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Faculty of Social Sciences

School of Economic, Social and Political Sciences

An examination into the relationships between local area characteristics and teenage conceptions and abortions through the teenage fertility declines of the 2000s and 2010s in England

by

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Thesis for the degree of Doctor of Philosophy

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University of Southampton

Abstract

Faculty of Social Science

School of Economic, Social and Political Science

Doctor of Philosophy

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Katie L Heap

Fertility amongst those under the age of 18 has declined across England over the last two decades, halving between 2008 and 2017. Whilst all local authorities experienced a decline in their rates, levels of fertility and the speeds of decline have varied across the country. Policymakers have stressed the links between where young women live, their aspirations/expectations, and becoming a teenage mother. This research examines the relationships between where women live and teenage conception and abortion ratio trends in England throughout this period of decline.

The annual under-18 conception rates and abortion ratios for every Local Authority District (LAD) in England for 1998 to 2017 are linked to various LAD-level area characteristics to consider the relationships with area characteristics over time. A decomposition analysis quantifies the role of rising abortion ratios in the fertility decline. The Next Steps (NS) study of 14-year-olds in 2004 is linked to area characteristics; logistic regression analyses consider the relationships between area characteristics, educational expectations, and experiencing teenage conception.

Although changing abortion ratios contribute to less of the decline in teenage fertility between 1998 and 2005 compared to when fertility decline was much more rapid from 2005 to 2017, abortion ratios still play an important role in the decline. Area characteristics can explain a higher proportion of variation in conception rates and abortion ratios between areas compared to the relationships between changes in characteristics with conceptions and abortions over time. Using the NS study, the variation in teenage women reporting a conception due to area characteristics can be explained by individual- and family-level characteristics. Local educational deprivation is the most predictive area-level measure for experiencing a conception as a teenager.

This research highlights that, while teenage fertility has halved in England, certain area characteristics continue to be associated with local teenage conception rates, abortion ratios, and individual likelihoods of conceiving as a teenager. This research adds to the literature by including the rapid decline of the 2010s, examining newer or more detailed area measures beyond indexes, investigating abortion ratios, considering the relationships of educational expectations with area characteristics and teenage conceptions, and examining whether the associations between area characteristics and experiencing a teenage pregnancy can be explained by individual and family characteristics in a contemporary individual-level survey of teenagers in England.

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Research Thesis: Declaration of Authorship

KATIE LOUISE HEAP

An examination into the relationships between local area characteristics and teenage conceptions and abortions through the teenage fertility declines of the 2000s and 2010s in England

I declare that this thesis and the work presented in it are my own and has been generated by me as the result of my own original research.

I confirm that:

- This work was done wholly or mainly while in candidature for a research degree at this University;
- Where any part of this thesis has previously been submitted for a degree or any other qualification at this University or any other institution, this has been clearly stated;
- Where I have consulted the published work of others, this is always clearly attributed;
- Where I have quoted from the work of others, the source is always given. With the exception of such quotations, this thesis is entirely my own work;
- I have acknowledged all main sources of help;
- Where the thesis is based on work done by myself jointly with others, I have made clear exactly what was done by others and what I have contributed myself;

Chapters 3 and 5 are co-authored as Heap, Berrington, and Ingham due to the supervision received regarding these papers early in the postgraduate research process.

Chapters 4 and 6 are single authored as Heap.

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Definitions and Abbreviations

Abortion rate The number of abortions to women aged X in the population per 1,000 women aged X.

Abortion ratio The proportion of conceptions to women aged X resulting in abortions rather than births.

BAME Black and Minority Ethnic

Conception rate The number of pregnancies to women aged X in the population per 1,000 women aged X.

EC Emergency Contraception

Exosystem The area level such as the local neighbourhood.

Fertility rate The number of births to women aged X in the population per 1,000 women aged X.

GCSE General Certificate of Secondary Education – A GCSE pass is A* to C during this time period.

GPs General Practitioners.

KS1 Key Stage 1 – Educational stage which ends around age 7 (until school year 2).

KS2 Key Stage 2 – Educational stage from around age 7 until around age 11 (school years 3 to 6).

KS3 Key Stage 3 – Educational stage from around age 11 to around age 14 (school years 7 to 9).

KS4 Key Stage 4 – Educational stage from around age 14 to around 16 (school years 10 to 11), the end of which is traditionally marked by sitting GCSEs in England.

LAD Local Authority District

LARC Long Acting Reversible Contraception

LEA Local Education Authority

LMUP London Measure of Unplanned Pregnancy

LSOA Lower Super Output Area

Macrosystem Local norms, values, and beliefs.

MCS Millennium Cohort Study

Microsystem The sphere between the area- and individual-levels, such as families and schools.

Natsal National Survey of Sexual Attitudes and Lifestyles

NS Next Steps survey

NPD National Pupil Database

Ofsted Office for Standards in Education, Children's Services and Skills

ONS Office for National Statistics

RSE Relationships and Sex Education – RSE has become compulsory since 2020 in England.

SHHS Sexual Health and HIV Strategy

SRE Sex and Relationships Education – SRE was the name of such education until the new and compulsory curriculum was introduced in 2020 as RSE.

STI Sexually Transmitted Infection

TPS Teenage Pregnancy Strategy

Chapter 1 Introduction

Despite the postponement of childbearing to older ages (Billari et al., 2006) the United Kingdom has one of the highest rates of teenage fertility in the Western World, even with the halving of rates since the late 2000s (Sedgh et al., 2015). As teenagers begin to engage in sexual activity they become at risk of Sexually Transmitted Infections (STIs) and unplanned or unwanted pregnancies. Thus, it is important to understand trends in teenage sexual behaviour from a health perspective. Moreover, academic and policy interest in teenage fertility is often justified by associations between teenage fertility and 'negative outcomes' for both the mother and the child (Social Exclusion Unit, 1999). Infant mortality rates are higher in mothers under the age of 20 in England and Wales (Office for National Statistics, 2021). Being born to a teenage mother is found to be associated with certain early adult outcomes from having lower educational attainment, being economically inactive, and having low income in the UK (Francesconi, 2008). Children born to teenage mothers have higher psychological distresses, self-reported poor school performances, were more likely to report school suspension, and were more likely to report smoking and alcohol use (Shaw et al., 2006). It is important to note, however, that it is very difficult to isolate the causal effect of being a young mother on these outcomes.

First, there is selection into childbearing at early ages; young mothers are disproportionately drawn from socio-economically disadvantaged backgrounds. Therefore, any negative outcomes may well be the result of pre-existing factors rather than the teenage pregnancy itself (Squires et al., 2012). As posed by Geronimus (1991), reports of relationships between teenage parenthood and outcomes which do not consider socioeconomic backgrounds present associations that are 'distorted' and do not reflect reality. Indeed, the associations between having a mother who was a teenage parent and many outcomes were explained by socioeconomic characteristics in two studies by Francesconi (2008) and Shaw et al. (2006), and this is prevalent in a range of studies that continue to be reported (Squires et al., 2012). Second, qualitative work has repeatedly highlighted that teenage parenthood provides opportunities for 'meaning making' as described in Edin and Kafalas (2011). Some young women report that their early motherhood provided purpose and, therefore, encouraged more positive outcomes such as re-engagement with school (Anwar and Stanistreet, 2014). Irrespective of

whether teenage motherhood is associated with positive or negative outcomes, trends in teenage fertility are important to consider for policymaking so that services can empower teenagers to fulfil their fertility desires of seeking or avoiding teenage parenthood, and for projection and planning purposes.

In England, policy makers and official statistics have tended to focus on pregnancies (and births) to women under the age of 18. The reason under-18 is used for the English measures of teenage fertility is because the age 18 signifies adulthood in England when teenagers can legally vote, go to prison, buy alcohol, and get married without parental permission. As of 2013, the educational participation age in England was increased to 17 and so under-18 conception rates represent conceptions that could disrupt compulsory education and training. The participation age for education has been at 18 since 2015.

While the under-18 fertility rate in England has been declining since the 1990s, England has only experienced a rapid decline in under-18 fertility since the late 2000s (Office for National Statistics, 2019). In 1998, the under-18 fertility rate was around 27 per 1,000 women aged 15 to 17 and declined to around 21 in 2007: that represents around a 22 per cent decrease in nine years. These rates fell further to around 9 per 1,000 women aged 15 to 17 by 2017, meaning that the teenage fertility rate more than halved in a similar time scale of ten years. Whilst the decline in teenage fertility has been widespread across the country, the teenage fertility rate has traditionally varied across England by area. In 1998, the five Local Authority Districts (LADs) with the highest under-18 fertility rate all had rates above 50 per 1,000 women aged 15 to 17¹, whilst the LADs with the lowest rates were all below eight per 1,000²; in other words, teenage fertility rates varied by a factor of over six between LADs with the highest and lowest rates. While the absolute differences in teenage fertility rates have narrowed substantially as rates have lowered across the country, the percentage difference has widened. Since the

¹ The five LADS with the highest under-18 fertility rates in 1998 were: Kingston upon Hull, Hartlepool, Nottingham, Lincoln, and Corby.

² The five LADs with the lowest under-18 fertility rates in 1998 were: Uttlesford, South Hams, Rushcliffe, Chiltern, and Richmond upon Thames.

teenage fertility declines of the 2000s and 2010s, the top five³ under-18 fertility rates in 2017 were now at least 10 times the rates in the lowest five LADs⁴ (over 20 compared with below 2 per 1,000 women).

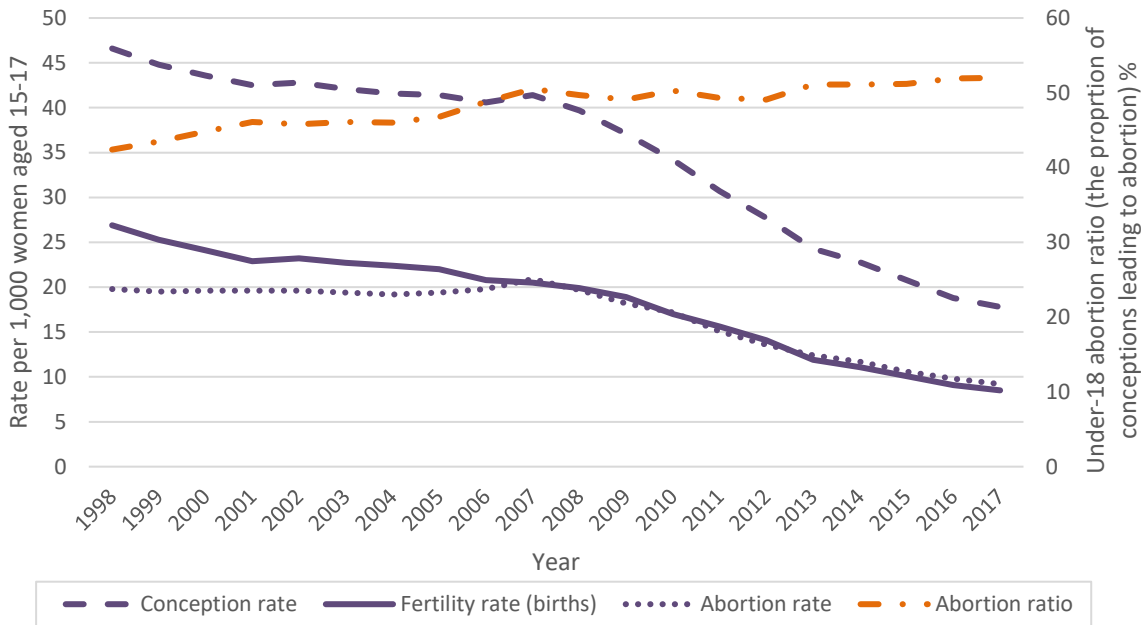
The teenage fertility rate is the result of a combination of measures that are presented in Figure 1.1. Firstly, fertility rates are determined by the level of pregnancies that occur, which is measured by the under-18 conception rate (number of pregnancies per 1,000 women aged 15-17). This thesis uses the terms 'teenage pregnancy' and 'teenage conception' interchangeably, along with using teenage 'fertility', teenage 'birth', and teenage 'motherhood' to share the same meaning. Unfortunately, England does not collect data to be able to report teenage fertility rates involving fathers who are below the age of 18. Secondly, the levels of these pregnancies which lead to teenage fertility through birth is governed by the proportion of those conceptions which result in births rather than abortions, which is determined by the abortion ratio or abortion proportion (the proportion of conceptions resulting in abortion). Two areas with the same teenage fertility rate may have contrasting conception rates if one has a higher proportion of conceptions leading to abortion. Sedgh et al. (2015) collated teenage fertility and abortion statistics for women below the age of 20 across the world for 2011. While countries like Denmark, the Netherlands, and Sweden had similarly low birth rates at around five per 1,000 women aged 15 to 19, such rates were low for Denmark and Sweden due to over 65 per cent of conceptions leading to abortion, while in the Netherlands the low fertility rates were driven by much lower conception rates. Compared to these three European countries with low fertility rates, according to figures from Sedgh et al. (2015), the higher fertility rate of England and Wales is explained by both the abortion ratio, that was much lower at around 42 per cent, alongside the much higher conception rate at around 47 per 1,000 women. Therefore, more women become

³ The five LADs with the highest under-18 fertility rates in 2017 were: Middlesbrough, Blackpool, North East Lincolnshire, Hartlepool, and Kingston upon Hull.

⁴ The five LADs with the lowest under-18 fertility rates in 2017 (not including those which were denoted as being unreliable in the initial dataset), were: Westminster, Wealden, Chiltern, Richmond upon Thames, and Windsor and Maidenhead.

pregnant before the age of 20 in England and Wales, and fewer of these pregnancies lead to abortion.

Figure 1.1 The under-18 fertility measures in England between 1998 and 2017



Source: Created by author using data from Office for National Statistics (2019)

The decline in under-18 fertility rates in England has been largely driven by the reduction in conception rates and both experienced a more rapid decline after 2007. However, while abortion proportions in England remain much lower than in other parts of Europe, rising proportions of conceptions resulting in abortion have contributed to the teenage fertility decline in the country. As illustrated in Figure 1.1, the fertility/birth rates of teenagers were higher than the abortion rate until 2007, at which point the rates of fertility and abortion were very similar; this situation remained until 2013 when the rate of abortions became higher than the fertility rate. The increase in the abortion ratio represents a move away from teenage parenthood at the time that fewer young women are experiencing conceptions. While conception rates declined in all local authorities in England, the extent to which the proportions of these conceptions result in abortion differed between local areas. For example, nine LADs had at least a doubling of under-18 abortion ratios between 1998 and 2017, over 50 experienced at least a 50 per cent

increase, whilst 61 of the 326 LADs experienced no change or declines in the ratios over the same time period. As of 2017, over half of all under-18 pregnancies resulted in abortion. The speeds of decline in under-18 fertility have also been heterogeneous throughout the country. Areas in Inner London had, on average, some of the highest teenage conception rates (and high abortion ratios) in 1998, but now have some of the lowest conception rates in the country (as presented later in the thesis in Figure 3.1). Under-18 abortion ratios were significantly higher in both Inner and Outer London in 1998 than the rest of England, and this has continued through the 2000s and 2010s as all regions have experienced rising abortion ratios (as presented later in the thesis in Figure 4.2).

The trends in teenage fertility measures vary by area, and the associations between the characteristics of the areas in which individuals reside and their behaviours have been the subject of research and theories for decades. One of the most widely used models is Bronfenbrenner's ecological systems theory, which examines the relationships between local area norms, area characteristics, social environments such as schools and families, and individual characteristics on development (Bronfenbrenner, 1979) (discussed further in Chapter 2). Another of the more frequently used theories is the Dahlgren-Whitehead 'rainbow' theory, developed in the 1990s, that is widely used in research to consider the role of the area on inequality in health outcomes (Dahlgren and Whitehead, 1991). This second model presents the interactions between socio-economic, cultural, and environmental conditions; living and working conditions; social and community networks; individual lifestyle factors; and age, sex and constitutional factors; on health outcomes and inequality. Indeed, the characteristics of areas where people live have been found to be associated with a range of health outcomes (Jivraj et al., 2020; Pérez et al., 2020; Pickett and Pearl, 2001) and relationships between the local area and experiencing fertility outcomes as teenagers have been established in both quantitative (Lupton and Kneale, 2010) and qualitative (Arai, 2007) studies in England.

The Teenage Pregnancy Strategy (TPS) was a ten-year national strategy which aimed to halve under-18 conception rates by 2010 (Hadley, Ingham and Chandra-Mouli, 2017)

and discussed further in section 2.3.2⁵. The strategy was implemented by the Teenage Pregnancy Unit and involved joined-up action at the national, regional, and local authority levels due to variation in rates across these geographies. The role of living in a disadvantaged area and having lower educational and career aspirations was stressed as one of the main mechanisms behind certain areas having higher under-18 fertility and conception rates in England (Social Exclusion Unit, 1999). A report by the Social Exclusion Unit presented arguments that ‘social exclusion’ was both a cause and consequence of teenage fertility and was used to shape the TPS, and this narrative of area and low expectations causing teenage fertility continued to be prevalent throughout local teenage pregnancy coordinators across England, even when faced with areas that did not fit this trend (Arai, 2003). Whilst this focus on area and expectations was tangible through policy, many of the studies about the relationships between area and teenage fertility do not include the mid- to late-2010s, which had the fastest declines. These studies considered such relationships at the ecological level (Girma and Paton, 2015; Humby, 2013; Uren et al., 2007), or employed qualitative methods (Arai, 2007; Tabberer et al., 2000). More recent studies have often used indexes of deprivation and area-level deprivation itself as overarching terms that can include a variety of types of area disadvantage, ranging from economic and educational disadvantage to physical barriers to services. Past research has used a variety of area characteristics to consider which aspect of deprivation is associated with under-18 conception rates, but these were conducted on trends in the 1990s (Bradshaw et al., 2005; Diamond et al., 1999). Limited studies have used individual-level data to consider the associations between area characteristics and experiencing teenage conception or motherhood. Whilst studies like Wellings et al. (2016) did consider the role of area amongst family and individual characteristics on teenage fertility, they employed just one index of deprivation rather than a variety of ecological measures. The only study in England that investigated the macro-micro interactions between area and personal disadvantage on experiencing a teenage conception was Crawford, Cribb, and Kelly (2013) but this used teenagers of the late 1980s and early 1990s. Therefore, the ways in which

⁵ The research described in this thesis does not evaluate the effect of the TPS on the teenage fertility decline but is interested in the links between where women live and their likelihoods of experiencing a teenage pregnancy and becoming a young mother.

these more specific ecological factors are explained by family and individual factors have not been studied much, if at all, since the declines in levels of teenage fertility.

The socioeconomic context in which young people grew up altered in England through the 2000s and 2010s from rising educational attainment (Department for Education, 2015) which varied by region (Greaves et al., 2014), rising participation in further and higher education (Universities UK, 2018), growing second- and third-generation ethnic minority teenage populations and fertility postponement among such ethnic groups (Berrington, 2020), the 2008 economic recession and accompanying youth unemployment, and the gentrification of areas across the country and particularly London (Waights, 2014; Yee and Dennett, 2020). Alongside the changes in the context in which young people live, teenage sexual behaviour has also been said to have altered in various ways during the 21st Century, and many of these changes have been proposed to be behind this rapid teenage pregnancy decline. Teenagers have been increasingly less likely to report traditionally 'risky' behaviours like consuming alcohol and/or drugs (Government Statistical Service, 2020) (discussed further in section 2.5.6). This avoidance of risk behaviours has been extrapolated to also propose that young people are also avoiding 'risky' sexual behaviours, by authors like Girma and Paton (2015, p.9), who noted that 'the evidence that risk-taking amongst young people has reduced over a number of dimensions (smoking, drinking and drug-taking) is suggestive of a more systematic shift in teenage behaviour'.

The rise in social media has coincided with teenage conception and fertility decline, as noted by Paton in *The Telegraph* (Bingham, 2016), yet this is not enough to conclude causation. The argument that is also made is that mobile phones and social media mean communication can now occur anywhere and everywhere and so replace face-to-face interactions and reduce the frequency of sex. However, studies have found that social media and the internet do have sexual uses in the form of finding and maintaining partners, even for teenagers (Amanda et al., 2015; Lenhart et al., 2015; Van Ouytsel et al., 2016). Vandenbosch and colleagues (2016) found that sexually inexperienced teenagers in Belgium who frequently used dating websites, chatrooms, or erotic contact websites were more likely to initiate sexual intercourse than their inexperienced counterparts who did not engage in these online behaviours. In a study of Dutch 16- to 19-year-olds, the only setting which teenagers noted that 'sexting' (sending sexually explicit messages or

images) would be used as a replacement for real-life sex was when moving to a long-distance relationship (Doornwaard et al., 2016) and teenagers in the UK reported that they pressured or were pressured to have certain sexual experiences while online (McGeeney and Hanson, 2017). Furthermore, Scott et al. (2020) found that teenagers in the 2010-12 wave were not significantly less likely to be engaging in sex than their 1999-2002 counterparts in the British National Survey of Sexual Attitudes and Lifestyles (Natsal) surveys. There was no significant difference in ever having sex or sexual frequency; however, it is not confirmed at the national level whether this sustained trend has continued for teenagers beyond 2012. Nonetheless, the trend of reduced teenage conceptions has been accompanied by growing rates of new STI diagnoses in 15-to-19-year-olds of symptomatic STIs like gonorrhoea and syphilis, with small declines of STIs such as chlamydia (Public Health England, 2019). Teenagers reported in Scott et al. (2020) were not significantly more likely to report using no method of contraception in the last six months in 2010-12 compared to 1999-01, but higher proportions of women reported the use of Long-Acting Reversible Contraception (LARCs) which suggests that teenagers are continuing to protect themselves from pregnancy but may be doing so through methods which allow STI transmission. The data around teenage sexual behaviour is limited in England and this is discussed further in section 2.6; however, these various trends do suggest that teenage sexual behaviour is continuing to occur - even though substance use has dropped and the way teenagers communicate has been transformed - but that this sexual activity is now less likely to result in a pregnancy.

