0.965 (0.919 – 1.013)
3	**0.830 (0.807 – 0.853)**	**0.931 (0.885 – 0.979)**
4	**0.743 (0.722 – 0.765)**	**0.889 (0.842 – 0.938)**
5	**0.692 (0.672 – 0.713)**	**0.854 (0.807 – 0.904)**
6	**0.631 (0.611 – 0.651)**	**0.817 (0.770 – 0.868)**
7	**0.585 (0.566 – 0.644)**	**0.774 (0.725 – 0.826)**
8	**0.569 (0.550 – 0.589)**	**0.806 (0.755 – 0.861)**
9	**0.542 (0.523 – 0.561)**	**0.726 (0.676 – 0.779)**
10	**0.454 (0.437 – 0.471)**	**0.679 (0.628 – 0.734)**
2017		
IMD Decile	**Abortion rate ratio (CI)**	**Repeat abortion rate ratio (CI)**
1	1.000	1.000
2	**0.923 (0.898 – 0.948)**	0.972 (0.926 – 1.021)
3	**0.827 (0.805 – 0.850)**	**0.941 (0.895 – 0.990)**
4	**0.726 (0.705 – 0.747)**	**0.872 (0.826 – 0.920)**
5	**0.690 (0.670 – 0.711)**	**0.863 (0.815 – 0.913)**
6	**0.636 (0.617 – 0.656)**	**0.828 (0.780 – 0.879)**
7	**0.604 (0.584 – 0.623)**	**0.798 (0.749 – 0.850)**
8	**0.573 (0.554 – 0.592)**	**0.803 (0.752 – 0.857)**
9	**0.548 (0.529 – 0.567)**	**0.763 (0.712 – 0.818)**
10	**0.426 (0.410 – 0.442)**	**0.664 (0.613 – 0.719)**
2018		
IMD Decile	**Abortion rate ratio (CI)**	**Repeat abortion rate ratio (CI)**
1	1.000	1.000
2	**0.906 (0.882 – 0.930)**	0.992 (0.945 – 1.042)
3	**0.804 (0.783 – 0.827)**	0.958 (0.911 – 1.008)
4	**0.737 (0.171 – 0.758)**	**0.898 (0.851 – 0.947)**
5	**0.676 (0.657 – 0.697)**	**0.903 (0.854 – 0.956)**
6	**0.626 (0.607 – 0.645)**	**0.848 (0.799 – 0.900)**
7	**0.583 (0.564 – 0.602)**	**0.812 (0.762 – 0.866)**
8	**0.585 (0.566 – 0.604)**	**0.835 (0.784 – 0.891)**
9	**0.547 (0.528 – 0.566)**	**0.826 (0.772 – 0.884)**
10	**0.437 (0.421 – 0.454)**	**0.742 (0.688 – 0.801)**
2019		
IMD Decile	**Abortion rate ratio (CI)**	**Repeat abortion rate ratio (CI)**
1	1.000	1.000
2	**0.901 (0.877 – 0.925)**	0.964 (0.919 – 1.011)
3	**0.804 (0.783 – 0.827)**	**0.927 (0.882 – 0.974)**
4	**0.724 (0.704 – 0.745)**	**0.885 (0.840 – 0.932)**
5	**0.668 (0.649 – 0.688)**	**0.853 (0.807 – 0.902)**
6	**0.621 (0.602 – 0.640)**	**0.827 (0.781 – 0.877)**
7	**0.579 (0.560 – 0.598)**	**0.836 (0.786 – 0.889)**
8	**0.592 (0.573 – 0.611)**	**0.807 (0.758 – 0.859)**
9	**0.566 (0.547 – 0.585)**	**0.780 (0.730 – 0.833)**
10	**0.440 (0.424 – 0.456)**	**0.688 (0.639 – 0.742)**

ABORTION RATES AND REPEAT ABORTION RATES IN ENGLAND BY ETHNICITY AMONG WOMEN BETWEEN THE AGES OF 16 AND 24 (2012 - 2019)