1.1 The contributions and aims of this project

Most of the previous quantitative research on teenage motherhood falls into two relatively distinct types of study; one which views an individual – or family-level risk factors for individuals – to experience teenage fertility, conception or abortion, and the other that uses ecological approaches that consider how area characteristics are associated with aggregate levels of teenage fertility, conception or abortion within geographical areas. Arguably, there has been momentum for the latter type of study (ecological) due to the localised focus of the aims of the TPS on falling teenage conception rates (see section 2.3.2 for further discussion of the TPS). The research described in this

thesis includes both individual-level and ecological analysis and has four main aims. The research questions will be introduced in section 2.7, after the literature review.

The first aim is to broaden the teenage fertility literature beyond using just fertility rates and conception rates. This will be achieved by considering the role of abortion ratios alongside the more traditional measures of teenage pregnancy.

The second aim is to fill gaps in the literature by investigating the role of time in the teenage fertility rate decline. The under-18 fertility rate decline varied in speed between 1998 and 2017 and was more rapid after 2007. This research aims to consider whether the associations between area characteristics and measures of teenage conceptions and abortions continued across this time period of halving under-18 fertility rates. Considering the UK's ten-year national TPS, which aimed to half teenage pregnancy rates, there are surprisingly few studies that have examined how the relationships between area characteristics and teenage fertility measures have altered over time; even though rates have altered so drastically that the relationships may well have changed. This research, therefore, fills this gap in the literature by examining whether the effects of the relationships between area characteristics and the measures of teenage conceptions and abortion ratios increase, decrease, or remain unchanged over this extended time period of nearly two decades. Another aspect of the relationship between time and teenage fertility is whether changes in areas themselves over the years explain the variation in teenage fertility over time. Few studies have considered what area-level characteristic changes may be associated with higher *declines* throughout the last two decades. Even in these rare studies, such as Girma and Paton (2015), the most recent period of rapid fertility decline has not been included. This research quantifies how changes in area characteristics explain the specific changes in teenage conception rates and abortion ratio trends over time. The more detailed ways in which each chapter examines one or more of the aims of this research will be discussed.

The third aim of this research is to add to the body of knowledge about the associations between a variety of area characteristics and teenage fertility trends across England. The fertility trends are measured through under-18 conception rates, under-18 abortion ratios, and individual-level experiences of teenage conceptions. This research goes beyond other work by considering a broad range of area characteristics (over a relatively long time period). The associations between area deprivation and teenage

fertility and conception rates have traditionally been examined through indexes of deprivation (Bradshaw et al., 2005; Diamond et al., 1999; Humby, 2013) such as the IMD (Department for Communities and Local Government, 2015). The work included in this thesis uses specific measures rather than wide-ranging indexes. Not only does using specific area characteristics allow for audiences to be able to see which aspects of deprivation and area measures may be driving the associations between indexes and fertility, but they allow researchers to use more appropriate measures to the population of interest. This current research uses area characteristics that better represent the experiences of the cohorts of young people who would be contributing to the teenage fertility rates rather than measures based upon a wider population that may not be relevant to the lives of many teenagers.

The research also aims to examine a macro-micro perspective of the factors associated with teenage fertility. While ecological studies (at the area level) are limited to conclusions only at the area level, these relationships are vital for policymaking as they can identify why certain areas may have lower rates than others, and therefore those that warrant additional attention. Another motivation for these ecological studies is that neighbourhoods are often homogenous and there may be neighbourhood effects that explain the geographical variation in England's teenage fertility. This research considers whether a variety of specific area characteristics are associated with teenage pregnancy rates and abortion ratios at the area level, but then goes on to examine whether the area characteristics of where individual young women live are also associated with their reproductive behaviour. This research is, therefore, also able to consider whether these relationships between area characteristics and experiencing a pregnancy continue to be present in individual-level data whilst controlling for the family and individual socioeconomic characteristics of young women and their expectations of going on to higher education. The research also examines macro-micro interaction effects to consider whether the relationships between area-level characteristics and experiencing a teenage conception varies by the family-level equivalent measures (i.e., local income deprivation and family occupational class).

Understanding the decline in under-18 conception rates throughout England's local authorities between 1998 and 2017 (Chapter 3)

The relationships between area characteristics and under-18 conception rates have been considered across England and this part of the research examines under-18 conception rates by area and over time. While past works have quantified the associations between area characteristics (often deprivation) and under-18 conception rates, this part of the PhD research aims to fill some of the gaps in this area. Firstly, various aspects of deprivation and area characteristics are considered alongside teenage conception rates in this chapter. The area characteristics include whether a local authority is urban or rural, in London, the youth unemployment rate, the average educational attainment, the housing affordability, the stock of social housing, the ethnic composition of teenagers, and controls for TPS funding per head. Secondly, while teenage fertility has continued to decline much more rapidly since 2007 and through the 2010s, many similar studies do not include the mid to late 2010s and this paper includes every year between 1998 and 2017. Thirdly, while studies like Wellings et al. (2016) found that associations between living in an area in the most deprived quartile had less of a link with teenage pregnancy between two distinct cohorts of teenagers, the analysis in this chapter considers the time-varying associations between area characteristics and under-18 conception rates throughout 1998 and 2017 by interaction effects. Finally, few studies have considered what changes in area-level characteristics may be associated with higher conception rate *declines* over the last two decades and most do not include the most recent period of rapid fertility decline. Alongside modelling the changing associations between area characteristics and higher levels of teenage conception rates across England, this part of the research also considers how changes in area characteristics are associated with under-18 conception rate changes throughout 1998 to 2017.

Decomposing the teenage fertility decline: the contribution of the proportion of conceptions resulting in abortion to changes in fertility rates (Chapter 4)

As discussed, although the abortion ratios directly affect teenage fertility rates, these abortion ratios are often overlooked in analyses considering the decline in teenage fertility in the United Kingdom. Before going on to examine the associations between

area characteristics and under-18 abortion ratios, this part of the research quantifies the role that abortion ratio changes played in the under-18 fertility decline. To the author's knowledge, this has not been completed for England during the teenage fertility decline of the 2000s and 2010s. This research adds to the literature not just by using decomposition analysis to quantify the contribution of changing abortion ratios to teenage fertility rate changes across England, but by also considering this contribution for each period of the fertility decline. These periods follow the speeds of the fertility decline and the TPS stages. As under-18 conception rates and their trends varied by region and rurality between 1998 and 2017, the contribution of the under-18 abortion ratio change is also considered for each of the categories of these area characteristics.

Factors associated with teenage abortion ratios: the associations between local authority district characteristics and the proportions of teenage conceptions resulting in abortion in England, 1998 to 2017 (Chapter 5)

After examining the extent of the role that the under-18 abortion ratio change played in the teenage fertility declines of the 2000s and 2010s, this research then examines the relationship between area characteristics and the variation in under-18 abortion rates over time. The associations between area characteristics and under-18 abortion rates have rarely been examined in the past. This research adds to past works because they have often only examined the geographical variation in under-18 abortion ratios by indexes of area characteristics (Griffiths and Kirby, 2000) or have included limited time frames (Virgo and Sear, 2016) which do not include the expansive time period of teenage fertility decline between the late 1990s and 2010s. After investigating a wider range of area characteristics and finding associations with conception rates, this part of the study tests whether such characteristics also explains under-18 abortion ratio variations and whether such associations alter over time. This part of the research also follows the aim of the thesis that is concerned with the role of time by considering whether the changes in area characteristics throughout 1998 and 2017 explain the differences in under-18 abortion ratios across these years.

Neighbourhood characteristics, educational expectations, and teenage conceptions in England (Chapter 6)

This part of the research considers whether the associations between a wider range of area characteristics and teenage reproductive behaviour are also found at the individual level, particularly when controlling for family and individual characteristics. The author uses data linkage to study the Next Steps (NS) survey alongside handpicked area characteristics for where young women lived at age 14 (as reported in Chapter 6). The NS survey asks women if they have ever been pregnant at the wave at age 19 (the age at pregnancy is not collected). These data allow for an examination of whether area characteristics continue to be associated with experiencing a pregnancy before or at age 19 using individual rather than ecological data. This part of the research is also able to fill further gaps in the literature by controlling for whether a wide range of deprivation measures continue to be associated with experiencing a teenage conception when controlling for educational expectations, family characteristics, individual characteristics and individual behaviours. As discussed earlier in this introduction, local disadvantage has been said to manifest through lower educational and career expectations in the report which inspired the TPS (Social Exclusion Unit, 1999). However, previous research has not tested the associations between teenage educational expectations, the characteristics of where women live, and their likelihood of experiencing a teenage conception since the late 1990s. This research updates this area of research by using the Next Steps survey to include teenagers of the mid to late 2000s and a wider variety of area, family, and individual characteristics. Finally, the research examines four macro-micro interactions of whether the associations between area-level characteristics and experiencing a conception varies by the equivalent family-level measure of disadvantage. These interactions included LSOA income deprivation with family occupational class; LSOA educational deprivation with mother's highest qualification; LSOA educational deprivation and personal university expectations; and LAD prevalence of the population employed in mining, construction, and quarrying with family occupational class).

1.2 Outline of the thesis

This research has been prepared in the format of a multiple-paper thesis.

Chapter 2 introduces the conceptual framework that will be used in this thesis and the relevant literature for each of the components of this framework. This literature review, therefore, includes previously found exosystem/area-level, microsystem/family-level, and individual-level factors related to teenage fertility rates, conception rates, and abortions. Alongside this review of the literature, context about how these factors have altered throughout 1998 to 2017 (for example, the changing expectations of further and higher education) are discussed alongside the data limitations of measures that are pertinent to this research.

Chapter 3, the first empirical paper of the thesis, reports the geographical variation in the levels of and decline in under-18 conception rates. The associations between area characteristics of Local Authority Districts and under-18 conception rates are examined between 1998 and 2017. This paper also describes how these relationships between area and conception rates alter throughout the various speeds of teenage fertility declines using random effect models. Fixed effect models measure the associations between changes in area characteristics and the changes in under-18 conception rates over time. Chapter 3 includes a slightly adapted version of a paper that has been published in *Health & Place*, and related supplementary material has been included in Appendix A and Appendix B.

Chapter 4 is the second empirical paper of the thesis that considers the contribution of abortion ratios to teenage fertility decline between 1998 and 2017. This chapter first discusses the trends in abortion ratios, the theoretical reasons why abortion ratios should be included in more discussions about teenage fertility trends, and what the abortion ratio change represents. The chapter uses decomposition analysis to investigate whether the contribution of abortion ratio changes varies over time and by certain area characteristics.

Chapter 5 is the third empirical paper of this thesis and considers the associations between the characteristics of Local Authority Districts in England and under-18 abortion ratios. Like Chapter 3, this chapter uses random effect models to consider the associations between area characteristics throughout 1998 and 2017 alongside how these relationships may have altered through this period. This chapter then goes on to use fixed effect models to examine the relationships between changes in area characteristics and abortion ratios over time. Chapter 5 includes a paper that has been prepared for

submission to an epidemiological style journal; again, supplementary material has been included in Appendix A and Appendix C.

Chapter 6 is the final empirical paper of the thesis and describes the relationships between the characteristics of where young women live and their educational expectations on their likelihood of experiencing a conception as a teenager. This chapter uses a cohort of women aged 14 in 2004 from the Next Steps cohort study, which has been linked by the author to area characteristics. The author acknowledges that this empirical chapter is lengthy. The author would argue that it is important to first understand how area characteristics relate to educational expectations before moving on to examine the role of these factors on experiencing a teenage pregnancy. Supplementary material has been included in Appendix E.

Chapter 7 is the discussion chapter which brings together the findings from the various chapters of the thesis. This chapter presents the implications of these findings for research, data collection, and policy. It then goes on to present the limitations of the research alongside recommendations for future work.

1.3 Outputs

As mentioned, Chapter 3 has been published as Heap et al. (2020) in *Health & Place* and as a *Centre for Population Change*⁶ policy brief (Heap et al., 2020b). Preliminary findings from Chapter 3 around the associations between area characteristics and under-18 conception rates have been presented alongside the associations between area characteristics and abortion ratios from Chapter 5 at a variety of conferences and workshops: Association for Young Person's Health (AYPH) 2018 conference, European Population Conference (EPC) 2018, the British Society for Population Studies (BSPS) 2018 conference, the 3rd Human Fertility Database Symposium Wittgenstein Centre Conference 2018, and the Population Association of America (PAA) 2019 conference. More developed forms of the paper which would eventually form Chapter 4 (the

⁶ The policy brief was based on the work in the paper in *Health & Place* and received considerable edits by Becki Dey and Theresa McGowan of the Centre for Population team.

decomposition analysis of teenage fertility) and Chapter 5 (area composition associations with abortion ratios) were presented at the Popfest 2019 conference, and the British Society for Population Studies (BSPS) 2019 conference. Findings from chapters 3 and 5 were also used in the 2018-based national population projections by the Office for National Statistics (ONS) to help set fertility assumptions.

1.4 Personal commentary and reflection

This PhD was sparked by the question ‘why do some teenagers have a teenage pregnancy when others do not?’. I am a woman who grew up in a local authority that traditionally has had high teenage pregnancy rates, but I was a part of a cohort of teenagers in the late 2000s and very early 2010s which had lower rates than in the past. I found it fascinating how subgroups of my year from secondary school were starting to have children at 17 when no one attending my college or from my immediate friendship groups had. I wondered how different it may have been if we had been born 5 or 10 years earlier when teenage motherhood was more common or if we had lived in an entirely different area. I have therefore seen the interactions between area and family/individual characteristics on teenage fertility. I must, therefore, admit that my perspective on this area is perhaps not as objective as positivist research is generally supposed to be. I have seen many Facebook posts of loving mothers who had their children aged under-18 or slightly older. Yet, I have also been involved in conversations around the colossal fear of getting pregnant during our early to mid-twenties and have become close to people from areas where peers having children before the age of 25 is a rarity. My mother also grew up in the same city and used to note how she felt like ‘an old mum’ when she had her first and only child at age 30. Such reflection has made me very aware that I personally (and as a researcher) strongly wish to avoid contributing to any – conscious or unconscious – stigmatisation of any of the behaviours and choices that are associated with the areas of interest in this thesis.

This PhD has morphed alongside my interests in certain topics and methods, to equip me with the skills I need for the future. The initial proposition of this four-paper thesis was to, first, quantitatively consider the relationships between teenage childbearing and the characteristics of local areas, then to quantitatively investigate these associations at the individual level using data from teenagers who had conceived, and

finally to qualitatively explore how teenagers and those of older cohorts and practitioners view the processes behind local changes in teenage fertility.

Whilst the primary topic of the thesis has remained the same, all three of these initially proposed sections have adapted and developed. The first work around the associations between local area characteristics and teenage fertility rates expanded into two projects. Conception rates were considered instead of fertility rates, and then abortion ratios were considered separately as the work increasingly observed that the role of abortion was often overlooked in works around fertility declines. I concluded that the idea for the qualitative work in the initial proposal about asking directly about local changes in teenage fertility had limitations as it would collect *opinions* about the decline. Whilst this would be an interesting topic, I realised that the opinions around teenage fertility are not the main interest of this research and so it changed direction. In an ideal world, without recollection bias and recruitment restraints, I would have liked to interview women who had lived in high teenage fertility areas in the early 2000s alongside contemporary teenagers from such areas to consider why more women from these areas are now avoiding pregnancy. Instead, for a more achievable project, I then set about planning a qualitative study that would ask teenagers about their sexual behaviour and related issues from areas with differing teenage fertility rates, to enable speculation on how this may have altered over time. This qualitative research even reached the ethics submission phase. However, not only were these ideas too large to contain in one paper, it also increasingly felt as if my thesis was becoming separated into two distinctive parts. This culminated in the decision to replace these qualitative plans with those that use secondary individual-level data. This was very fortunate in the light of the impending pandemic.

I then investigated various surveys that could be used to consider teenage pregnancy in England and found that the Next Steps survey fitted relevant criteria. To consider the role of area, plans were made so that I could use a version of the Next Steps dataset which included the geographical location of the interviews but, to access this sensitive data, I needed to undergo a lengthy application process with the UK Data Service to use their remote secure lab. This process took a considerable amount of time and was then further drastically delayed by the pandemic. The pandemic meant that I needed to remotely access my university desktop which then ran the remote secure lab

software (technological issues were abundant and this again delayed progress when approval was needed to access the office to just turn the computer off and on again). The limitations with the secure lab environment also meant that, in hindsight, I would have liked to include other area measures to compare but have not been able to do so due to time constraints. I also limited the amount of macro-micro interactions (labelled as exosystem and microsystem variables in this thesis) I included in the analysis due to time and I instead focused on those directly related to educational expectations. I do acknowledge that, without the confines I set myself, this rich dataset that has emerged from linking the Next Steps survey with area characteristics and the aims of the final chapter could have grown into a separate thesis. Nonetheless, what has been done with this dataset has allowed this research to consider associations with area characteristics and teenage reproductive behaviour using individual data. This final chapter introduced me to many English surveys whilst I searched for an appropriate data source and taught me patience alongside an abundance of useful skills related to longitudinal analysis.

Chapter 2 A review of the factors associated with teenage fertility, conceptions, and abortions – with a focus on England

Due to the national policy focus on the decline in teenage pregnancy in England (Hadley, Ingham and Chandra-Mouli, 2017), it is unsurprising that literature examining the factors associated with teenage fertility in this part of the world were much more abundant in the early 2000s. Nonetheless, research around teenage fertility is wide ranging and encompasses a range of factors at the area, family, and individual levels. An exhaustive review of every studied determinant of teenage fertility is therefore beyond the constraints of this thesis and, in the process of completing this research towards a PhD, the author has created a conceptual framework of relevant factors associated with teenage fertility. Factors associated with teenage fertility that are included in the conceptual framework relate to the aims which revolve around the associations between area characteristics and teenage fertility. Family and individual characteristics have also been found to be factors and are included as they may explain such associations between area and fertility. The relationships between area characteristics and teenage fertility occur due to a variety of mechanisms. The simplest mechanism would be where relationships at the area-level may simply reflect the relationships at the individual level (i.e. areas with lower attainment are more likely to have higher teenage fertility as individuals with lower attainment are more likely to become teenage mothers). Conversely, area-level associations with teenage fertility may be capturing more complex mechanisms and may, alongside individual and family factors, work to influence the level of fertility indirectly. In consideration of these complex relationships, this chapter explores many of the mechanisms by which factors at many levels are related to teenage fertility.

This review of past works will follow the organisation of the conceptual framework shown in Figure 2.1. The factors associated with teenage fertility are grouped in the framework in a way that is inspired by the ecological systems theory in which Bronfenbrenner (1979) illustrated the importance of environment and social systems

Chapter 2

alongside individual factors for development. The aspects of the ecological systems theory that are used in this review and the conceptual framework for this thesis are:

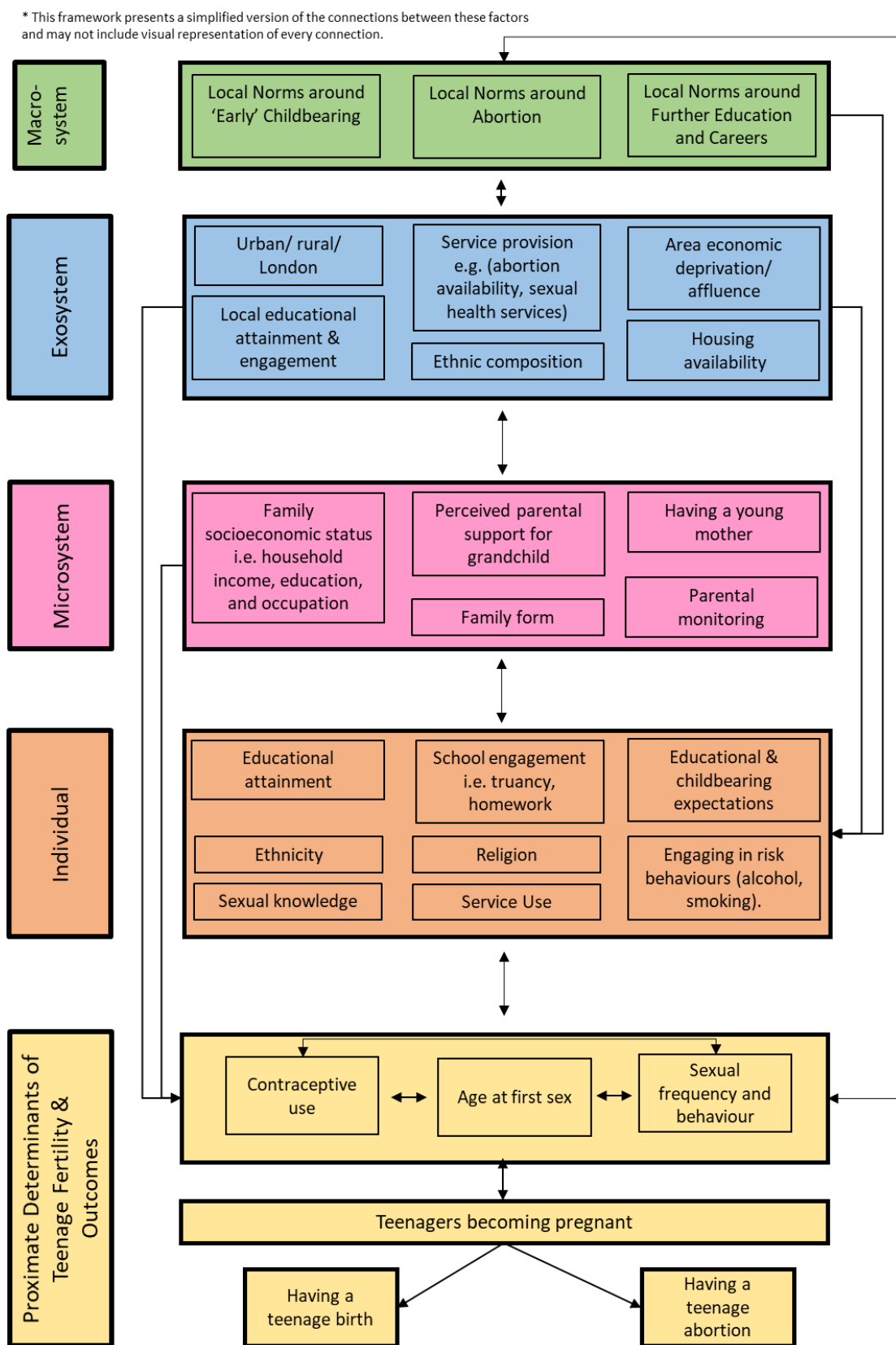
macrosystem factors which are the values and beliefs in areas such as local norms around childbearing, aspirations, and abortions,

exosystem factors which are the local factors – i.e. the neighbourhood, such as the characteristics of the local area, like levels of deprivation,

microsystem factors consisting of the connections with people in the immediate sphere such as in families and schools, and so includes measures like household income and parental education.

Alongside these aspects of the ecological system, the conceptual framework for the research described in this thesis also considers **individual** level factors like ethnicity, and the **proximate determinants** of conceptions which are inspired by Bongaarts' proximate determinants of fertility (1978). The proximate determinants of fertility consist of various indices which can collectively calculate the total fertility rate. The basic model by Bongaarts (1978) included the index of marriage, index of contraception, index of lactational infecundability, index of abortion, index of pathological sterility, and total fecundity. The proportion married was chosen to represent the population at risk of conceiving (through the past assumption that sex only occurred in marriage) and so, for contemporary fertility, we consider whether our teenage population of interest are engaging in sex. Teenage conception is determined by the prevalence of teenage women engaging in sexual intercourse, their use of contraceptives; with teenage fertility then being determined by the frequency of abortion. Therefore, the macrosystem, exosystem, microsystem, and individual factors associated with teenage fertility must operationalise through variation in these sexual/reproductive behaviours and this chapter examines these variations where relevant.

Figure 2.1 The conceptual framework of the factors associated with teenage fertility that are the basis of this thesis



Chapter 2

This research, and therefore this whole thesis, focuses only on the women involved in teenage pregnancy, for multiple reasons. Firstly, the partners of the women who become pregnant as teenagers may not be teenagers themselves. Data that measure teenage motherhood in an area may not represent the prevalence of teenage fatherhood and rates of teenage fatherhood are unknown. Secondly, the partners of the women who become pregnant as teenagers have been found to have various levels of involvement, particularly in terms of pregnancy planning and decisions post-pregnancy. In a qualitative study of women who reported that their teenage pregnancy was 'planned' (Coleman and Cater, 2006), the contribution of the partner varied from high involvement to women going ahead with attempts to conceive without discussion with their partner or against the partner's expressed wishes of not wanting a baby. The author of this thesis acknowledges that, while teenage pregnancy literature is very female based, the role of partners in teenage fertility trends is an important area that has not been able to be examined in this research and subsequent conceptual framework.

It is important to acknowledge, before delving into the research about the factors associated with teenage fertility, that teenage pregnancy planning is rather more complex than a simple process of being planned or unplanned. Planning a pregnancy is multifaceted at any age, as noted by Barrett, Smith and Wellings (2004), and is better represented as falling along a continuum. The London Measure of Unplanned Pregnancy (LMUP) was created using qualitative findings from a range of pregnant and non-pregnant women and represents multiple aspects of planning a pregnancy '(1) expressed intentions; (2) desire for motherhood; (3) contraceptive use; (4) pre-conceptual preparations; (5) personal circumstances/timing; and (6) partner influences' (Barrett et al., 2004). Although some teenagers do actively plan their pregnancies in England, as viewed in the qualitative work by Coleman and Cater (2006), the prevalence of teenage births which were actively 'planned' across the country is unknown. The proportion of teenage conceptions which end in abortion may represent how prevalent unplanned pregnancies are in areas if we assume these pregnancies are more likely to end in abortion. However, abortion ratios still do not measure the planned nature of the conceptions which end in births. The interpretations of abortion ratios are examined further in Chapter 4. 'Unplanned' pregnancy is more common at younger ages such as in 16-to-19-year-olds and, in Natsal 3 in 2010-2012, this age group reported the highest proportion of pregnancies that were 'unplanned' (Wellings et al., 2013). Of the 97 women

who had become pregnant as teenagers in Wiggins et al. (2005), 88 per cent reflected that their pregnancy was 'unplanned', compared to 50 per cent of the 300 plus pregnancies to women aged 20 or over at pregnancy.

One of the main aspects of pregnancy planning in the LMUP is contraceptive use (Barrett et al., 2004), but studies have found that many teenage women who conceive are using contraception of some kind around the time of becoming pregnant. Most of the studies which asked about contraceptive use at the time of the conception involved women who had been using the pill (with some citing method failure due to antibiotics and other reasons) (Arai, 2003; Brown and Guthrie, 2010; Tabberer et al., 2000; Wiggins et al., 2005). Alongside potential gaps in knowledge around contraceptive failure, another common theme is that teenagers who go on to become pregnant have also been found to be unaware of their ability to get pregnant. Teenage women have been found to have assumed that their ability to conceive is low because, having earlier expected that getting pregnant is easy when they had had unprotected sex and did not get pregnant, they were led to believe that they may be infertile (Hoggart and Phillips, 2011; Tabberer et al., 2000). A general suspicion of infertility also emerged as a reason for not using contraception and then experiencing a teenage pregnancy (Coleman and Cater, 2006).

Teenage women are also sometimes unclear about their own motivations around getting pregnant. A study by Wiggins and colleagues (2005) found that, although some women did not actively 'try' for a baby, they said that, on reflection, they had wanted a baby even if this may have been 'unconscious' at the time of conception. This complex motivation is also illustrated in the finding that ambivalence to pregnancy is related to contraceptive use and pregnancy amongst those aged 15 to 19 in the US (Brückner et al., 2004). Teenagers may not clearly want, or not want, a child; many studies are not able to capture this level of complexity, which needs to be kept in mind.

As discussed, this review will follow the organisation of the conceptual framework. This review of the literature, therefore, first examines the established links between macrosystem characteristics such as area norms and teenage reproductive behaviour. The associations between exosystem factors and teenage reproductive behaviour will be discussed, involving living in an urban or rural area, local sexual health services, area economic deprivation, local educational attainment, ethnic composition, and housing availability. The relationships between microsystem family factors and teenage

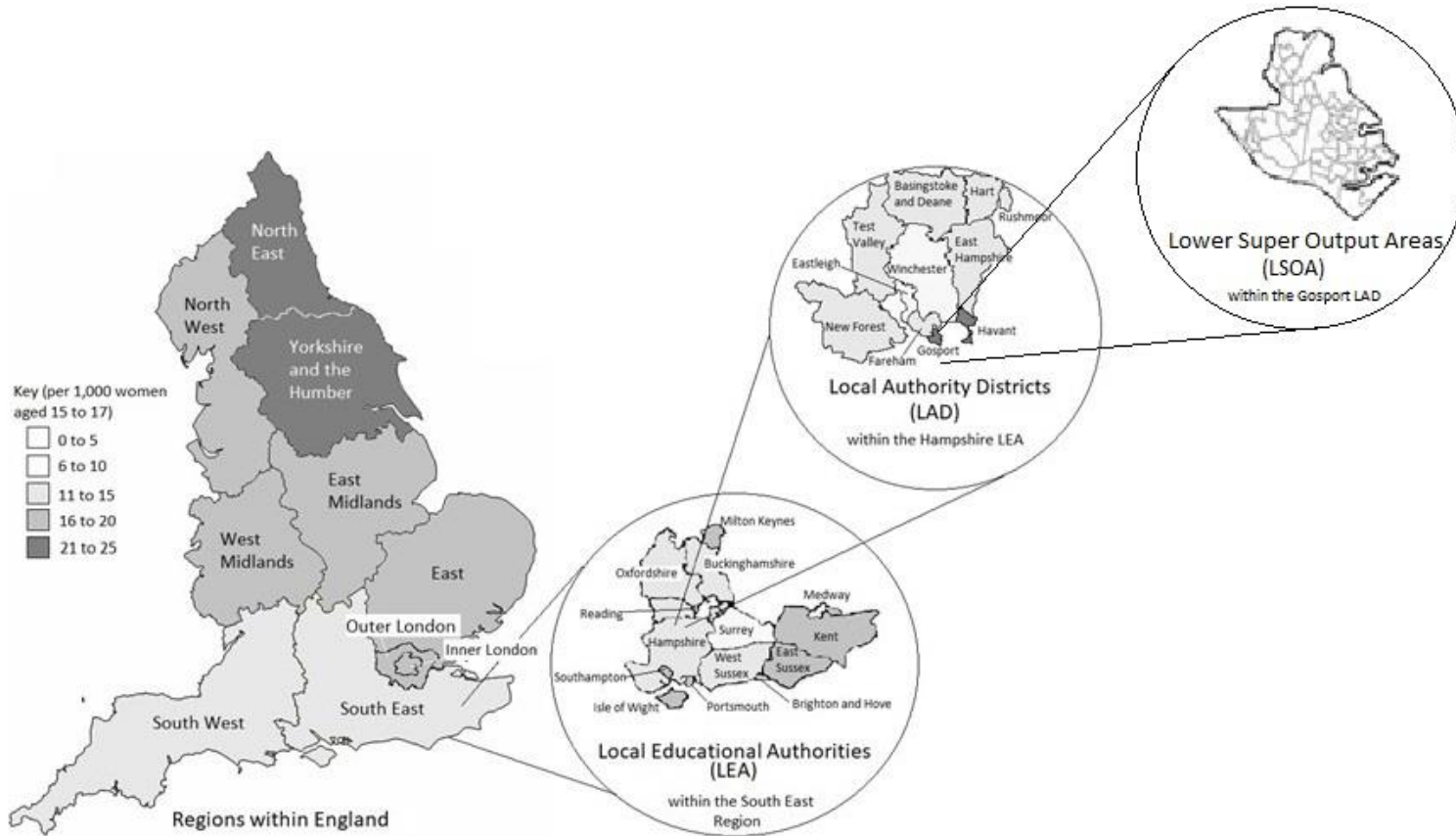
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reproductive behaviour involve family socioeconomic status, perceived parental support, having a young mother, family form, and parental monitoring. The relationships between individual characteristics and teenage fertility will be summarised, involving educational attainment, school engagement, educational and childbearing expectations, ethnicity, religion, engaging in substance use, and knowledge around sex. Finally, the proximate determinants of pregnancy will be discussed such as contraceptive use, age at first sex, and teenage sexual behaviour in England.

2.1 The geographies of English official statistics

England has various geographical hierarchies, including administrative geographies which include local governmental geographies, electoral geographies, census geographies, geographies related to health authorities, and geographies related to educational authorities. The analyses reported in this thesis use the administrative geography of the Local Authority District, the educational geography of the Local Education Authority, and the census geography of Super Output Areas (presented in Figure 2.2).

Figure 2.2 - A map of England showing hierarchy of the statistical geographies with the under-18 conception rate in 2017



(Figure was created by the author using shape files from the ONS Open Geography Portal)

Regions

All of England's geographies fit into nine regions: North East, North West, Yorkshire and the Humber, West Midlands, East Midlands, East, South East, South West, and London (including Inner London and Outer London).

Local Education Authorities (LEA)

Many explanatory variables related to teenagers are unsurprisingly measured by schools at the Local Education Authority level, the 152 local councils which have the educational responsibilities for the area, as they revolve around schools which include important data about pupils. LEAs have been disused as a formal geography since 2004 when their powers were transferred elsewhere; however, this geography is often utilised for comparison purposes and to highlight local authorities with this educational responsibility.

Local Authority Districts (LAD)

Teenage conception statistics for England are publicly available for Local Authority Districts⁷. These 326 LADs consist of 55 Unitary Authorities, 36 Metropolitan Districts, 201 Non-Metropolitan Districts, 32 London Boroughs, and the Isle of Scilly and the City of London which are often merged with Cornwall and Hackney respectively due to small populations. LADs therefore often represent individual cities or clusters of other areas and, as illustrated in Figure 2.2, roughly fit into Local Education Authorities and therefore regions.

⁷ Ward-level data were obtained but could not be utilised in these analyses due to high levels of suppression due to low counts in many wards.

Output Areas (OA)

The UK census is conducted every ten years with the most recent in 2011 and 2001. Output Areas were created to report small area statistics and, for 2001, consisted of over 170,000 Output Areas with most of these areas representing between 110 and 139 households. Super Output Areas (SOAs) were created from the 2001 census to represent slightly larger areas and there were over 6,700 Middle Super Output Areas (MSOAs) and 32,000 Lower Super Output Areas (LSOAs) in England. The 2001 LSOA census geography is used for the analysis in Chapter 6 (as the dataset is from 2004) and links individual-level survey data to the data about the characteristics of areas by using LSOAs codes.

2.2 Macrosystem factors associated with teenage fertility, conceptions, and abortion

2.2.1 The relationships between local norms and teenage reproductive behaviour

Area norms around teenage childbearing relate to the normality of teenage motherhood within the individuals in the community. Young women who ‘planned’ their pregnancies were interviewed in Coleman and Cater (2006, p. 602) and many of the women reported that they were ‘surrounded by a norm of settling down early. Therefore, for most, becoming pregnant appeared to be normal’. Focus group interviews with 15-year-olds in Scotland found contrasting themes around norms about teenage motherhood between young women from schools in less affluent areas compared to the schools in a more affluent area (Turner, 2004). These norms around early parenthood may relate to other norms around the importance of education and establishing careers and the timing of other life events. Not only does the wider environment relate to teenage motherhood but experiencing a teenage birth has also been found to be more likely in teenagers who have a mother who had a child as a teenager, and this is discussed in more detail in section 2.4.3.

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While young women may know/see young mothers in their local area and have discussions about young parenthood which reinforce norms for or against young childbearing, young women are less likely to have direct discussions about abortion in families or amongst friends (Tabberer et al., 2000). Tabberer and colleagues found that young women in areas where early childbearing is socially accepted have a difficult choice between the options of the more discussed and accepted motherhood and an abortion which is relatively unknown to them. In contrast, young women in areas where young motherhood is less accepted have to decide between two relatively unknown outcomes of motherhood and abortion. Young women in areas of high teenage fertility may not have examples of someone who has opted for an abortion but can see women who have gone on to teenage motherhood, and such women may even include their own mothers. Young mothers often cite anti-abortion views as reasons for their motherhood (Coleman and Cater, 2006; Greene, 2006; Hoggart, 2012; Lee et al., 2004); however, it is difficult to know whether these feelings are presented because they can be used as justifications for continuing a pregnancy rather than actual anti-abortion sentiments.

Although direct discussions around abortion may be unusual, areas *do* have pervasive norms around abortion which may influence the behaviours of young women. A study of four local authorities in London found that young women in the more affluent areas were more likely to have positive views on abortion (Smith and Roberts, 2009). Focus groups with teenagers found that young women from a more affluent school were more likely to view abortion as acceptable, whilst women in the two other schools which were in less affluent areas were less likely to report abortion acceptability (Turner, 2004). Concern around peers finding out about abortion were reported in qualitative research by Tabberer et al. (2000) and Hoggart et al. (2010), which highlights that, although discussions around abortion are uncommon, young women still feel the weight of the stigma which accompanies abortion.

2.3 Exosystem factors associated with teenage fertility, conceptions, and abortion

This section will summarise the exosystem/area-level factors behind teenage fertility. It is important to explain the limitations of ecological research before examining the findings in this section. Ecological research considers the associations between area-level characteristics and particular outcomes. The ecological fallacy is a fallacy of using conclusions at the group-level to incorrectly infer relationships at the individual-level (Sedgwick, 2015). Relationships at the area-level do not mean that individuals with those characteristics have the same relationships with the outcome. This does not mean that ecological studies do not have their own contributions, but that interpretations cannot generalise beyond what these studies measure.

Although there is substantial research which considers the associations between area characteristics and teenage reproductive behaviours, very few consider whether the changes in areas explain the change in fertility measures. The gentrification of certain areas is one of the mechanisms behind why areas have changed between the 2000s and 2010s. However, gentrification itself is a complex process to measure. Gentrification in England has been mapped by Waights (2014) for the 1990s and 2000s in London but also in areas like Manchester, Birmingham, and Newcastle Upon Tyne, while Yee and Dennett (2020) mapped London's gentrification patterns around 2011. While these two papers attempted to create composite measures of gentrification, both had to use a variety of measures which captured changes in housing, planning permissions, un/employment, non-UK born populations, population churn, relationship status, children, and population density.

2.3.1 The associations between living in an urban or rural area and teenage reproductive behaviour

Urban areas have consistently had higher teenage fertility and conception rates in England which, as discussed by Humby (2013), can be seen when just looking at the breakdown of rates across the country. Humby (2013) found that the urban/rural ONS

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variable explained for around 20 per cent of the variation in under-18 conception rates in 2008 to 2010, and also found that population density variation explained a similar level of the differences in conceptions. Bradshaw et al. (2005) found that areas with poorer access to services had lower under-18 conception rates in the 1990s and concluded that access in their study was acting as a proxy for rurality. Diamond et al. (1999) considered the associations between area deprivation and under-18 conception rates in rural versus non-rural wards in the south of England. This study found that measures of deprivation have varying relationships with conception rates by whether areas are urban or rural and found that the effect of services were lower in rural areas as there was an overall lack of services in these rural areas. Qualitative studies have found that the level of rurality plays a part in young people's paths to teenage motherhood. Young mothers in rural locations with physical barriers to services and opportunities stated that they had limited life options due to these restrictive or limited opportunities (Coleman and Cater, 2006). These young women from rural locations had issues due to needing to travel to college or for jobs, and so they felt as if they had limited 'purpose' in their lives which would be provided by the role of being a teenage mother. Nonetheless, it is interesting to note that while quantitative ecological studies found that rural teenage conception rates were lower, accounts from young women report that certain types of rurality may explain an opposite association.

2.3.2 The relationships between services and teenage fertility behaviours

The 2000s introduced two national strategies which were relevant for teenage reproductive behaviour. First, the Sexual Health and HIV Strategy (SHHS) was introduced in 2001 (Adler et al., 2002) to improve and join-up sexual health services (such as HIV and STI treatment and prevention, contraception access and knowledge, abortion access and knowledge, and access to services to relating to psychosexual problems) to improve access across all ages. Second, although this research is not focused on investigating the impact of the Teenage Pregnancy Strategy (TPS), it is important to understand the strategy for insight into the service and behaviour changes relevant to teenage pregnancy throughout the 2000s and 2010s. The 10-year governmental TPS aimed to halve under-18

pregnancy rates by 2010 and was implemented throughout the whole of England (Hadley, Ingham and Chandra-Mouli, 2017). The strategy involved uniting national and local efforts to engage in actions to improve the prevention of teenage pregnancy through higher access to contraception and improved sex and relationships education, and campaigns for teenagers and parents (Hadley, Ingham and Chandra-Mouli, 2017). A Teenage Pregnancy Strategy Unit was created in the early 2000s to lead the implementation of the strategy with local Teenage Pregnancy Coordinators and local Teenage Pregnancy Partnership Boards throughout the country. A parallel target was to support those teenagers who chose to go ahead with their pregnancy; for example, the Care to Learn programme provided financial support to young mothers to enable continuing engagement in education if they wished.

Each of these local areas in England, along with a dedicated Teenage Pregnancy Coordinator, also received funding grants to assist in their efforts to support the strategy. Areas with higher initial levels of under-18 pregnancy rates, or higher numbers of teenagers, received higher amounts of TPS funding grants (Hadley, Ingham and Chandra-Mouli, 2017). Further funding was provided for high pregnancy rate areas that had slower declines in the first half of the TPS after the mid-course review (Hadley, Ingham and Chandra-Mouli, 2017). The TPS funding that areas received has been considered in terms of the decline in teenage pregnancy rates. Baxter et al. (2021) considered the role of the TPS in the teenage conception rate decline by comparing England to European and English-speaking high-income countries (including Wales and Scotland). This study concluded that, as the comparative countries also experienced declines, the TPS had little to no effect, as the other countries experienced a decline without a national strategy. However, while countries like Scotland may not have had a dedicated strategy during the time of the TPS (a ten-year strategy for Scotland has since started in 2016 (The Scottish Government, 2016)), Scotland did have a national *target* to reduce the under-16 pregnancy rate by 20 per cent between 1995 and 2010 (Information Services Division, 2010). Previous studies have found that areas within England that received more TPS funding experienced higher declines in under-18 pregnancy rates (Wilkinson et al., 2006; Paton and Wright, 2017; Wellings et al., 2019). However, as noted by Paton and Wright (2017), interpretation of this relationship is difficult as the funding was higher in areas

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which had further to fall, and the funding ring-fence was removed in 2008/9. This removal of the ring-fence occurred just prior to the growth in the speed of the decline between 2010 and 2017, and due to the removal of the ring fence it is not known how much each area still dedicated these funds to teenage pregnancy related initiatives, nor the extent to which local attitudes, funding, and focus remained after the end of the official period of the strategy itself.