2012			
Ethnicity	Abortions	Repeat abortions	RAR
Asian Bangladeshi	610	185	303.279
Asian Indian	1594	387	242.785
Asian Pakistani	1257	341	271.281
Asian Chinese	803	176	219.178
Asian other	1842	543	294.788
Black African	3406	1232	361.715
Black Caribbean	1998	789	394.895
Black other	2151	847	393.770
White British	55155	15062	273.085
White Irish	312	71	227.564
White Other	4385	1015	231.471
2013			
Ethnicity	Abortions	Repeat abortions	RAR
Asian Bangladeshi	1225	362	295.510
Asian Indian	2981	730	244.884
Asian Pakistani	2453	660	269.058
Asian Chinese	1566	335	213.921
Asian other	3509	996	283.842
Black African	6623	2336	352.710
Black Caribbean	3993	1573	393.939
Black other	4327	1683	388.953
White British	108977	29580	271.433
White Irish	605	143	236.364
White Other	9030	2133	236.213
2014			
Ethnicity	Abortions	Repeat abortions	RAR
Asian Bangladeshi	573	168	293.194
Asian Indian	1313	339	258.187
Asian Pakistani	1148	331	288.328
Asian Chinese	697	121	173.601
Asian other	1543	461	298.769
Black African	3209	1109	345.591
Black Caribbean	1869	727	388.978
Black other	2205	872	395.465
White British	52333	14177	270.900
White Irish	260	66	253.846
White Other	4808	1120	232.945

Highest annual RAR

Lowest annual RAR

2015			
Ethnicity	Abortions	Repeat abortions	RAR
Asian Bangladeshi	621	184	296.296
Asian Indian	1149	273	237.598
Asian Pakistani	1170	345	294.872
Asian Chinese	643	104	161.742
Asian other	1456	365	250.687
Black African	3176	1017	320.214
Black Caribbean	1812	617	340.508
Black other	2209	794	359.439
White British	50815	13623	268.090
White Irish	328	65	198.171
White Other	4841	1154	238.380
2016			
Ethnicity	Abortions	Repeat abortions	RAR
Asian Bangladeshi	592	183	309.122
Asian Indian	1136	250	220.070
Asian Pakistani	1083	287	265.005
Asian Chinese	537	90	167.598
Asian other	1516	398	262.533
Black African	2968	978	329.515
Black Caribbean	1635	586	358.410
Black other	2225	771	346.517
White British	48612	13079	269.049
White Irish	404	94	232.673
White Other	4963	1180	237.759
2017			
Ethnicity	Abortions	Repeat abortions	RAR
Asian Bangladeshi	612	178	290.850
Asian Indian	1121	253	225.691
Asian Pakistani	1167	315	269.923
Asian Chinese	471	65	138.004
Asian other	1543	388	251.458
Black African	2928	929	317.281
Black Caribbean	1715	608	354.519
Black other	2643	903	341.657
White British	49869	13311	266.919
White Irish	441	109	247.166
White Other	5123	1177	229.748
2018			
Ethnicity	Abortions	Repeat abortions	RAR
Asian Bangladeshi	602	159	264.120
Asian Indian	1128	296	262.411
Asian Pakistani	1218	311	255.337
Asian Chinese	469	78	166.311
Asian other	1514	370	244.386
Black African	3048	948	311.024
Black Caribbean	1651	570	345.245
Black other	2529	875	345.987
White British	50385	13673	271.370
White Irish	436	99	227.064
White Other	5099	1188	232.987

Highest annual RAR

Lowest annual RAR

2019			
Ethnicity	Abortions	Repeat abortions	RAR
Asian Bangladeshi	649	193	297.381
Asian Indian	1140	279	244.737
Asian Pakistani	1303	357	273.983
Asian Chinese	448	64	142.857
Asian other	1752	470	268.265
Black African	3057	955	312.398
Black Caribbean	1592	601	377.513
Black other	2823	977	346.086
White British	50220	14161	281.979
White Irish	352	91	258.523
White Other	5123	1231	240.289

Highest annual RAR

Lowest annual RAR

Ratio of repeat abortion rates among women aged 16 – 24 in England by ethnicity (2012 - 2019)