The efforts of the TPS were adapted for each specific area by the local TPS coordinator and, due to this, the way that each area utilised this funding varied (Paton and Wright, 2017) which means that the simple measure of funding received could be deceptive. Two past works by Wilkinson et al. (2006) and French et al. (2007) attempted to quantify the quality of the implementation through 'effort scores' that were created from the panel assessments of the Teenage Pregnancy Partnership Board reports. These empirical measures of the efforts of local implementation are arguably the best way that previous work has assessed the impact of the TPS, yet the Teenage Pregnancy Strategy Unit was discontinued with a change in government and such rich sources of information around the local efforts have been lost.

The TPS and the SHHS prompted a rise in young person specific sexual health services to encourage young person engagement. During this time, the supply of services increased alongside encouragements to increase the demand of services through improvements in sexual knowledge, which is discussed in section 2.5.7. The number of young person specific clinic sessions held by NHS community contraceptive clinics in England rose from around 20,000 in 1997/98 pre-TPS to around 55,000 in 2009/10 at the end of the TPS (The Health and Social Care Information Centre, 2011). Unfortunately, how under-25 clinic session data are collected has changed since 2010/11 and so only clinic data for all ages are available for more recent years, which is a less helpful measure for the context of teenagers (Government Statistical Service, 2019a). A higher proportion of teenage women aged 16 to 17 used sexual and reproductive health services in 2017/18 compared to those aged 13 to 15 (Government Statistical Service, 2019a). Sexual and reproductive health service use as a percent of the resident population was greatest in women aged 16 to 17 in the North West at 21 per cent, then Yorkshire and the Humber

(13%), the North East (12%), and London (10%), with the lowest prevalence in the East of England (7%).

2.3.3 The relationships between area economic deprivation and teenage fertility behaviours

The associations between exosystem/area-level factors and teenage conception and fertility rates have more commonly been examined with measures of local deprivation. Past literature has often used indexes of deprivation to capture area characteristics and their relationships with teenage fertility or conception rates, particularly indexes measuring area deprivation (Conrad, 2012; Humby, 2013; Uren et al., 2007). Bradshaw et al. (2005) and Diamond et al. (1999) widened the literature by considering the associations between more specific measures of deprivation and under-18 conception rates in England; however, these studies considered trends in the 1990s. Nonetheless, Bradshaw and colleagues (2005, p.17) found that the child poverty score and the income deprivation score had the highest positive correlations with LAD-level under-18 conception rates, which sat over 0.86 in 1994 to 1996 and over 0.83 in 1997 to 1999. The employment score had a slightly lower positive correlation with under-18 conception rates at 0.80 in 1994 to 1996 and 0.65 in 1997 to 1999. Diamond and colleagues (1999) were interested in whether different measures of area deprivation are associated with teenage conceptions in urban versus rural wards. While the proportion of children under 5 and local non-car ownership explained conception rates in urban and rural areas, the percentage of 17-year-olds not in full-time education and population mobility only predicted conception rates in urban wards, whilst overcrowding and a lack of basic amenities only predicted conception rates in rural wards. Both studies highlight that certain aspects of deprivation are better predictors of under-18 conception rates than others. More contemporary research has found that under-20 female unemployment rates were associated with under-18 conception rates from 2004 to 2012 (Girma and Paton, 2015).

Fewer studies have considered the associations between living in a more deprived area and individual experiences of teenage conceptions and pregnancies. Nevertheless,

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Wellings et al. (2016) found that young women living in an area of higher deprivation, measured through quartiles of IMD, were more likely to report experiencing a pregnancy before the age of 18 in Natsal. McCall et al. (2015) considered which measure of deprivation predicted pregnancy in women before the age of 20 using register data in Scotland between 1950 and 2010 and found that the Scottish Index of Multiple Deprivation explained more variation than the Carstairs index or family-level social class based on occupation. Qualitative works, like that by Arai (2003) and Tabberer et al. (2000), found common narratives of teenage pregnancy being a natural pathway to take in areas with lower prospects. The area of this latter study had experienced economic decline due to a reduction in the mining industry, and teenagers reflected on this as the reason for teenage pregnancy. While this is an interesting finding, it is important to keep in mind that these are the opinions of teenagers about local behaviours rather than accounts from teenage mothers themselves and so could be subject to stereotype. Indeed, the influence of area on opportunities and teenage pregnancy are complex. Qualitative interviews by Arai (2003) found that while local teenage pregnancy coordinators focus on disadvantage as a factor for teenage motherhood, young mothers themselves do not cite their families or communities being more disadvantaged as factors behind teenage pregnancy. However, when asked specifically about structural factors, many of these women reported that they were relatively less affluent. Although the link between living in a deprived area and high local conception and fertility rates are established, and that this is a pervasive narrative by policymakers, these relationships may occur through mechanisms like varying sexual behaviours, which mean that young women do not observe this link between area deprivation and teenage motherhood.

Another measure that is related to area deprivation is the area classification grouping, which is an output of the census by the Office for National Statistics. Area classifications group areas by the demographic, education, and employment characteristics the residents in the area have, alongside the services, employment sectors, and housing quality in the area (Office for National Statistics, 2018). The area classifications differ from the IMD by including more context as areas are grouped according to their deprivation *alongside* features such as having a past or present in mining, or whether it is a seaside town. Area classifications have rarely been used to

consider under-18 conception rates, and the most comprehensive study was by Wood (1996) who considered the age-specific conception rates by area classifications in 1993. Although Humby (2013) did not specifically use the area classification measure, this research found that seaside towns, major urban areas, and the north of England were overrepresented in the highest rates of under-18 conception rates in local authorities between 2008 and 2010. The ONS area classification was also found by Lee et al. (2004) to be associated with proportions of conceptions resulting in abortion in England in 1997 to 1999. In this research, local authorities classified as 'mining, manufacturing, and industrial areas' had lower proportions of conceptions resulting in abortion, which is consistent with Griffiths and Kirby's (2000) findings in the early- to mid-1990s. For Inner London in Lee et al. (2004), area classification was consistent in predicting teenage abortion ratios even after controlling for deprivation through the percentage of family credit claimants per area, suggesting that area classifications do indeed capture context beyond deprivation.

While the relationships between area characteristics and local teenage fertility trends are established in the literature, this does not mean that these relationships are consistent for all individuals living in such areas. Smith and Elander (2006), using a non-representative sample of young women aged 13 to 15, found a relationship between living in an area with higher socioeconomic deprivation and how many educational and career milestones that they believed were important to achieve *before* having a baby, which was moderated by family circumstances. Research which considered the macro-micro relationships that area-level, school-level characteristics, family characteristics, and school attainment had on experiencing a teenage conception by Crawford, Cribb, and Kelly (2013) found that women living in the most deprived quartile were more likely to conceive as a teenager than their counterparts who lived in a less deprived area. However, this study found that the effect of being a young woman who was eligible for Free School Meals (FSM) on experiencing a teenage conception was stronger for those living in the least deprived areas than the more deprived areas. These findings highlight that while the level of deprivation in the areas young women live in are predictive of teenage conceptions, family-level factors can predict conceptions within these groups.

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Local deprivation has also been explained by other factors and Johns (2011) found that in a sample of young women in the South West of England, women living in a ward with the lower quartiles of IMD were less likely to report teenage motherhood, but that these associations were explained by perceived environmental risk and family stress. 'Early' sexual activity means that young persons have a longer period of being a teenager in which they can become pregnant (assuming that they continue to engage in sexual intercourse after their first sex), and Smith and Elander (2006) found that 13-to-15-year-olds from the deprived area had higher early sexual activity; however, the women from the deprived area had a much higher likelihood of early sexual activity if they also belonged to a less affluent family. The area in which young women grow up and their family characteristics may therefore both contribute to their likelihood of engaging in teenage sexual behaviour, which may lead to teenage fertility.

The period of interest of this thesis has involved changes in economic deprivation across the country, including changes in unemployment. However, research has not focused on how deprivation changed over this time and what effect such changes had on under-18 conception rates in England. The New Labour government created the New Deal for Young People⁸ in January 1998, which aimed to end long-term youth unemployment by providing support to participation in an activity that would improve chances of getting a job for those aged 18 to 24 claiming Jobseeker's Allowance (JSA) or National Insurance credits for six months or more (Department for Work and Pensions, 2008). The late 2000s and early 2010s saw rising percentages of the population claiming JSA, and this particularly affected youth unemployment, with four per cent of 18 to 24-year-olds claiming in 2008, rising to over seven per cent in 2009 and this remained around seven per cent until 2012, when the rate steadily declined. While youth unemployment

⁸ The New Deal plus was created for those aged over 25 in July 1998. Jobcentre Plus centres were first opened in 2001 and were where persons claimed work benefits and had contact with personal advisors that were in place to aid the participant in looking for or gaining a job. The New Deal of the 2000s and the short-lived Flexible New Deal introduced in 2009 were replaced by The Work Programme from 2011. Those receiving JSA or Employment Support Allowance must take part in The Work Programme after nine months after aged 18 to 24, and after three months if not in education, employment, or training.

represents young adults, teenagers under 18 are more likely to still be in education and training. The prevalence of economic disadvantages that teenagers directly face can be measured by the percentage of secondary school teenagers who are eligible for Free School Meals⁹ (FSM) and statistics are available annually at the LEA level. The prevalence of FSM eligibility in state-funded secondary school pupils declined through the 2000s until the 2008 financial crash, where it fluctuated between 14 and 15 per cent until 2015.

2.3.4 The relationships between local educational attainment or engagement with teenage reproductive behaviour

When considering the relationship between the educational attainment in an area and local teenage fertility measures the literature often uses GCSE attainment, which are nationally standardised qualifications taken around the age of 16 and have been found to be associated with under-18 conception rates (Girma and Paton, 2015). Nationally standardised testing has traditionally occurred at the end of each Key Stage in England. Key Stage 1 (KS1) ends around age 7, Key Stage 2 (KS2) around age 11, Key Stage 3 (KS3) around age 14, and Key Stage 4 (KS4)/GCSE around age 16. However, the most useful Key Stage testing to consider attainment just before engaging in sexual activity, KS3, was only compulsory until 2008 and so such results have not been fully collected since then¹⁰. The percentage of secondary school pupils achieving an equivalent of 5 A* to C (passes) in their GCSEs or equivalent has risen through the 2000s from 46 in 1997/8 to 81 in 2010/11 (Department for Education, 2015). The grading of GCSEs changed from 2016 to numbered levels from the traditional A* to E, which means that results from these years are lower

⁹ Eligibility for FSM depends on whether the family receives certain types of income support and allowances and the measure is used as a measure of disadvantage in schools in reports about the School Census (Department for Education, 2018a).

¹⁰ While Key Stage 3 teacher assessments were published between 2008 and 2011, due to the subjective nature of teacher assessments and still having missing KS3 data from 2012-2017, the analysis in this thesis does not use these statistics.

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even when using the percentage of students receiving equivalent passes in the past. Girma and Paton (2015) credited the declines in teenage conceptions from 2004 to 2012 to the growth in educational attainment due to finding a strong association between these variables but little to no association between LARC uptake and the fertility measures. There has been increasing continued engagement in education after Key Stage 4/GCSEs in England with growth from 82 per cent of pupils being in education destinations in the year after KS4 (GCSE) in 2010/11 to 86 per cent in 2017/18 (Department for Education, 2019). Although this upward trend of engagement at age 16-18 was already established during this time, the compulsory participation age in education was legally raised for teenagers in England from 16 to 17 in 2013 and to 18 in 2015.

The teenage fertility and conception rates in Inner London have experienced the largest decline between 1998 and 2017 as the regional rates were the highest in England for the start of the century but fell to being one of the lowest by the late 2010s. The 'London Effect' in educational attainment represents how children in London have achieved higher attainment than pupils in the rest of England since the late 1990s, as suggested in Greaves, Lindsey and Sibieta (2014, p.14) and particularly for economically disadvantaged pupils. The authors noted that the London Effect could be partly explained by targeted educational interventions in London¹¹. However, as noted by Allison (2018), while such interventions may have contributed to the London Effect, they occurred too late to be the initial driver for the difference in attainment. The ethnic diversity in London has also been considered as a reason for the London Effect as ethnic minority pupils have, on average, higher educational attainment. While Allison (2018) found that London pupils from most ethnic groups (including White British) performed better than their non-London counterparts when using propensity score matching, ethnicity cannot entirely explain the London Effect. Progression to higher education is also higher in London. London has the highest proportion of pupils progressing to higher education in England,

¹¹ The educational interventions in London include The London Challenge which aimed to reduce numbers of low-performing secondary schools in the early 2000s, and national strategies like the National Literacy and Numeracy Strategies, which were initially rolled out in multiple areas of Inner London.

as shown in work by Department for Education (2020, p.9) at over 70 per cent, compared to the lower rates in the East, South East, and South West of under 60 per cent. This report stated that while the North East also had a lower progression rate, students in this region had lower prior attainment or were more likely to study qualifications that were not academic in the first place (represented by the score of zero).

Educational participation also varies by area deprivation. In work by Crawford et al. (2017), teenagers living in the least disadvantaged areas had the highest percentage entering university and this declined throughout the quintiles; all groups experienced an increase in university entrance between 2004 and 2014. University fees rose in England from 2011, but Crawford et al. (2017) concluded that these fees did not appear to have shifted entry rates for any of the groups beyond a 'blip' around 2011, which could have been from teenagers delaying gap years so that they could access the final year(s) of the lower fees.

2.3.5 The ethnic composition of an area and teenage reproductive behaviour

How ethnic composition is defined is likely to influence whether the variable is found to be associated with teenage fertility measures. However, the ecological studies for the associations between ethnic composition and teenage fertility measures have used measures that are not teenage-specific or often simplistically group ethnicities together. Bradshaw, Finch and Miles (2005) found that in the 1990s the percentage of the LAD population which was defined as an ethnic minority in the census was related to variations in the proportion of conceptions resulting in abortion but not the levels of teenage conception rates. Girma and Paton (2015) reported that, in the 2000s, the percentage of non-White pupils in their final year of schooling in the area was found to be associated with the local teenage conception rates. While there appears to be an association between a higher prevalence of ethnic minority populations and teenage conception rates, it is not clear what this relationship represents. As BAME subpopulations are overrepresented in disadvantaged and urban areas and some are more likely to have low socioeconomic status (Hadley, Ingham and Chandra-Mouli, 2017), there is a need to be cautious when interpreting the associations between ethnicity and

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early childbearing. This is particularly the case when looking at area-level relationships as interpretations must avoid the ecological fallacy (Sedgwick, 2015) which is referred to above. Considering associations with groups of BAME populations (i.e., non-White versus White) also require caution as such groupings hide the heterogeneity of teenage fertility patterns within more specific ethnic groups which is discussed in section 2.5.4.

2.3.6 The housing availability in areas and teenage reproductive behaviour

A rise in house prices (therefore leading to a longer time for a person to own a property or build a sufficient deposit) has been found to be associated with the postponement of childbearing and the move towards a later age at childbearing (Clark, 2012). However, to date, there has been little literature examining the role of housing accessibility in teenage pregnancy and motherhood, particularly when considering the housing market in the area in which women live rather than their personal housing situation. In a study by Wright et al. (2016) of 15- to 18-year-olds in 2001, authors used house prices to represent cumulative household wealth. In this sample of women in Northern Ireland, women reporting higher house price have lower risks of reporting teenage motherhood before the age of 20. As house prices have risen so drastically in the period of interest of this current research (the 2000s and 2010s) and the availability of social housing provision has reduced, the environments in which young women can establish their independence through housing have diminished.

It is important to acknowledge that there was a prevalent narrative in the English media about teenagers becoming pregnant to access social housing in the 1990s and 2000s. However, while teenage mothers have stated that their desires to escape from their problematic family lives by teenage childbearing were related to wanting new accommodation in qualitative interviews by Coleman and Cater (2006), this was a rare and extreme option that occurred from wanting a different life rather than simply aiming for a home. Indeed, Coleman and Cater made a point of emphasising that teenagers are often unaware of the local authority housing and welfare systems, and interviewees of young parents in another qualitative study distanced themselves from more disadvantaged mothers who they said got pregnant to receive housing (Smith and

Roberts, 2011). This is an interesting theme as these young mothers in Smith and Roberts (2011) who distanced themselves from those who they said became pregnant for a house also received social housing but were from less disadvantaged backgrounds. Even before the social housing cuts, the majority of teenage mothers continued to live in the parental home (Tabberer et al., 2000; Wiggins et al., 2005) and so it seems unlikely that teenagers are indeed becoming pregnant to access a home. In the light of these results, it can be speculated that local housing accessibility may not influence teenage fertility in a direct way, but that living in an area with poorer housing accessibility may signify an environment in which there are higher opportunity costs of teenage fertility and barriers to the transition to adulthood.

2.3.7 Summary of the exosystem factors

The characteristics of areas have altered through 1998 to 2017 alongside the changes in under-18 conceptions, fertility, and abortion changes. These exosystem factors, which are represented by area characteristics like being an urban area and having higher economic deprivation, have been widely cited as being associated with higher teenage conceptions rates in these areas. This review of the literature has examined past research into these relationships and has highlighted how the mechanism behind these relationships behind area characteristics and teenage fertility may be complex or acting as proxies for other factors. For example, the differences in urban and rural areas have been found to be acting as proxies for access to services and for economic deprivation. Area characteristics should go beyond just looking at one or two area characteristics for this reason and this review has also considered how housing availability could have associations with teenage fertility.

2.4 Microsystem factors associated with teenage fertility, conceptions, and abortions

2.4.1 Family socioeconomic status and teenage reproductive behaviour

As discussed in section 2.3.3, family socioeconomic status explains more of the variation in individual teenage pregnancy and childbearing than local deprivation in the macro-micro study by Crawford, Cribb, and Kelly (2013), who suggest that young women who are eligible for FSM are more likely to experience a conception. Family socioeconomic status has also been measured by housing tenure in Allen et al. (2007) but was only found to be significantly associated with experiencing a pregnancy at or before the age of 16 before controlling for family structure, individual behaviours, and expectations for the future. Research by Scott et al. (2017), using Natsal, found that women with a parent in a middle or higher socioeconomic group were significantly less likely to report a pregnancy before the age of 20 than those with a parent in the lower socioeconomic group in Britain.

The relationships between some measures of socioeconomic status and teenage reproductive behaviour are therefore well established, but teenagers from more disadvantaged backgrounds do not necessarily recognise these relationships themselves. Wiggins et al. (2005) conducted interviews of women across a range of ages who had become pregnant as teenagers and expected that poverty would be a frequent theme in the women's discussions around why they experienced a teenage pregnancy. Instead, half of the women stated that there had been unhappiness in their childhood. How young people associate events with disadvantage is clear in the following quotation from the authors of Wiggins et al. (2005, p.29): 'several women strongly denied that the material restrictions resulting from family poverty mattered to them, for example, the chance to go on school trips because of a lack of money. Instead, the common concerns that emerged from the interviews about childhood were chaos and instability at home; loss; difficulties with parents; violence, and transience and loss of a significant person in childhood was a common theme. This was most often the loss of their father through parental separation'. Turner (2004) also found that while young women in a more affluent school in Scotland discussed the links between deprivation and teenage fertility,

teenagers in two schools in less affluent areas stressed links between emotional deprivation and teenage motherhood rather than economic deprivation.

Parental education has been found to be associated with the educational attainment and expectations of young people across cohorts born in 1958, 1970, and 1989/90 (Schoon, 2010). The established relationships between having educational expectations and reduced teenage reproductive behaviour that results in motherhood are discussed further in Section 2.5.3 and Chapter 6. Even though parental education has been found to influence educational expectations, parental education is not commonly used in quantitative teenage fertility research in England. However, Mollborn (2010) found that in the US National Longitudinal Study of Adolescent Health of young people aged 15 to 20, each year of additional parental education was associated with eleven percent more embarrassment at the prospect of teenage pregnancy even after accounting for other socioeconomic characteristics and the neighbourhood socioeconomic index. Parental education has also been found to more widely delay age at first birth across Europe such as in Great Britain (Breen and Ermisch, 2017), in Sweden (Dahlberg, 2015), and Finland (Pöyliö and Van Winkle, 2019), and the US (Schoen et al., 2009). One of the reasons parental education may be less commonly measured may be because parental education influences occupational class and so this measure of household socioeconomic status is preferred. Parental education may also influence the parental expectations of parents which have been found to be associated with lower likelihoods of teenage motherhood in two British cohorts born in 1958 and 1970 (Kneale, 2010). Parental education and parental expectations may, in turn, mean that parents may be less supportive of their daughter having a teenage birth.

2.4.2 Perceived parental support for grandchildren and teenage reproductive behaviour

Qualitative studies around teenage childbearing and decisions around teenage pregnancies often include the reactions young women received from people around them about their pregnancy (Arai, 2007; Brown, 2016; Hoggart, 2012; Lee et al., 2004; Wiggins et al., 2005). In a study by Wiggins et al. (2005), young women were asked what had

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helped them most when they first found out they were pregnant and 70 per cent of responses included support, which most commonly came from mothers or partners. In a study of views on teenage motherhood in schools in areas of higher and lower affluence in Scotland, Turner (2004) used focus groups and found that many of the 15-year-old women from the more affluent school reported that their parents would not provide childcare support. This was in contrast with the young women from the less affluent schools who largely commented that parents would be supportive if they wanted to keep a child from a teenage conception, with only a few mentioning that their parents might not assist with childcare. This represents a difference in the way that teenagers perceive the support from parents and may explain why some women are more likely to opt for an abortion. In Lee et al. (2004) certain areas which have higher teenage conception rates were found to have grandmothers willing and 'keen' to be caregivers to the child to enable the young mother to continue education or work. Lee et al. (2004) found that parents were able to influence abortion decisions and one particular young woman reported that one of the reasons for opting for abortion was that, while the mother communicated she would support her pregnant daughter either way, the mother stated that she would not be able to financially support her daughter and her baby. Mothers who had their children as teenagers described their difficult position where they wanted to discourage their daughter from continuing the pregnancy by sharing the hardships they faced as young parents and how they 'wanted better for their daughters' (Brown, 2016, p.160) without hurting the daughter's feelings.

Higher parental support may therefore explain why certain areas have lower proportions of pregnancies which lead to abortion. As young women in the school in the more affluent area in Turner (2004) were much more likely to report that their parents would not support them if they had a teenage birth, these individuals were also more likely to report that teenage motherhood would 'ruin' their future plans and that their parents would want them to have an abortion. While this was not considered directly in this study, the expectations from parents for young women to avoid teenage motherhood to allow them to go on to these educational and career plans may be interconnected. This would be an interesting area for further work, since increases in further educational participation and teenage fertility decline are widespread. Research could consider how

links between parental support and expectations may have changed over time in the middle to least affluent areas of the country, where such narratives were less pervasive.

2.4.3 Having a young mother and teenage reproductive behaviour

Living in an area with early childbearing norms appears to be associated with early childbearing (as discussed in section 2.2.1). Women who have a mother who had a teenage birth have been consistently found to be more likely to have a teenage birth themselves, as reported in quantitative studies in England (Allen et al., 2007), Northern Ireland (Wright et al., 2016), the US (East et al., 2007) and qualitative studies in England (Coleman and Cater, 2006; Higginbottom et al., 2006). A systematic review by Cederbaum et al. (2020), of largely US studies, found that sexual debut was earlier and teenage pregnancy was more likely in those whose mothers had a teenage pregnancy than their counterparts with mothers who had childbearing later. While young women with mothers who had a teenage pregnancy have consistently been found to be more likely to experience a teenage pregnancy and/or birth, qualitative accounts from studies have also found that experiencing hardships alongside having a younger mother has given reasons for avoiding the same path. The teenage pregnancy and social exclusion study by Wiggins et al. (2005) included interviews with children aged 13 to 33 of teenage mothers. While ‘almost all of the children described their relationship with their mother as good’ (p.49), most of the children strongly wanted to avoid teenage motherhood for themselves. For some, wanting to avoid teenage motherhood was specifically because of witnessing the hardships their mothers had to face and wanting to be able to establish a career and home for their future children. Qualitative interviews of women who had a teenage abortion reported by Lee et al. (2004) found that, in some instances, witnessing their parents’ experiences influenced them more than their mother’s verbal support (or lack of) and one woman ‘did not want to ‘make the same mistake’ as her mum’’ (p.42).

2.4.4 Family form and teenage reproductive behaviour

Family forms have been considered in terms of increasing the likelihood of experiencing a teenage pregnancy and going on to teenage motherhood. Teenage fertility has been found to be less prevalent in young women who have two natural parents compared to other family forms. Living with both parents was significantly associated with reduced odds of experiencing a pregnancy by age 16 in a survey in East Scotland by Buston, Williamson and Hart (2007). In a study by Bonell et al. (2006), teenagers were more likely to report ever having sex at age 15/16 if they were from a single-parent household, but they were not significantly more or less likely to report contraceptive use than young women in two parent households. Yet, the effect of not living with both parents has also been found to vary by where young women live. In a Northern Irish sample in the early 2000s, 15- to 18-year-old women *not* living with both parents were more likely to experience teenage motherhood and this risk was significantly higher for women in rural rather than urban areas (Wright et al., 2016). These relationships may be due to young women not in *stable* two-parent families having higher likelihoods of teenage pregnancy through various mechanisms.

It could be argued that family form acts as a proxy for such accompanying characteristics. Indeed, a study by Wright et al. (2016) found that women with single mothers had higher odds of experiencing teenage motherhood than those with married mothers (not including remarriage) but this relationship was explained when controlling for sociodemographic characteristics including social class and employment deprivation. Whilst women with mothers who were separated, divorced or remarried continued to have higher odds of teenage motherhood than their counterparts with married mothers once controlling for sociodemographic characteristics, Wright et al. (2016) highlights how family forms are linked with other factors which have been found to be associated with teenage fertility. In contrast, Bonell et al. (2014) found that even *within* a sample of disadvantaged women aged 13 to 15 in England in the mid-2000s, those who lived with both of their parents (not including step-parents) were less likely to report pregnancy nine months later than women in other family forms. This analysis controlled for family home ownership and the working status of parents but still found that family form was associated with teenage pregnancy amongst a disadvantaged sample. Indeed, Clutterbuck

et al. (2014), using a sample of young women aged 9 to 14 in one local authority in the North East of England, considered the relationships between family form and having a younger ideal age at parenthood. Whilst women who reported more half-/step-brothers and more frequent residential relocation were more likely to have a younger ideal age at parenthood in the multivariate models, the timing of father absence or living with a step-father was not significantly associated (Clutterbuck et al., 2014). These studies therefore present how the way the family form is measured, controlling for socioeconomic characteristics, is important to establish whether these relationships with teenage reproductive behaviour are reliable.

Experiencing *family upset* may be behind associations with teenage pregnancy rather than the forms themselves. Family upset was associated with higher 'planned' teenage pregnancy and many teenagers who reported 'planning' their pregnancy in Coleman and Cater (2006) gave their main reason for wanting a teenage birth as wanting a 'loving family of their own'. These young women discussed their disruptive home environments which ranged from parental separation (most of which were discussed as 'problematic') and resulted in frequent relocation, to specific life events which included drugs and alcohol misuse, and physical and mental abuse personally or in their family. A study by Bellis et al. (2014) of a nationally representative sample of 18-to-69-year-olds in England found that adverse childhood experiences (including 'physical, verbal, and sexual abuse; parental separation; exposure to domestic violence; and growing up in a household with mental illness, alcohol abuse, drug abuse, or incarceration' (p.2)) were associated with unintended teenage pregnancy and early sexual initiation before the age of 16. Young women with low paternal involvement were more likely to report earlier intended reproduction and actual early reproduction in a UK study by Nettle et al. (2010). This desire for a family is related to the idea of a 'purpose' which occurs through teenage motherhood for some women during the time in which other women find meaning by their educational or career engagement (this will be discussed further in section 2.5.3). These young women discussed how their desire for their own loving family was linked to their experiences of unsettled backgrounds and families. More teenage pregnancy may occur for individuals in certain family forms through earlier sex or more unprotected sex. Young women who experience father absence have been found to experience their first

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sexual intercourse earlier than women in two-parent families (Ellis et al., 2003; Mendle et al., 2009). In a more recent non-representative sample of under 400 women in the US, Richardson, La Guardia and Klay (2018) found that being in a 'fragmented family structure' increased the likelihood of ever having sex (the average age of the sample being 20.7), but did not predict the age at which this occurred.

Family form is a complex factor to consider in terms of teenage fertility but past research has established that women in various forms have higher rates of teenage pregnancy than their counterparts living with both natural parents. Even so, the prevalence of teenagers growing up in households with two natural parents has declined over the last two decades, but teenage fertility has halved. These 'non-traditional' family forms are now much more commonplace and so the author presents the need for further research to consider whether contemporary experiences of these family forms and/or disruption continue to have the same effects on the likelihood of teenage pregnancy/motherhood in England.

2.4.5 Parental monitoring and teenage reproductive behaviour

Parental monitoring can include a range of behaviours which involve parents keeping an eye on their children, in reference to sexual behaviour, monitoring can range from parents establishing strict rules about dating to parents requiring information on the movements and activities of their children (Dittus et al., 2015). Parental monitoring may therefore prevent or discourage young people to engage in certain sexual behaviours. A meta-analysis by Dittus et al. (2015) found that studies reported that parental monitoring was associated with later age at first sex and more teenage contraceptive use, including condoms. The relationship between family form and teenage reproductive behaviour could be thought to be acting as a proxy for parenting behaviours such as parental monitoring. However, Heifetz et al. (2010) found that Canadian teenagers aged between 9 and 15 considered if parental monitoring moderated the relationship between family form and having a romantic partner, alongside their 'susceptibility to romantic influence' (measuring the extent they will sacrifice what they should be doing, like homework, to maintain their relationship). While young persons from divorced families were more likely

to report dating and to be more susceptible to romantic influence, these relationships were not mediated by parental monitoring. The associations between lower parental monitoring and sexual behaviour are consistent in US studies (Ethier et al., 2016; Roche et al., 2005; Roche and Leventhal, 2009). Teenagers in the East of Scotland who reported low parental monitoring were significantly more likely to report being pregnant under 16 than their counterparts with high parental monitoring (Buston et al., 2007). Variation in parenting may, therefore, contribute to the associations between family characteristics beyond family form and teenage fertility if parenting practices vary by these family characteristics.

Parenting practices like parental monitoring and control have also been found to vary in different cultures (Soenens and Beyers, 2012) and may explain some of the ethnic differences in teenage reproductive behaviour, but, to the author's knowledge, this has not been examined in England. One explanation behind the links between where young women live as teenagers and the characteristics of their area may be due to different parenting practices amongst certain sociodemographic groups. Parents of higher socioeconomic status and/or higher educational attainment are more likely to monitor or supervise their teenagers more closely, as suggested in Wight, Williamson and Henderson (2006). In this large sample of Scottish teenagers, parents who displayed lower parental monitoring had teenagers who engaged in earlier sexual activity. Qualitative interviews in London by Smith and Roberts (2011) found that young parents proposed that teenagers in more affluent areas experience higher parental control which is more likely to reduce levels of sexual activity. This parental control could manifest by direct prevention of sexual activity by not allowing romantic/sexual partners to visit, to indirect prevention through using the teenager's spare time so that they do not have the opportunities to meet with their partners. Parents in areas with higher levels of deprivation may have less surveillance due to working longer hours but may also be more likely to recognise that their teenage children are becoming sexually active. In a study of adults' opinions of young people's sexual behaviours in an area of high deprivation in England, many of the adults believed that young people's first sexual intercourse was occurring before the national average age at first sex (16) with adults who were parents having significantly lower assumed age at first sex (Baraitser et al., 2004).

2.4.6 Summary of the microsystem factors

The role of family in the behaviours leading to teenage childbearing have been examined in the literature through quantitative and qualitative works. Quantitative research has examined the relationships between microsystem factors like family socioeconomic status and family form with teenage childbearing. Qualitative research into the passing on of family norms of early parenthood and the perceived support of parents for teenage childbearing have found that family is important in the decision to have a teenage fertility (whether this is through a 'planned' pregnancy or through not opting for an abortion). Family factors can bridge the gap between area characteristics and individual behaviours where teenagers with certain family socioeconomic status may be more likely to live in certain areas. Such women from these families may receive less parental monitoring which, in turn, is also associated with behaviours which are correlated with teenage conceptions. The next part of the literature review will examine the research into individual characteristics and behaviours with teenage conceptions, fertility, and abortion.

2.5 Individual factors associated with teenage fertility, conceptions, and abortion

2.5.1 Individual educational attainment and teenage reproductive behaviours

Higher educational attainment in local areas has been found to be associated with lower teenage conception rates by Girma and Paton (2015) and was discussed in section 2.3.4. This relationship is also found in individuals. Crawford, Cribb, and Kelly (2013) linked National Pupil Database information on prior attainment to teenage birth records and found that young women with lower prior attainment were more likely to conceive and to continue to a birth even after controlling for other individual, family, and school characteristics. While educational attainment was associated with reproductive behaviour, family disadvantage measured through FSM eligibility and persistent absence

was more predictive than attainment. This study provides a more in-depth examination into the role of educational attainment beyond traditionally available datasets and could consider progression between academic performance from age 11 to 14. Young women who made slower educational progress during the first years of secondary school (between age 11 and 14) were particularly more likely to conceive and to go on to a birth than women whose educational progress continued as expected.

2.5.2 Engagement with school and teenage reproductive behaviour

A lack of engagement ranging from a dislike of school to truancy and disengagement is a pervasive theme of interviews with teenage mothers. Of young women who experienced teenage childbearing, their dislike of school (often due to boredom, not appreciating the value of school, or bullying) was said to be their reason for truancy in multiple qualitative studies of teenage mothers (Coleman and Cater, 2006; Hosie, 2007) and the majority of the young mothers in Arai (2003) reported weak attachments to the education system before they conceived (ranging from dislike of school to not being in some kind of education or training). In Crawford, Cribb, and Kelly (2013), 'persistent absentees' were more likely to conceive before the end of year 11 (around age 16) and to continue to motherhood if they did so. It is important to acknowledge that disengagement and truancy are not always due to disliking school, and may be due to responsibilities at home which were found to often prevent school attendance in Wiggins et al. (2005), whereby schools were reported to have not understood these problems very well. A measure of truancy, overall absence rates, has declined since 2008 (Department for Education, 2018b) and contemporary teenagers appear to be truanting less frequently. Disengagement with school may therefore need to be measured by aspects beyond truancy to capture these more recent cohorts of teenagers who dislike school but are no longer truanting.

It has been suggested that engaging in education is linked to reduced teenage fertility in a variety of ways. Silles (2011) presented three theoretical explanations behind the relationships between schooling and fertility in their study of the effect of changes in compulsory schooling laws: 1) school increases the knowledge of sexual and reproductive

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health information, 2) there is a higher opportunity cost of childbearing, and 3) attending school for longer gives individuals less time to engage in activity that leads to pregnancy. This third point was also proposed by Black et al. (2008) whereby attending school had an ‘incarceration effect’ as teenagers had less time to become pregnant. While these other aspects are interesting to consider, this section of the literature focuses on the rising opportunity costs of teenage pregnancy as further and higher education plays a higher role in society.

2.5.3 The links between educational or childbearing expectations and teenage reproductive behaviours

The transition to adulthood has been characterised in Western societies by a series of events from finishing education or training, entering employment, leaving the parental home, entering into marriage, and entering into parenthood (Billari and Liefbroer, 2010). The more contemporary transition to adulthood has been presented by authors like Billari and Liefbroer (2010), which involves delayed entry into parenthood across Europe whilst more and more young people seek further and higher education before childbearing. This trend of postponement means that those who start their childbearing relatively early are an increasingly distinct group with contrasting transitions to their peers. In England, an extended transition to adulthood which lasts a longer period whereby teenagers pursue further education or a career to progress to adulthood is most frequent (Côté and Bynner, 2008); however, for some, teenage childbearing is their way to transition to adulthood.

Teenage motherhood has emerged as an alternative to further/higher education or a career in this area of research. The report commissioned just before the TPS in England (the TPS is discussed in section 2.3.2) proposed ‘social exclusion’ and ‘low expectations’ as contributing to teenage pregnancy (Social Exclusion Unit, 1999). Local teenage pregnancy coordinators across England were interviewed in Arai (2007) about why they thought their local areas – and the country in general – had certain teenage fertility rates; and reiterated that less disadvantaged young women were more likely to believe that having a baby as a teenager would ruin their future plans as they have ambitions for a career or education (Arai, 2007). Such relationships between educational expectations have been

found to be linked to experiencing a teenage pregnancy or birth in quantitative studies. In East Scotland, among teenage women who had experienced sexual intercourse, those who reported a more positive attitude towards school (involving questions about liking school to truanting) were less likely to experience pregnancy by age 16, whilst those who believed they were more likely to have a child in the near future were more likely to experience pregnancy by age 16 in Buston, Williamson and Hart (2007). In another study, this time containing a sample of teenage women aged 13 to 14 in the late 1990s, Allen et al. (2007) found that women who reported that they did not expect to be in education at age 20 were more likely to report a pregnancy by follow up at age 17.

Careers and jobs were regularly given as reasons for teenage motherhood in qualitative studies and many young women who had a child before the age of 20 in Arai (2003) were in 'low-grade' jobs at the time of conception. However, young women who became teenage mothers in Coleman and Cater (2006, p.602) reported that they 'did not want to do a 'boring' or mundane job with no direction, meaning or room to progress', which highlights how teenagers who experience teenage pregnancy and then motherhood do not necessarily lack these aspirations for a meaningful career. Instead, these young women may feel as if they cannot gain meaning from their career or education at that time and seek meaning from parenthood. Indeed, a qualitative study of young mothers from a housing estate in Scotland by Greene (2006) found that women often discussed how they felt that their careers and education could wait until after childbearing as they felt that their chance of having a child was more uncertain than their career or education. As an interviewee in Greene (2006) expressed, delaying a career until after a teenage pregnancy does not mean that a young woman does not want a career at all but that, simply, she was willing to have her child before entering her career. Many women in the Coleman and Cater study (2006) who reported that their pregnancy had been 'planned', said that early motherhood was their preference so that they could then move on with their lives and get children 'out of the way'. Young women who become teenage mothers may therefore have different priorities for the next stage of their life and ideal sequences of their transitions to adulthood. This was found in a study by Wiggins et al. (2005) where women over the age of 20 were asked what they had most wanted to do at age 16 over the next few years of their lives and those who wanted to

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leave their parental home, find a job, and have a child were more likely to have become pregnant compared to those who had wanted to complete A-Levels, attend university, and travel (Wiggins et al., 2005). Future aspirations have been pervasive themes as reasons provided by pregnant young women to opt for an abortion in Lee et al. (2004) and Hoggart (2012). The common narrative that emerges from this research is that having educational and/or career aspirations or expectations provide reasons for young women to avoid pregnancy and opt for abortion if they do conceive, and the lack of such aspirations or expectations are why some women choose to become pregnant as a teenager or opt for birth if they have an unplanned pregnancy.

2.5.4 The ethnicity of young women and their teenage reproductive behaviour

This review of the literature has discussed the associations between the ethnic composition of areas and teenage fertility measures in section 2.3.5. While studies have considered the area ethnic composition on teenage fertility measures, there are limited individual-level studies that involve ethnic breakdowns of teenage fertility measures in England due to the poor availability of such data. Aspinall and Hashem (2010) discussed in detail how ethnicity has not been recorded alongside live births or abortions in England and how this has resulted in poor availability of ethnic breakdowns of teenage fertility. So, ethnicity has not been recorded for the whole time period of 1998 to 2017 and there have also been issues even when ethnicity *has* been routinely recorded. Jardine et al. (2021) examined the accuracy of the coding of ethnicity in birth records from hospital data to the self-reports in England from 2015 to 2017 and found the need for grouping due to issues with defining specific ethnicities, particularly mixed ethnicities. Most of the literature around the ethnic differences in teenage fertility behaviours in the United Kingdom, and particularly England, have therefore been found by the use of surveys that include a large enough ethnic minority sample.

Teenage childbearing differs between ethnic groups in England, but trends have altered in recent decades. Traditionally, Bangladeshi teenagers had the highest teenage fertility before the age of 19 (Berthoud, 2001) but due to the rapid declines in the 1990s have had lower fertility rates than the White British population since the mid- to late-

2000s (Coleman and Dubuc, 2010). Black Caribbean and Black African women were the only ethnic group to have similar or higher rates of teenage fertility than White British teenage women in the 2000s (Coleman and Dubuc, 2010). In more recent years, England has had a growing second (and third) generation of Black and South Asian teenagers who contribute to fertility trends. Using birth cohorts in the Understanding Society study, Berrington (2020) found that the expected age of motherhood for second generation young women from all South Asian ethnicities was relatively high at over 27 for those aged 16 to 21 in 2009-14. Black Caribbean young women reported a lower average age of entry into parenthood but this was still over 25 (Berrington, 2020). The later expected age of entry into parenthood in second-generation ethnic minority teenagers in England represents how non-White teenagers are similarly or less likely to experience teenage fertility. This may link to the higher educational expectations and university attendance by non-White British teenagers which is discussed in Chapter 6. The prevalence for early marriage has declined and young women of certain ethnicities may now be more likely to be motivated to avoid teenage pregnancy because childbearing would disrupt their educational aspirations and expectations and those of their families.

2.5.5 The religion of young women and their teenage reproductive behaviour

Data on the religious beliefs of teenagers in England are mainly obtainable from surveys and therefore primarily available at just national levels. The main exception is that religion is recorded for teenagers in the national censuses for the age categories 10-14, 15, 16-17, 18-19 and is available at many geographical levels including Local Authority Districts, although these are limited to 2001 and 2011. Reductions in religious beliefs have occurred across Western Europe and young people are particularly less likely to report being religious (Pew Research Center, 2018); so relying on the censuses limits the ability to see when these shifts occurred. Teenagers themselves may also not fill out their information in the census, and so these figures may not capture *their* beliefs but rather of their parents/guardians. The European Social Surveys 2014-2016, which asked 16 to 29 year-olds directly, found that 7 in 10 young people in the United Kingdom reported having no religious affiliation (Bullivant, 2018). Of these young people who reported no

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religious affiliation, 20 per cent had a religious upbringing (9 per cent Anglican, 5 per cent Catholic, 4 per cent Protestant, and 3 per cent for other non-Christian and non-Muslim religion). Alongside the 70 per cent of United Kingdom's young persons of no religion, 10 per cent reported being Catholic, 9 per cent Protestant, 6 per cent Muslim, 2 per cent other Christian, and 3 per cent other religion. Due to the overlap of religion and ethnicity, studies have more commonly considered the trends in teenage fertility in England by ethnicity rather than religion.