2012	
Ethnicity	**Rate ratio (CI)**
Asian Bangladeshi	1.110 (0.960 – 1.283)
Asian Indian	**0.889 (0.804 – 0.983)**
Asian Pakistani	0.993 (0.892 – 1.106)
Asian Chinese	**0.803 (0.692 – 0.931)**
Asian other	1.079 (0.991 – 1.176)
Black African	**1.325 (1.250 – 1.404)**
Black Caribbean	**1.446 (1.344 – 1.553)**
Black other	**1.442 (1.344 – 1.545)**
White British	1.000
White Irish	0.810 (0.632 – 1.022)
White Other	**0.847 (0.795 – 0.903)**
2013	
Ethnicity	**Rate ratio (CI)**
Asian Bangladeshi	**1.089 (0.979 – 1.208)**
Asian Indian	**0.902 (0.837 – 0.971)**
Asian Pakistani	**0.991 (0.916 – 1.071)**
Asian Chinese	**0.788 (0.706 – 0.878)**
Asian other	**1.046 (0.981 – 1.114)**
Black African	**1.299 (1.245 – 1.355)**
Black Caribbean	**1.451 (1.379 – 1.527)**
Black other	**1.433 (1.363 – 1.505)**
White British	**1.000**
White Irish	**0.871 (0.734 – 1.026)**
White Other	**0.870 (0.832 – 0.909)**
2014	
Ethnicity	**Rate ratio (CI)**
Asian Bangladeshi	**1.082 (0.924 – 1.260)**
Asian Indian	**0.953 (0.853 – 1.061)**
Asian Pakistani	**1.064 (0.952 – 1.187)**
Asian Chinese	**0.640 (0.531 – 0.766)**
Asian other	**1.103 (1.003 – 1.210)**
Black African	**1.276 (1.199 – 1.356)**
Black Caribbean	**1.436 (1.331 – 1.547)**
Black other	**1.460 (1.362 – 1.563)**
White British	**1.000**
White Irish	**0.937 (0.724 – 1.193)**
White Other	**0.860 (0.808 – 0.914)**
2015	
Ethnicity	**Rate ratio (CI)**
Asian Bangladeshi	**1.105 (0.950 – 1.278)**
Asian Indian	**0.886 (0.783 – 0.999)**
Asian Pakistani	**1.100 (0.986 – 1.224)**
Asian Chinese	**0.603 (0.493 – 0.732)**
Asian other	**0.935 (0.840 – 1.038)**
Black African	**1.194 (1.120 – 1.273)**
Black Caribbean	**1.270 (1.170 – 1.377)**
Black other	**1.341 (1.247 – 1.440)**
White British	**1.000**
White Irish	**0.739 (0.570 – 0.943)**
White Other	**0.889 (0.837 – 0.944)**

Highest rate ratio   Reference   Lowest rate ratio

2016	
Ethnicity	**Rate ratio (CI)**
Asian Bangladeshi	**1.149 (0.988 – 1.329)**
Asian Indian	**0.818 (0.719 – 0.927)**
Asian Pakistani	**0.985 (0.873 – 1.107)**
Asian Chinese	**0.623 (0.501 – 0.766)**
Asian other	**0.976 (0.881 – 1.078)**
Black African	**1.225 (1.147 – 1.307)**
Black Caribbean	**1.332 1.224 – 1.447)**
Black other	**1.288 (1.196 – 1.384)**
White British	**1.000**
White Irish	**0.865 (0.698 – 1.059)**
White Other	**0.884 (0.832 – 0.938)**
2017	
Ethnicity	**Rate ratio (CI)**
Asian Bangladeshi	**1.090 (0.935 – 1.263)**
Asian Indian	**0.846 (0.744 – 0.958)**
Asian Pakistani	**1.011 (0.901 – 1.131)**
Asian Chinese	**0.517 (0.399 – 0.659)**
Asian other	**0.942 (0.849 – 1.042)**
Black African	**1.189 (1.111 – 1.271)**
Black Caribbean	**1.328 (1.222 – 1.441)**
Black other	**1.280 (1.195 – 1.369)**
White British	**1.000**
White Irish	**0.926 (0.760 – 1.118)**
White Other	**0.861 (0.810 – 0.914)**
2018	
Ethnicity	**Rate ratio (CI)**
Asian Bangladeshi	**0.973 (0.827 – 1.138)**
Asian Indian	**0.967 (0.859 – 1.085)**
Asian Pakistani	**0.941 (0.838 – 1.053)**
Asian Chinese	**0.613 (0.484 – 0.765)**
Asian other	**0.901 (0.810 – 0.999)**
Black African	**1.146 (1.072 – 1.224)**
Black Caribbean	**1.272 (1.168 – 1.384)**
Black other	**1.275 (1.189 – 1.365)**
White British	**1.000**
White Irish	**0.837 (0.680 – 1.019)**
White Other	**0.859 (0.808 – 0.911)**
2019	
Ethnicity	**Rate ratio (CI)**
Asian Bangladeshi	**1.055 (0.910 – 1.216)**
Asian Indian	**0.868 (0.768 – 0.977)**
Asian Pakistani	**0.972 (0.872 – 1.079)**
Asian Chinese	**0.507 (0.390 – 0.647)**
Asian other	**0.951 (0.866 – 1.043)**
Black African	**1.108 (1.037 – 1.183)**
Black Caribbean	**1.339 (1.232 – 1.458)**
Black other	**1.227 (1.149 – 1.310)**
White British	**1.000**
White Irish	**0.917 (0.738 – 1.126)**
White Other	**0.852 (0.803 – 0.903)**

Highest rate ratio   Reference   Lowest rate ratio