Religious beliefs are better captured by asking about religiosity, a term that aims to quantify the role of religion in life by asking such questions such as how often respondents attend religious service. In this study of religiosity across Europe by Bullivant (2018), just under 60 per cent of 16-29-year-olds from the United Kingdom reported never attending religious services outside of special occasions, and 7 per cent attend weekly or more. Similarly, 63 per cent of 16-29-year-olds reported never praying outside of religious services, and just 18 per cent prayed weekly or more (Bullivant, 2018).

The number of state-schools schools of a religious character is available for each local authority level but attending a school of a certain faith does not necessarily mean that the teenager or their family is of that faith. As of 2018, just over 80 per cent of all state-funded secondary schools were non-religious, with 6 per cent and 9 per cent being Church of England and Roman Catholic respectively (Department for Education, 2018c)

2.5.6 Engaging in risk behaviours and teenage reproductive behaviour

Teenage sexual behaviour is often categorised by researchers as risky behaviour, alongside activities ranging from substance use to truancy. The clustering of multiple risky behaviours in teenagers, whereby two or more such behaviours are engaged in, has been found in research reported by, for example, Wright et al. (2020) and MacArthur et al. (2012) in England; and Jackson et al. (2012) and Parkes et al. (2007) in Scotland. Indeed, studies have even suggested the screening of teenagers using substances as a strategy to reduce teenage fertility in the US by Connery, Albright and Rodolico (2014) and Cavazos-Rehg et al. (2011). The reduction in teenage alcohol use has been put forward as one of

the factors behind the reduction in teenage fertility (Wise, 2018) accounting for teenagers having reduced their risk-taking. The proportion of secondary school teenagers in the Smoking, Drinking and Drug Use among Young People survey (Government Statistical Service, 2020) has declined; around 60 per cent of secondary school pupils reported ever having an alcoholic drink in the 1990s, but this started declining from the mid-2000s with just under 40 per cent reporting the same by 2014. Under-18 alcohol-related hospital admissions have also declined and so not only are present-day younger teenagers avoiding excessive alcohol consumption that may lead to hospital admission, but fewer are even trying alcohol compared to previous cohorts. In this survey, the prevalence of teenagers reporting ever smoking or being a current or regular smoker also declined between the 1990s and 2010s (Government Statistical Service, 2019b). Drug use has also become less common in this sample, particularly for cannabis, which has continued to be the most common drug that teenagers have used (Government Statistical Service, 2019c).

A propensity for engaging in risk may be the reason why multiple risk behaviours, including those which lead to teenage fertility, co-occur. Women who regularly smoked cigarettes in their early teenage years were found to also be more likely to experience a pregnancy before the age of 16 than their counterparts who had never tried cigarettes in East Scotland (Buston et al., 2007). Engaging in alcohol use during teenage years was found to be associated with earlier sexual intercourse in a nationally representative sample, the 1997 National Longitudinal Study of Youth in the US, even after controlling for sociodemographic and family variables (Doran and Waldron, 2017). This relationship between age at first drink and sexual intercourse was particularly strong for females aged 12 or 13 at the time of their first alcoholic drink. Teenagers aged 12 to 17 who were pregnant were more likely to have prior substance use such as alcohol or cannabis than their non-pregnant counterparts in a national survey between 2002 and 2012 in the US (Salas-Wright et al., 2015). The reason behind the link between general substance use and teenage pregnancy may be that such teenagers are more likely to engage in risky sex. General substance use (not specifically at the timing of the sexual intercourse) has been found to be negatively associated with condom use at first sex (Parkes et al., 2007; Svare et al., 2002). However, associations between such general substance use and contraceptive use were also examined by Rees, Argys and Averett (2001) who found in a

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nationally representative sample of US teenagers under the age of 18 that the associations between marijuana or high alcohol use (not specifically at the time of sex) and *last* contraceptive use were insignificant and concluded that relationships found in other studies may be due to the positive correlation with unobservable covariates.

Not only may there be a general link between being more likely to engage in various risk behaviours, including sexual risk behaviours that could lead to teenage pregnancy, but being drunk at the time of sex may also encourage certain decision-making. The themes which emerged from qualitative interviews with 14- to 17-year-olds around the relationship between alcohol use during sex and contraception use formed a continuum in Coleman and Cater, (2005, p.567) ranging from a higher attraction to others, being used as an 'excuse' for behaviours, lowered inhibitions, the inability to recognise/take charge of risky situations, to the complete loss of control. Certainly, being under the influence of alcohol at the time of first sex has been found to be associated with not using a condom (Dye and Upchurch, 2006; Sprecher, 2013). A review of the literature also found that a noteworthy minority of respondents 'implicate [the] use of alcohol to their loss of virginity' (Hawes, Wellings and Stephenson, 2010, p.142) and a lack of planning of this first sex. In two studies of English women who went on to have a teenage abortion, being under the influence was discussed as an explanation as to how they became pregnant or as a general reason for avoiding contraception in the past (Brown and Guthrie, 2010; Hoggart and Phillips, 2011).

A common finding that teenagers who engage in substance use are more likely to go on to experience a teenage conception and motherhood has emerged from these studies. However, many of these studies include young women who were teenagers before the more rapid fertility decline and during times where substance use was more prevalent; these relationships may have altered for more recent cohorts of lower risk-taking teenagers.

2.5.7 Knowledge around sex

Improvements in knowledge around sex and the available sexual and reproductive services was an aim of both the 10-year governmental TPS and the national SHHS (Department of Health, 2001). Although increased knowledge was at the forefront of policy in England in the 2000s, the difference in knowledge has largely not been formally studied. The only study that has done so is French et al. (2007) which, using a sample of 13-21-year-olds in England, found that there was no significant increase between 2000 and 2004 in young women's knowledge about contraceptive services, whilst young men had increasing knowledge about contraceptives being free and that any age could access free condoms. However, as this was very early on in the TPS it is impossible to extrapolate this finding to the whole of the period. To the author's knowledge, no other study has tested the sexual knowledge of teenagers in England during this time. The quality in sex education by area is not formally measured as a part of the Ofsted inspections of schools, in part due to Sex and Relationships Education (SRE) not being compulsory for all schools in England from 1998 to 2017. Relationships and Sex Education (RSE) has since become compulsory in all schools in England from 2020. Yet, for the period of interest for this study, there is no available measure of the varying quality of SRE throughout England. This is unfortunate, since the influence of local teenage pregnancy coordinators on sexual knowledge cannot be measured to assess the geographical variation in the influence of the teenage pregnancy strategy. There are also limited studies which have measured how sexual knowledge may now be gained from the internet (Doornwaard et al., 2016; Gray et al., 2005), particularly for the English context. Only eight per cent of young women aged 16 to 24 reported that they used information and support websites in 2010/12 (Aicken et al., 2016) but this does not encompass all aspects of the internet which provides sexual information (that may or may not be correct).

2.5.8 Summary of the individual factors

The behaviours and characteristics of young women have been found to be associated with experiencing a conception and the decision-making process after

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conception. Area differences in teenage fertility measures may result from such areas also having teenage women with different characteristics and behaviours. For example, the ways in which young women envision their futures are often stated as determinants of teenage motherhood. Young women who do not want to (or feel they cannot) engage in education or careers which might be disrupted by teenage motherhood do not have the barriers that other young women have to childbearing at this age. Areas with poor educational or career prospects for young women have therefore been theorised to create this path to teenage motherhood. Aspirations and expectations may also differ by individual characteristics like ethnicity which may be behind these differences in teenage fertility, and how they have altered over time. However, the actual proximate determinants of pregnancy, which will be examined in the next section, have also been found to differ by individual factors like ethnicity.

2.6 Proximate determinants of conception

As noted previously in this chapter, the differences in conceptions must occur from differences in the proximate determinants of fertility (Bongaarts, 1978). This section considers the proximate determinants of conception (i.e. this does not include abortion) through the associations between contraceptive use, age at first sex, and sexual frequency with teenage reproductive outcomes and limitations in measuring these behaviours.

2.6.1 Contraceptive use and teenage fertility decline

The contribution of changes in contraception and sexual activity reductions in the decline of teenage fertility has been examined in the United States (Santelli et al., 2007; Lindberg, Santelli and Desai, 2018). However, there are many limitations regarding access to data that can consider the geographical variations and trends in teenage contraception use in England for the extensive time period covered by this thesis. One of the main studies which considered changes in a range of types of contraceptive use in women aged

16 to 19 between the early 2000s and 2010s on teenage fertility is by Scott, Wellings and Lindberg (2020). While this study found that the decline in teenage fertility in the US may have been due to reductions in sexual frequency alongside modest increases in contraceptive use between the early 2000s and 2010s, British figures from Natsal suggested that sexual frequency had not declined but that teenagers in Britain increasingly reported the use of more effective contraceptive methods like LARCs. Data about contraceptive use rarely consider whether user-dependant methods were used correctly. However, the shift towards LARCs represent rising proportions of women who are very unlikely to experience method failure, which is important as many qualitative studies which asked women about contraceptive use at the time of conception as a teenager reported evidence of incorrect use of contraception or what was reported as being method failure, often the contraceptive pill (Tabberer et al., 2000; Arai, 2003; Wiggins et al., 2005; Brown and Guthrie, 2010).

Long-Acting Reversible Contraception (LARC)

During the period of interest of the research in this thesis, there was increased availability and uptake of reliable forms of contraception with financial incentives for General Practitioners (GPs) to fit LARC methods. LARCs are promoted above other hormonal contraceptive methods due to not being dependent on users and are therefore less likely to be subject to user error like the contraceptive pill or condom. LARCs include the contraceptive implant, the Intrauterine System (IUS) or hormonal coil, and the Intrauterine Device (IUD) or copper coil. Girma and Paton (2015) considered whether increases in LARC uptake was associated with under-18 conception, birth, and abortion rates in England between 2004 and 2012. The authors found that the negative association between teenage clinic LARC uptake and under-18 fertility rate was significant at the 10 per cent level between 2004 and 2012 when controlling for area characteristics, but that clinic LARC uptake did not have significant associations with conception and abortion rates. This study was only able to account for GP LARC uptake alongside clinic LARC uptake for 2008 to 2012 but found insignificant associations with conception, fertility, and abortion ratios, which may have been due to the limited time frame. A study by Connolly

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and colleagues (2014) used a variety of data sources like the IMS British Pharmaceutical Index or the IMS Hospital Pharmacy Audit to measure LARC prescriptions more comprehensively in England between 1998 and 2011. This study found that LARC use in under 18s increased 'six-fold' between 1998 and 2011. The study considered England's age-specific LARC prescriptions for those aged 15 to 17 with the national teenage pregnancy rates and found significant associations between growing LARC use and declines in teenage pregnancy and abortion rates.

Condoms and the contraceptive pill

While the role of LARC uptake has been studied in relation to teenage fertility, condoms and the contraceptive pill continue to be the most common forms of contraception used by teenagers in Britain aged 16 to 19, as suggested by Natsal (Scott, Wellings and Lindberg, 2020). This study found that while the contraceptive pill has a higher prevalence than LARCs, their use amongst those aged 16 to 19 had declined since the early 2000s, alongside growth in the use of IUDs and IUSs. However, the prevalence of condom use remained at similar levels between the 1999-01 and 2010-12 surveys. The 2000s experienced a push for condom use when the SHHS (Department of Health, 2001) and condom distribution schemes were introduced across the country. A study reported by Public Health England (2017) found that condom schemes¹² were prevalent across England in 2015/16 even after the end of the TPS in 2010 and SHHS (Public Health England, 2017). Although condoms still play a large role in the contraception used by teenagers, at least at their sexual debut, there are no measures of the prevalence of teenage condom use by geographical area in England.

¹² C-Card schemes involve young people applying for a C-Card and having a risk assessment and consultation with a trained practitioner, and then users can present their card at distribution outlets to access free condoms. Outlets range from pharmacies to sexual health services (Public Health England, 2017) with the aim of making condoms readily accessible.

Reliable measures of contraceptive pill use are not available at any age disaggregated by geographical areas in England and, unlike Long Acting Reversible Contraception, are not collected or published by Public Health England. Some efforts have been made to quantify contraceptive pill use in the past, such as the paper by Rowlands et al. (2001) which used the General Practice Research Database to count national contraceptive pill prescriptions to 13- to 19-year-old women in 1997. Although the data used by Rowlands et al. was highly sensitive and protected, access to these kinds of records of prescriptions is often the only way to accurately measure the contraceptive use prevalence in England.

There have also been changes in the demand for hormonal contraceptives beyond avoiding pregnancy within teenagers. Fewer teenagers (aged 12 to 15 and 16 to 18) reported that their contraceptive prescription was for contraceptive management in 2011 compared to 2002. Instead, there were increases in prescriptions for 'excessive, frequent and irregular menstruation' and 'pain and other conditions associated with female genital organs and menstrual cycle' (Rashed et al., 2015). Whilst this finding does depend on what teenagers disclosed to their provider, if more women use contraceptives for reasons other than preventing pregnancy, this may mean that a higher proportion of young people have already established contraceptive practices before first intercourse. Equally, such teenagers may also be more likely to form habits which include user error (which can result in pregnancy) if their pain or other symptoms continue to be treated when using the contraception incorrectly.

Emergency contraception

The emergency contraceptive (EC) pill was made easier to access in the UK in the time period of interest of this research. From 2001, the emergency contraceptive pill could be accessed without a prescription (over the counter). Since 2009, an emergency contraceptive pill with efficiency until 120 hours after unprotected sex or contraceptive failure was available, and this was changed to access over the counter in 2015 (Black et al., 2016; Glasier et al., 2021). The copper intrauterine device has continued to be available as a form of emergency contraception throughout this time. While the

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accessibility to EC has grown in England, it has become more difficult to measure the prevalence of use because more and more woman moved to access emergency contraceptives in community settings, which do not collect routine data. However, pharmacy emergency contraception schemes were considered alongside teenage conception rates and STIs between 1998 and 2004 by local authorities in England by Girma and Paton (2011). Girma and Paton suggested that access to emergency contraception may encourage more risky sexual behaviour as teenagers can rely on EC methods, but did not find that teenage fertility consistently significantly varied in their study. This study found that emergency contraception access in pharmacies did have associations with higher teenage STI rates in the same period but found that associations with teenage fertility were not consistently significant. This study was conducted before the period of teenage fertility decline and it is difficult to establish whether these relationships have continued. A cross-national study by Italia, Schröder-Bäck and Brand (2020) considered the teenage abortion rates of those aged between 15 to 19 before and after emergency contraception moved to non-prescription status. This study across Europe, which included the United Kingdom, found that teenage abortion rates were, on average, 35 per cent higher 15 years before emergency contraception moved to non-prescription status and 40 per cent lower 15 years after.

2.6.2 Age at first sex and teenage fertility decline

Age at first sex is often used in research because it signifies the start of the sexual life course and the beginning of the risks of becoming pregnant. While age at first sex is useful in some regards, it is only a snapshot in time. A person's sexual activity can vary greatly after first sex and this is missing from trends that only look at this single measure. Nonetheless, in Natsal, higher percentages of women and men report their first sex before the age of 16 in more recent cohorts (Clifton et al., 2017); 30 per cent of women aged 16-24 (born in the late 1980s to the late 1990s) in 2010-12 reported having sex by age 16 compared to 25 per cent of 25-34-year-olds (born in the late 1970s to the late 1980s) and fewer than 20 per cent of 35- to 44-year-olds (born in the late 1960s to late 1970s). Another study using Natsal, however, focused on women aged 16 to 19 and found

that the percentage reporting ever having vaginal sex declined between 1999-01 at 68 per cent to 65 in 2010-12, but that this reduction was statistically insignificant (Scott, Wellings and Lindberg, 2020). These two studies show how important it is to consider teenage-specific measures when possible. This research also suggests that the declines in teenage fertility are unlikely to be due to rapid declines in teenagers engaging in sex that could result in pregnancy.

2.6.3 Sexual frequency and teenage fertility decline

Another measure of sexual behaviour, much less used than even age at first sex, is the frequency of sex in a given time period. A study comparing the three Natsal surveys by Wellings et al. (2019) found that, while the proportion of women aged 16 to 24 who reported no sex in the previous month declined from 42.3 per cent in 1990 to 35.2 per cent in 2000 and 38.8 per cent in 2010-12, the proportions of women reporting that they had sex 10 or more times in the same period were 19.4, 25.0 and 17 per cent respectively. These trends create an image that while more young people are having sex in a month, they are doing so less often. However, the age range of 16 to 24 encompasses a wide range of young women and, until the study by Scott, Wellings and Lindberg (2020), the specific sexual frequency for teenagers in the Natsal surveys had not been reported separately. Scott and colleagues found that the percentages of women aged 16 to 19 (born in the early to mid-1990s) reporting ever having vaginal sex, being sexually active in the last 12 months, 6 months, and 4 weeks declined between 2000 and 2010-12. Importantly, while the frequencies of sexual intercourse declined, they only did so slightly and there does not appear to be a drastic reduction in sexual frequency amongst teenage women. Future work on this topic would be helpful to observe whether these trends have continued for the latest cohort of teenagers that were born in the late 1990s and 2000s.

2.7 Concluding the review of the literature and introducing the research aims

This chapter introduced and followed the organisation of the conceptual framework for the thesis. This literature review has discussed various factors associated with teenage fertility, conception, and abortion trends at the area level and the likelihood of becoming pregnant or becoming a mother at the individual-level. The trends in certain characteristics and behaviours across the period of study have been discussed in relation to past findings. This review is not exhaustive, and specific areas of past research are elaborated upon within the individual empirical chapters of this thesis where the discussions are more directly relevant.

This thesis contributes to the literature examined in this chapter by considering the exosystem/area-level factors associated with teenage fertility measures across a longer time frame, which involves contemporary trends. This thesis focuses on both conception rates and abortion ratios, where the latter have been largely neglected in the role of fertility decline. It also goes beyond past literature by considering a variety of exosystem measures beyond deprivation to investigate which specific area characteristics explain geographical variations and tests how the relationships change over time. This research also analyses and tests a frequently cited (but previously unanalysed) mechanism in the literature that is presented to be behind the links between area and teenage fertility: the educational expectations of teenagers. The macro-micro interaction between area educational characteristics and individual expectations are tested in this thesis.

The research questions for this PhD research are:

RQ1 - What is the contribution of teenage abortion ratios on teenage fertility decline?

RQ2 - How have teenage conception rates and abortion ratios varied between 1998 and 2017, and how are these variations related to area characteristics?

RQ3 -What are the associations between area characteristics of where young women live and teenage reproductive behaviour when considering a macro-micro perspective?

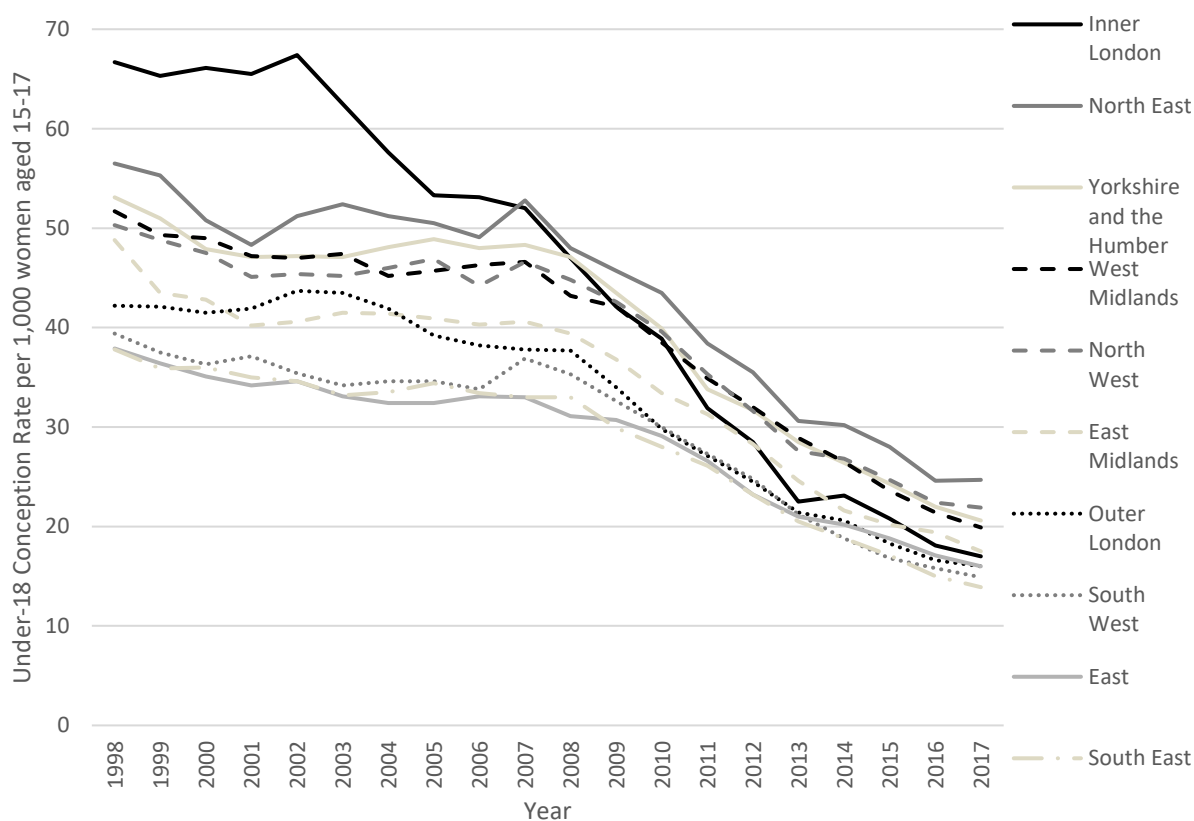
Chapter 3 Understanding the decline in under-18 conception rates throughout England's local authorities between 1998 and 2017

The research in this chapter has been published in *Health & Place* (Heap et al., 2020). The final published version is included here alongside additions which have been included in *italics*. Such additions also include appendices which include descriptive analyses, which elaborate on the research processes, and other relevant aspects of this chapter that were condensed for the journal paper.

3.1 Introduction

The decline in under-18 fertility rates in England has recently accelerated. Rates started at 27 births per 1,000 15-17-year-old women in 1998 and fell by around a quarter to 20 per 1,000 in 2008, but then halved in the subsequent eight years (to 9 births per 1,000 in 2017) (Office for National Statistics, 2019). This decline was primarily driven by reductions in conception rates (from 43 conceptions per 1,000 in 1998 to 18 per 1,000 in 2017) and, to a lesser extent, higher proportions of conceptions resulting in abortion (42% in 1998 to 52% in 2017). Whilst all English regions have seen a decline in under-18 conception rates, there are significant geographical differences in the levels and rates of decline. Northern regions have higher conception rates than southern regions (Figure 3.1). Inner London has much higher initial conception rates but a faster decline.

Figure 3.1 The Regional Under-18 Conception Rates in England, 1998-2017

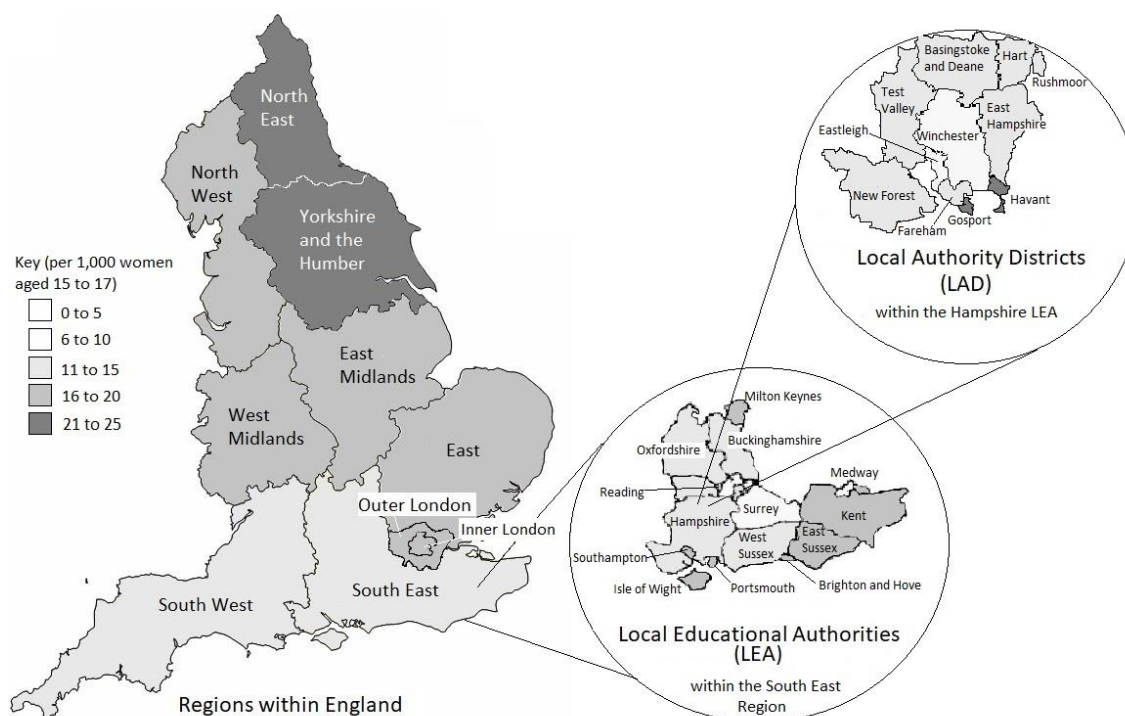


Although regional trends are clear, as presented in Figure 3.2, they condense heterogeneity at lower geographies such as Local Authority Districts (LADs) and may be explained by areas in regions having particular local area characteristics. This paper provides new insight into local *exosystem*/area-level characteristics associations with these differential rates of decline. It moves beyond existing work in several ways; firstly, much of the existing literature focuses on the 2000s (prior to the accelerated decline). Indeed, the nationally representative source of individual-level data on teenage sexual behaviour previously used to consider teenage fertility (Scott et al., 2020; Wellings et al., 2016) is nearly a decade old, necessitating our ecological approach. Secondly, multitudes of societal changes have occurred alongside the decline in teenage conceptions such as rising educational attainment and aspirations, growing populations of teenagers who are second- and third-generation Black and South Asian, and rising economic deprivation and youth unemployment around the 2008 economic recession. We specifically capture these measures regarding teenagers in conjunction with a wider range of socio-economic

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factors than hitherto examined, including the per capita local stock of state-subsidised social rented housing, and housing affordability. Thirdly, we use variables capturing teenage- and youth-specific changes in local authorities, such as the changing teenage ethnic composition. Finally, by using both random effects and fixed effects models we demonstrate how relationships between these area characteristics and under-18 conception rates have altered throughout 1998 to 2017.

Figure 3.2 A visualisation of the under-18 conception rate in 2017 across England with examples highlighting the hierarchical nature of the English geography



(Figure was created by the author using shape files from the ONS Open Geography Portal)

Past research has consistently found higher rates of teenage conceptions in more socio-economically deprived areas (Conrad, 2012; Diamond et al., 1999; Girma and Paton, 2015; McLeod, 2001; Uren et al., 2007; Wellings et al., 2016; Wright et al., 2016), whilst areas with larger proportions of non-White populations (at all ages) were found to experience higher rates of teenage conceptions (Blackman, 2013; Bradshaw et al., 2005). The generally higher conception rates found in urban areas have thus been explained by

accompanying higher levels of economic deprivation and ethnic diversity (Diamond et al., 1999, p. 199; McLeod, 2001; Wright et al., 2016). Past research highlighted educational attainment as a key factor associated with levels of teenage pregnancy at the individual (Crawford, Cribb, and Kelly, 2013; Wellings et al., 2016), school (Crawford, Cribb, and Kelly, 2013), and neighbourhood level (Girma and Paton, 2015; Paton and Wright, 2017). In local areas, educational attainment improvements were found to be the biggest predictor of a drop in teenage conception rates in the period 2004 to 2012 (Girma and Paton, 2015). Individuals attending schools with lower performance in results at age 15/16 have been found to have higher odds of conceiving by age 16, even after accounting for individual attainment (Crawford, Cribb, and Kelly, 2013). However, the individual-level Natsal data suggested a weakening relationship between educational attainment and the likelihood of teenagers experiencing a conception between 1999-2001 and 2010-2012 (Wellings et al., 2016).

A number of studies have attempted to quantify the impact of the 10-year governmental Teenage Pregnancy Strategy (TPS), which aimed to halve under-18 conception rates in England by 2010 by a national and local joined-up strategy aimed to improve access to contraception and sex and relationships education alongside a communications campaign for young people and their parents (Hadley, Ingham and Chandra-Mouli, 2017). Authors have suggested that the declines in under-18 conception rates were higher in areas receiving more TPS funding (Paton and Wright, 2017; Wellings et al., 2016; Wilkinson et al., 2006). However, we argue that it is not possible to precisely attribute reductions to the strategy for several reasons: Firstly, areas with higher initial levels of under-18 conception rates, and/or higher numbers of teenagers, received higher amounts of TPS funding grants (Hadley, Ingham and Chandra-Mouli, 2017). Furthermore, high conception rate areas with slower declines during the first half of the TPS received additional funding after the mid-course review (Hadley, Ingham and Chandra-Mouli, 2017). It is therefore difficult to disentangle the causal direction of associations between funding amounts and declines in teenage conceptions. Finally, the decline in teenage conception rates accelerated just at the point when the Government policy officially finished. Local authorities have taken different approaches since 2010 in the funding and nature of young adult sexual health provision, which is not captured in the earlier funding

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figures. Whilst some have argued for potential lagged effects of the policy (Hadley, Ingham and Chandra-Mouli, 2017) it also seems likely that these declines in teenage conception rates (which were mirrored, albeit less dramatically so, in many other high-income countries) could also be, at least partly, explained by broader changes in society beyond considering earmarked funding.

Factors – such as increased education – must work through more proximate variables (Bongaarts, 1978) like levels of teenage sexual activity and contraceptive use, to determine conception rates. The contribution of changes in contraception use and sexual activity in the decline of teenage fertility has been examined in the United States (Lindberg et al., 2018; Santelli et al., 2007) but are difficult to measure for the UK due to the lack of detailed comparative data. Wellings and colleagues found lower reported levels of sexual behaviour among men and women aged 16 to 24 in Britain in 2010-2012 compared to 1999-2001, but no data are available since that time (Wellings et al., 2019). Another study, by Scott and colleagues using the same representative data, found no difference in reporting of ever having had vaginal sex or the frequency of sexual activity within 16 to 19 year-olds between the surveys, which highlights how teenagers are distinctive within young persons and that declines in teenage conceptions may not be due to reductions in teenagers engaging in vaginal sex (Scott et al., 2020).

Teenagers can access Sexual Health Services (otherwise known as genitourinary medicine or GUM clinics, family planning, and reproductive health) alongside GPs for free in England, and the former are often located in easily accessible areas and are centres providing free contraception and testing for STIs, among other related services.

Throughout the TPS, condom access through the post, schools, or at sites throughout the community were introduced in various local areas (Hadley, Ingham and Chandra-Mouli, 2017). Overall, in Britain, condom use at first heterosexual sex has grown from around 80% of men and women aged 16-24 in 2010-2012 compared to 68% and 73% respectively in the older cohort aged 25-34 in 2010-2012 (Clifton et al., 2017). This other proximate determinant of teenage *conceptions*, contraceptive use, has limited data for England. Although the TPS promoted increased availability and uptake of reliable contraception (Connolly et al., 2014), measures of contraceptive pill or LARC (Long-Acting Reversible Contraception) uptakes are not available at the LAD level for teenagers or adults. Where

contraceptive use data is available for larger geographical areas, they do not include access from every setting (i.e. LARCS from GPs were the only measured setting until 2014), are often not teenage-specific, and do not cover an extensive time period before the 2010s. Nonetheless, in the most recently available nationally representative survey, teenagers aged 16 to 19 were significantly more likely to use LARCs in 2010 to 2012 (13%) than in 1999 to 2001 (1%) (Scott et al., 2020). Whilst Girma and Paton (2015) did not find LARC uptake to be significantly associated with declines in teenage conception rate, they did not use youth-specific uptake.

The UK government also introduced access to over-the-counter emergency hormonal contraception or 'the morning after pill' in 2001 (access without a doctor's prescription) (Ashraf and McCarthy, 2000) but have not measured the variation in the local use. Therefore, the only available measures of emergency contraception from Sexual and Reproductive Health Services do not capture most emergency contraceptive use. Whilst Black and colleagues found a slight increase of reported emergency contraceptive use during the previous year amongst sexually active females aged 16 to 24 from 1999-2001 (5.2%) to 2010-2012 (7.1%), this study does not include more recent years (Black et al., 2016).

The contexts of young people's lives have changed in other ways that may have impacted on local area variations in conception rates. Certain areas, especially London, experienced rapidly declining housing affordability and gentrification in the 2000s and 2010s. These gentrified areas experience the arrival of middle class (often White British) renters and homeowners (Paccoud et al., 2021) who may replace populations with traditionally higher teenage conception rates. Youth unemployment rose following the 2008 recession, particularly in the Midlands and North East of England. Economic recessions are often associated with fertility postponement (Sobotka et al., 2011) and, much like older groups, such uncertainty may motivate teenagers to avoid pregnancy. This rise in youth employment precariousness occurred alongside rising barriers to leaving the parental home (Fox, 2009). A transition to adulthood through experiencing residential independence has become more difficult for young people through declining housing affordability alongside country-wide reduced social (state-subsidised) housing and housing benefit cuts.

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Aspirations for education or a career provide reasons for young people to want to avoid pregnancy and educational participation is associated with later childbearing throughout Europe (Neels et al., 2017). Government policy increased the minimum age of leaving education or training from age 16 to age 17 from 2013 and age 18 from 2015, which is towards the end of our time period. Young persons can leave school at 16 but must remain in full-time education, enter an apprenticeship or traineeship, or spend at least twenty hours a week working or volunteering whilst being in part-time education or training until participation leaving age. Higher proportions of young adults now remain in education beyond this participation age (Universities UK, 2018), reflecting rising aspirations for university. There were improvements in educational attainment in the 2000s, which varied by region (Greaves et al., 2014) and rapidly amongst certain ethnic groups (Berrington et al., 2016; Strand, 2015). In a study of a cohort of teenagers who took their GCSEs in 2008, all ethnic minority groups had a higher probability of attending university than White British teenagers (Crawford and Greaves, 2015). Larger urban areas have become increasingly ethnically diverse, with London LADs' mean percentages of South Asian teenagers growing from 14.9 per cent in 1998 to 19.6 per cent in 2017, and Black teenagers from 16.9 per cent to 21.5 per cent. While historically Pakistani, Bangladeshi, and Black Caribbean teenagers displayed higher rates of young childbearing (Dubuc and Haskey, 2010), the limited available evidence suggests that childbearing is being postponed among all ethnic groups (Berrington, 2020). High numbers of second and third generation teenage ethnic minority populations in local areas may now represent a larger group of young women avoiding teenage pregnancy and contributing to reducing teenage pregnancy rates.

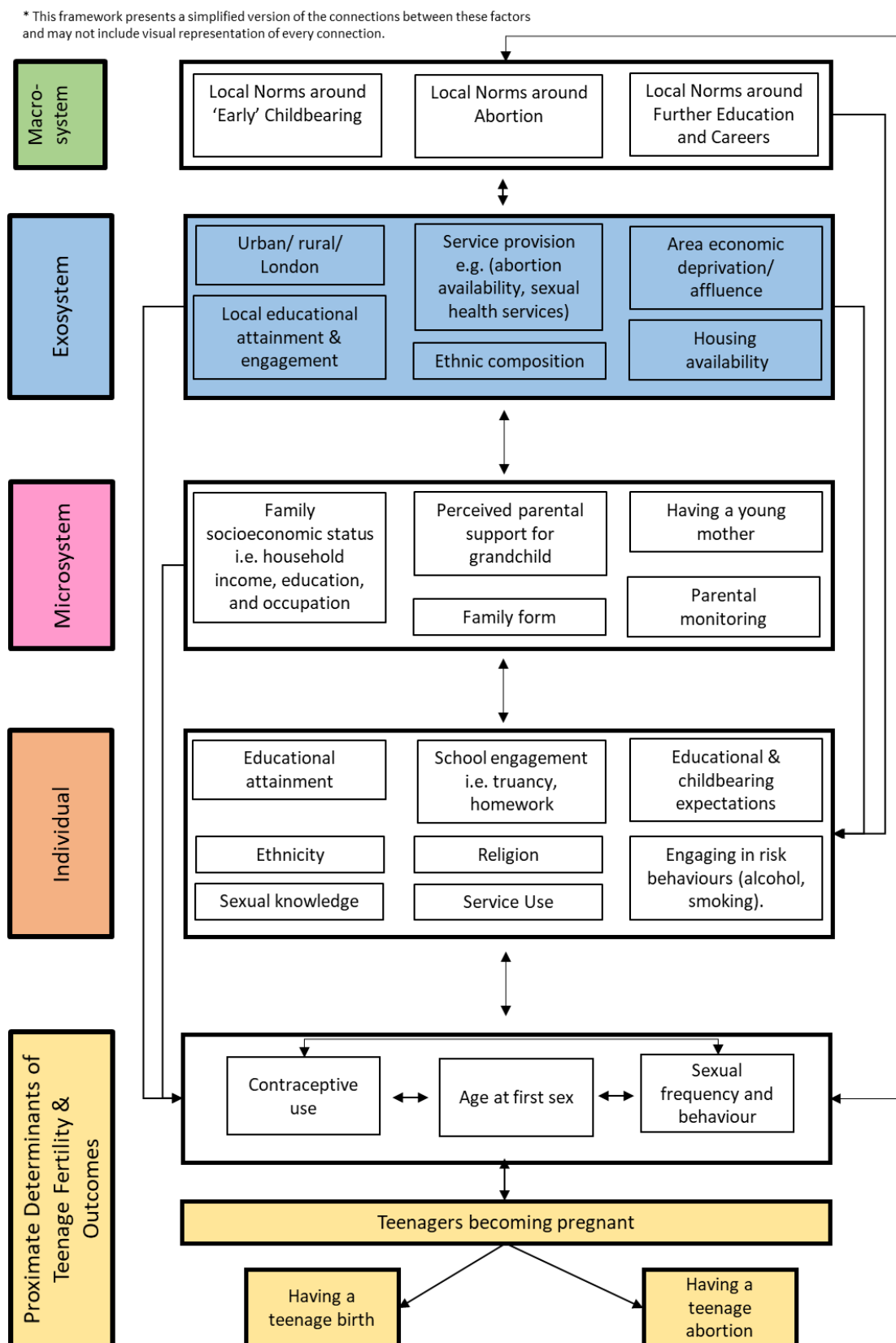
3.1.1 Conceptual framework

The first empirical paper aims to examine the exosystem/area-level factors that explain why certain areas in England have higher conception rates than others, and how these relationships and rates have varied over time. Figure 3.3 outlines the conceptual framework for this paper, which details factors at multiple levels that have been considered to be associated with teenagers becoming pregnant. To make it clearer, the

variables that are not available to be measured in the analysis in this chapter are included in white. This empirical chapter considers the variation of conception rates by exosystem/area-level factors and we use aggregate measures for economic and educational area deprivation, housing availability, and ethnic composition alongside whether an area is urban or rural, to consider whether these relationships exist throughout the 2000s and 2010s.

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Figure 3.3 The conceptual framework for the thesis, where the variables that are available for the analysis in the first empirical chapter are in colour



3.1.2 Aims

This paper identifies factors that explain geographical differences in teenage conceptions and the differential rates of decline between 1998 and 2017.

The research questions are:

1. To what extent do Local Authority District characteristics explain geographical differences in under-18 conception rates, and have these relationships changed between 1998 and 2017?
2. How are *changes* in Local Authority District characteristics associated with the *changes* in under-18 conception rates throughout the period from 1998 to 2017?

3.2 Methods

The mean and range of the time-varying explanatory variables by area and time period, alongside their sources, are shown in Table 3.1. The conception statistics for under-18s in LADs are rates per 1,000 15-17-year-old women published by the Office of National Statistics. The conceptions are calculated using the total numbers of conceptions from live births and stillbirths¹³ and the number of registered (and therefore legal) abortions¹⁴, whereby the estimated age *at* conception is determined by the estimated date of conception and the woman's date of birth. Four of the 326 LADs have been combined into two (Isle of Scilly with Cornwall, and the City of London with Hackney) in

¹³ Pregnancy losses (miscarriages/spontaneous abortions) are not included in these official statistics due to the difficulty of recording them, particularly as individuals may be unsure if they experienced a pregnancy loss. It is estimated that, for all ages, one in five pregnancies end prematurely but only one in eight realise and/or report this as a miscarriage (Tommy's, 2020).

¹⁴ Emergency contraception is not included in these statistics as numbers of conceptions that would have occurred without use cannot be known and, in any case, such use cannot readily be attributed to a specific geographical area.

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the original conception statistics dataset due to small numbers. Therefore, for this analysis, the values for Hackney or Cornwall are taken to represent the merged LADs for the explanatory variables (unless the combined value is available). Boundary changes are addressed by assigning the values from historical geographies to current areas.

The main level of geography used in this paper is Local Authority District (LAD), which is an administrative district for local government that includes London boroughs and Unitary Authorities (often cities). As presented in Figure 3.2, Local Authority Districts are smaller than Local Education Authorities (LEAs) and are the level of geography for which school-related public figures are released. For urban areas which are Unitary Authorities like cities, the LEA and LAD level are often the same (i.e., Portsmouth, Southampton, and Brighton and Hove in Figure 3.2). For less populated areas, LADs fall into larger LEAs (i.e., Hampshire). Explanatory variables measured for the 152 Local Education Authorities are applied to their respective LADs.

Although we are interested in explaining the regional differences, region cannot be included in the model alongside measuring urban/rural due to high correlations. We merged two measures to capture the urban/rural differences alongside the largest regional differences between London and the rest of England. We use the 2001 and 2011 urban/rural classification categorical measures from the Department for Environment, Food & Rural Affairs ranging from most urban LADs 'Major Urban' to most rural 'Rural-80' LADs. As all the London LADs are in the Major Urban category and, due to London's distinctiveness, two additional categories are used to represent Inner London and Outer London. To check whether London influences the associations found, sensitivity analyses compare the models with and without London in Table B.2 and Table B.3.

Multi-dimensional indices of deprivation were traditionally often used to consider the relationships between area-level deprivation and England's teenage conception statistics (Conrad, 2012; McLeod, 2001; Uren et al., 2007). Whilst such indices, such as the nationally produced governmental English Index of (Multiple) Deprivation (McLennan et al., 2019), aim to capture a well-rounded measure of socio-economic deprivation (for example, from economic disadvantage to housing deprivation to local environment quality), the specific relationships between the outcome and the particular aspects of

deprivation are not able to be considered. *Domains of the IMD such as the income deprivation domain collate multiple measures for each aspect of deprivation but are more specific than the overall IMD, but these statistics are not calculated every year.* Rather than using standard multi-dimensional indices of deprivation, we therefore identify which specific component(s) are most closely associated with under-18 conception rates. *Studies have considered which aspects of deprivation are associated with under-18 conception rates but they were conducted in the 1990s* (Bradshaw et al., 2005; Diamond et al., 1999). Another reason for using specific measures is that they are also available year-on-year, meaning temporal changes can be captured, compared to large-scale indices which are often updated less often. LAD youth unemployment rates are measured by the proportion of the 18 to 24-year-old male and female population claiming Jobseeker's Allowance (JSA). We also considered the percentage of state-funded secondary school pupils in the LAD eligible for free school meals as a measure of economic hardship but found JSA to explain more model variation. *The decision-making process for the economic deprivation measure is discussed further in Appendix A and the regression models with FSM rather than Jobseeker's Allowance are presented in Table B.2 for the random effect models, and Table B.3 for the fixed effect models.*

Educational attainment is measured by the percentage of students receiving five 'passes' (A* to C) in their nationally standardised General Certificate of Education (GCSE) results. Extrapolation has been used for 2016 and 2017 due to changes in grading. Due to this extrapolation and missing data in 2005, which have been filled from interpolation, we perform sensitivity analyses using LAD-level attainment at age 11 (KS2) where results at age 11 are assigned to the year when teenagers would be 16. Additionally, as GCSE results (at age 16) may be negatively affected or even disrupted by teenage pregnancy/parenthood, in certain areas where this is common our measure of GCSE attainment may be biased compared to areas with little teenage pregnancy and so comparing the attainment at age 11 ensures a robust interpretation. Results are generally unaltered and *are presented in Table B.2 for the random effect models, and Table B.3 for the fixed effect models*; there is evidence of the correlation between results at age 11 and 16 beyond our research (Benton and Sutch, 2014) *and in Figure A.2.*

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Areas with high house prices also have higher rent prices, although rent-price ratios vary by area affluence (Clark and Lomax, 2019). This paper considers housing unaffordability to represent the ease in which young people in the area can establish their independent living, but also the exclusion of lower income groups over our time period.

The decisions behind why this measure of house price is used is discussed further in Appendix A. We capture housing unaffordability by the ratio of median house price to the overall earnings of those working in that LAD from the Office for National Statistics (ONS). We measure the availability of social housing per capita to represent the other side of housing availability through public provision by dividing the stock of social housing for each LAD from the Ministry of Housing, Communities & Local Government, by the total number of adults aged 18 and over from the ONS estimates.

The UK has a growing number of second (and third) generation Black and Asian teenagers, *so we wanted the ethnic composition to be teenage-specific.* To examine the ethnic diversity of teenagers in LADs, rather than completely grouping non-White populations, we utilise individual percentages of Black (Black Caribbean, Black African, Black British, and Black Other), and South Asian (Pakistani, Bangladeshi, and Indian) pupils within state-funded secondary schools. These measures are collected annually and so, unlike previous work, our models can control for year-on-year ethnic composition changes. A sensitivity analysis compared these state-funded ethnic composition variables to the 2011 Census resident teenage ethnic composition and found high correlation (*presented in Figure A.2*).

To control for the TPS, we use the local amounts of TPS funding from 1999 to 2010 (made available to us by the Department for Education) by creating annual per head amounts from dividing by the female 13- to 17-year-old population estimates by the ONS. Due to the lack of data on local authority funding dedicated to teenage pregnancy reduction after the official ending of the TPS, the values for 2011-2017 are coded as zero (although it is acknowledged local spending may have continued in certain areas). No data is available at the LAD level about frequency of sexual intercourse, quality of sexual education, or teenage-specific contraceptive use.

The time periods represent the different phases of teenage conception rate decline and the TPS. The baseline year, 1998, is pre-TPS and needs to be separate due to having zero values for the TPS funding. The subsequent categories are from 1999 to 2005, 2006 to 2010, and 2011 to 2017. The cut-off point, 2005, was chosen because of the more rapid decline in the late 2010s and to represent the second-half of the TPS after the mid-course review in 2005 where interventions occurred in areas not achieving their targets (Hadley, Ingham and Chandra-Mouli, 2017). Post-TPS is represented by 2011 to 2017.

3.2.1 Analytical strategy

This work was exempt from ethical approval, per the University of Southampton's ethical regulations, due to the aggregate data. *Extensive descriptive analyses of the relationships between under-18 conception rates and area characteristics were conducted before the modelling and are presented in Appendix B.* We use two types of modelling to address two aspects of change. The approach for research question one considers whether changes in the specific relationships between area characteristics and conception rates have occurred and can explain areas becoming more similar (i.e., more recently, the level of youth unemployment has a smaller relationship/coefficient with conception rates than the earliest period). For the second research question, the models consider whether actual changes in area characteristics over time are related to the conception rate change over time (i.e., declines in teenage conceptions are changing at a similar pace to youth unemployment reduction).

Random intercept models address research question 1 and consider relationships between the outcome of teenage conception rates by LAD with the LAD characteristics. These models capture the *between* and *within* LAD variation and are used to view the changing associations between the covariates and the repeated annual conception rates from 1998 to 2017. For the random effect models, Model 1 considers the variation in under-18 conception rates when only controlling for the time period and urban/rural location. Model 2 additionally includes unemployment, educational attainment, ethnic composition, housing availability and TPS funding. By comparing the coefficients, we can see how much variation by rurality is explained by the additional LAD characteristics. The

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LAD-level characteristics are interacted with time period to explore if these relationships alter through time.

The second research question only focuses on change *within* LADs over time irrespective of the differences between areas. For our second research question, fixed effect linear regression models are used to view the variation *within* LADs' under-18 conception rates from 1998 to 2017. Fixed effect models control for the time constant unobserved heterogeneity between the subjects (LADs) and so, unlike random intercept models, can focus only on change. These models focus on *change* in both the explanatory and outcome variables through time, meaning time-constant variables like urban/rural cannot be included in the model. For the fixed effect analyses we include three models. The first two models include the whole time period 1998-2017, whilst the third just 1998-2010. The different time periods are because, in the first two models, TPS funding at the LAD level is not included as the values post 2010 are effectively zero due to no available data on post-TPS dedicated funding by LAD. In Model 3 we include the value of TPS funding until 2010.

We have also applied these models without London LADs for the random effect models (Table B.2) and the fixed effect models (Table B.3) to check if their particular characteristics influence the overall models.

3.3 Results

To show the changing LAD characteristics over time, Table 3.1 presents the mean and range of each time-varying variable in 1998, 2005, 2010, and 2017 (to match the time periods) in London LADs and LADs in the rest of England excluding London. The mean values of the LAD characteristics for each urban/rural category for 1998 and 2017 are presented as an appendix in Table B.1. The mean percentage of 18-24-year-olds claiming Jobseeker's Allowance reduced from 1998 to 2005 in London and the rest of England, but rose again by 2010, most likely due to the 2008 financial crisis. The mean educational achievement in LADs grew, whereby less than half of teenagers were achieving five A* to C grades in 1998 but increased to over three-quarters of teenagers achieving this in 2010,

with this mean later decreasing. Social housing per capita has declined across England alongside a growth in the median house price to workplace earnings measure of housing unaffordability. The mean percentages of the population that are Black and South Asian have consistently grown, but in 2017 there remain much higher percentages of Black teenagers in London LADs at 21.5 than the rest of England at 1.9, and South Asian teenagers at 19.6 and 6.0 respectively.

Table 3.1 Summary statistics of the time-varying variables in LADs in London and the rest of England, 1998 and 2017

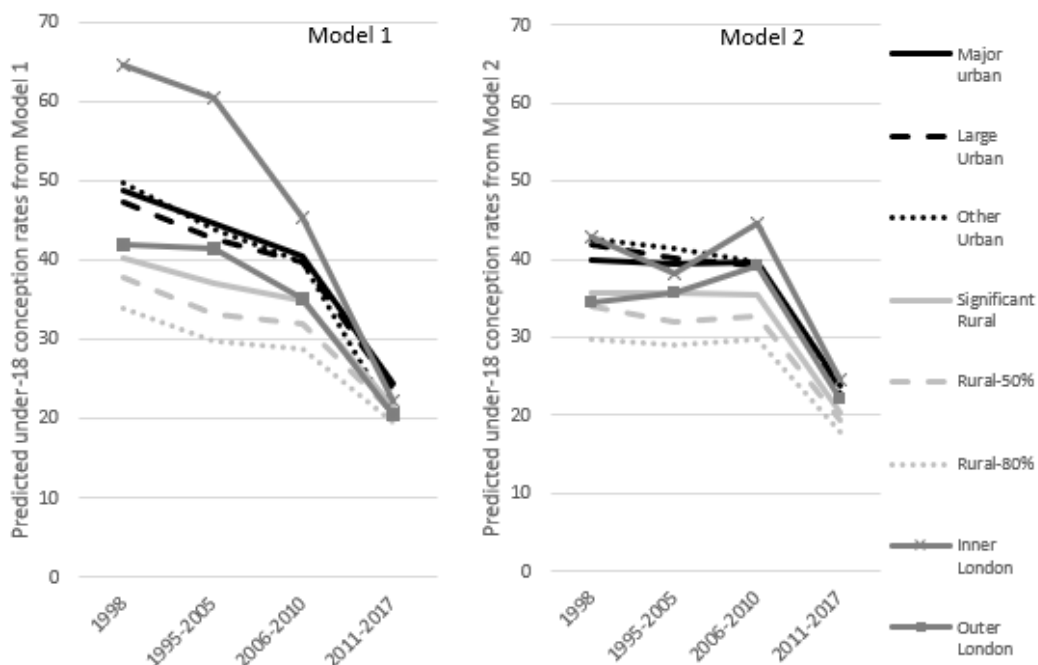
Variable name with sources as footnotes	Mean value across LADs (lowest value – highest value)							
	England excluding London				Inner and Outer London			
	1998	2005	2010	2017*	1998	2005	2010	2017*
Under-18 conception rate per 1,000 15-17-year-old women ^a	42.6 (16.0 – 84.6)	37.5 (12.3-84.8)	32.1 (7.6-63.7)	17.0 (4.5-43.8)	51.1 (23.1-87.2)	43.8 (20.8-77.1)	32.9 (17.4-51.1)	15.9 (6.6-25.1)
% claiming Jobseeker's Allowance among the 18-24-year-old population ^b	5.9 (1.0-18.8)	1.7 (0.5-5.1)	3.1 (1.3-7.9)	0.7 (0.0-2.8)	6.5 (2.0-14.4)	3.2 (1.4-5.3)	3.8 (1.8-5.6)	0.8 (0.1-1.5)
% of Pupils Attaining at least 5 GCSEs A*-C ^c *	46.8 (23.7-61.4)	56.0 (39.5-67.4)	75.6 (63.7-86.9)	65.6 (45.3-78.1)	39.9 (23.3-59.0)	54.5 (41.7-70.1)	77.9 (64.0-92.4)	70.3 (60.7-80.9)
Median House Price to Workplace Earnings Ratio ^d	4.0 (1.9-9.4)	7.2 (2.4-11.9)	7.2 (3.3-14.0)	8.5 (2.7-18.0)	5.1 (2.6-11.9)	8.8 (6.1-17.1)	9.8 (5.9-24.3)	15.8 (9.68-40.7)
Total Number of Social Housing Units for each LAD per 100 people (18 and over) ^e	7.2 (0.0-20.4)	4.2 (0.0-16.8)	3.2 (0.0-15.9)	3.5 (0.0-14.4)	11.3 (0.0-28.4)	8.1 (0.0-21.3)	6.7 (0.0-17.8)	5.7 (0-15.4)
% Pupils in Secondary Schools which were Black ^f	0.9 (0.1-9.0)	0.9 (0.0-9.3)	1.3 (0.1-12.3)	1.9 (0.1-16.6)	16.9 (1.7-51.7)	19.8 (3.9-52.8)	21.4 (4.1-48.3)	21.5 (4.0-46.4)

Variable name with sources as footnotes	Mean value across LADs (lowest value – highest value)							
	England excluding London				Inner and Outer London			
	1998	2005	2010	2017*	1998	2005	2010	2017*
% Pupils in Secondary Schools which were South Asian ^f	3.2 (0.1-33.7)	3.4 (0.1-43.4)	4.4 (0.1-46.4)	6.0 (0.3-51.8)	14.9 (1.8-55.5)	16.3 (1.9-56.8)	17.6 (3.1-61.7)	19.6 (4.4-69.7)
<p><i>*In this table, the 2015 values for GCSE attainment have been taken for 2017 due to grading changes.</i></p> <p>Data sources: A – Conception tables from the Office for National Statistics.(3) B - Official Labour Market Statistics from the Office for National Statistics. C - GCSE and equivalent results in England from the Department for Education. D - House price to workplace-based earnings ratio from the Office for National Statistics. E – Ministry of Housing, Communities & Local Government, and population estimates from the Office for National Statistics. F - Schools, pupils and their characteristics tables which are derived from the School Census.</p>								

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The coefficients in Model 1 Table 3.2 follow the pattern in Figure 3.1, whereby reductions in conception rates are greatest during the most recent period. More rural LADs have lower under-18 conception rates; the most rural LADs have conception rates 15 per 1,000 women lower than the more urban non-London LADs in 1998. The consistent differences between the urban/rural conception rates were significantly reduced after including the LAD characteristics. This is shown in Figure 3.4, whereby the differences in the predicted under-18 conception rates in Model 2 for each urban/rural category are much smaller than in Model 1, suggesting variation between the rural LADs and the more urban non-London LADs are partly explained by characteristics. The characteristics of LADs in rural areas are more likely to include lower proportions of youth unemployment, higher educational attainment, lower per capita social housing, lower proportions of Black and Asian teenagers, and higher housing unaffordability, than urban (non-London) LADs (*this is presented in Table B.1 of Appendix B*).

Figure 3.4 The comparison of the predicted under-18 conception rates from the interaction between the urban/rural and time period from Model 1 and 2 of the random effect models, between 1998 and 2017 in England



To calculate the predicted under-18 conception rates in Model 2, the overall mean value has been used for each continuous explanatory variable: JSA 4.5, GCSE 62.3, House Price 7.0, Social Housing 4.5, % Black 3.1, % S. Asian 5.4, TPS 1998 & 2011-2017 0, TPS 1999-2010 7.8

LADs in Inner London have much higher under-18 conception rates than the most urban non-London LADs in 1998, and rates drop significantly across the period in Model 1. If we compare Model 1 and Model 2, coefficients for Inner London are no longer significantly different from the most urban non-London LADs after including characteristics. The speed of the decline is also no longer faster in Inner London. This suggests Inner London's distinctive trend is due to the changes in socio-economic circumstances, ethnic composition, and housing availability in these boroughs. In contrast, Outer London LADs have lower conception rates in 1998 and controlling for LAD characteristics largely eliminates the distinction to most urban non-London LADs post-2006.

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LAD-level deprivation is associated with higher conception rates. As the JSA and Free School Meal measures are correlated, we used the measure which explained more variation. In 1998, each additional percentage of 18 to 24-year-olds claiming for JSA is associated with a 0.89 increase in conception rates, which changes to 0.59 (0.89 for 1998 minus 0.30 for the time interaction) between 2006 and 2010. Therefore, each unit of JSA predicts a higher rate of teenage conceptions in 1998 to 2005 and 2011 to 2017 compared with 2006 to 2010.

Higher housing unaffordability and less social housing availability are significantly associated with lower conception rates, with this effect weakening through the period. We find mainly weak (negative) relationships between LAD educational attainment and teenage conception rates, apart from a large negative interaction effect (-0.48) with GCSE attainment in 2006-2010. So, each unit of GCSE attainment has a higher predictive ability for under-18 conception rates in 2006-2010, whilst other variables like JSA, housing affordability, or social housing have smaller effects. Due to this large interaction, during model building we found that including this interaction between time and educational attainment in Model 2 changes the overall time coefficient for 2006-2010 from a negative to 26.07. The other relationships in Model 2 were unchanged after including this interaction and, when predicted values are calculated, this positive coefficient for 2006-2010 is largely offset by the coefficient from the interaction between 2006-2010 and education.

Ethnic diversity is associated with rates of teenage conceptions, but this changes across the period. In 1998, each percentage increase in Black teenagers is associated with a 0.51 higher conception rate, but this coefficient declines to become small and negative or close to zero in 2006 to 2017 (Model 2). Teenage conceptions are lower in LADs with higher proportions of South Asian teenagers, with significant coefficients from 1999 to 2010. Without London, the association between more Black or South Asian teenagers and conception rates largely disappear.

The amount of received TPS funding was allocated using pre-TPS rates of teenage conceptions and if areas had a high population of young people, therefore areas with higher initial rates received more TPS funding (Hadley, Ingham and Chandra-Mouli, 2017).

The results in Table 3.1 reflect that this remains the case even after controlling for LAD characteristics and does not vary over time.

The σ_u captures the between-LAD variation not explained by the model; thus, including the LAD characteristics partly explains between-LAD variation as it is 8.43 pre- and 4.28 post-controls. The within-LAD variation, σ_e , reduces from 5.82 to 4.83 post-controls. Therefore, the larger σ_u reduction demonstrates that LAD characteristics are better at explaining why areas have higher/lower conception rates than the within-LAD temporal changes.

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Table 3.2 The random intercept models of the relationships between Local Authority District under-18 conception rates and the Local Authority District characteristics, between 1998 and 2017 in England

VARIABLES	Model 1 Rurality and time Period Only	Model 2 Rurality, time period, and area characteristics
Time Period (Ref. = 1998)		
1999-2005	-4.21 ***	2.12
2006-2010	-8.20 ***	26.07 ***
2011-2017	-23.17 ***	-23.01 ***
Urban/ Rural Measure (Ref. = Major Urban)		
Large Urban	-1.33	2.12
Other Urban	1.08	2.93 **
Significant Rural	-8.48 ***	-4.11 ***
Rural-50%	-10.99 ***	-5.90 ***
Rural-80%	-14.83 ***	-10.00 ***
Inner London	15.90 ***	3.60
Outer London	-6.85 **	-5.44 **
Urban/Rural Interactions with Time Period		
Large Urban * 1999-2005	-0.60	-1.22
Large Urban * 2006-2010	0.55	-2.66 *
Large Urban * 2011-2017	0.59	-2.41 *
Other Urban * 1999-2005	-1.64	-0.93
Other Urban * 2006-2010	-1.88	-2.86 **
Other Urban * 2011-2017	-5.51 ***	-3.82 **
Significant Rural * 1999-2005	1.07	0.56
Significant Rural * 2006-2010	2.81 **	-0.19
Significant Rural * 2011-2017	5.55 ***	0.60
Rural-50% * 1999-2005	-0.45	-1.34
Rural-50% * 2006-2010	2.56 *	-0.95
Rural-50% * 2011-2017	7.29 ***	1.57
Rural-80% * 1999-2005	0.05	-0.22
Rural-80% * 2006-2010	3.22 **	0.02
Rural-80% * 2011-2017	9.82 ***	4.04 ***
Inner London * 1999-2005	-0.04	-4.22
Inner London * 2006-2010	-11.15 ***	1.87
Inner London * 2011-2017	-18.21 ***	-2.35
Outer London * 1999-2005	3.84 **	1.94
Outer London * 2006-2010	1.57	4.89 **
Outer London * 2011-2017	2.86	3.77 **
% of 18-24 year-olds claiming Jobseeker's Allowance		
1999-2005 * Jobseekers Allowance		0.14
2006-2010 * Jobseekers Allowance		-0.30 *
2011-2017 * Jobseekers Allowance		0.03
% of Pupils Attaining at least 5 GCSEs A-C		
		0.08

VARIABLES	Model 1 Rurality and time Period Only	Model 2 Rurality, time period, and area characteristics
1999-2005 * GCSE		-0.20 ***
2006-2010 * GCSE		-0.48 ***
2011-2017 * GCSE		0.00
Median House Price to Workplace Earnings Ratio		-1.78 ***
1999-2005 * Housing Unaffordability		1.24 ***
2006-2010 * Housing Unaffordability		0.99 ***
2011-2017 * Housing Unaffordability		1.58 ***
Total Number of Social Housing Units for each LAD per 100 people (18 and over)		0.43 ***
1999-2005 * Social Housing		-0.12
2006-2010 * Social Housing		-0.30 ***
2011-2017 * Social Housing		-0.47 ***
% Pupils in Secondary Schools who are Black		0.51 ***
1999-2005 * % Black		-0.02
2006-2010 * % Black		-0.49 ***
2011-2017 * % Black		-0.54 ***
% Pupils in Secondary Schools who are South Asian		-0.01
1999-2005 * % South Asian		-0.12 **
2006-2010 * % South Asian		-0.15 ***
2011-2017 * % South Asian		-0.07
TPS Funding per each Female aged 13-17		0.23 ***
2006-2010 * TPS Funding (REF. = 1999-2005)		0.00
Constant	48.70 ***	39.78 ***
<u>Random Effects</u>		
Between LAD variation	8.43	4.28
Within LAD variation	5.82	4.83
Rho	0.68	0.44
<u>R-squared</u>		
Within	0.68	0.78
Between	0.34	0.72
Overall	0.49	0.72
*** p<0.01, ** p<0.05, * p<0.1		

Table 3.3 presents the fixed effect models which examine how changes in LAD characteristics relate to changes in under-18 conception rates when controlling for characteristics which are unaltered over time. Therefore, these fixed effect models can test whether the change in under-18 conception rates within LADs have followed the same trends in these variables like unemployment. Model 1 presents the average decline in conception rates in each LAD *before* controlling for the variation in LAD area

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characteristics over time. When compared to our reference period (1998 to 2005), the difference in the decline in conception rates was larger in 2011 to 2017 at -17.59 than in 2006 to 2010 at -3.73.

As Model 2 considers the within-LAD changes in characteristics over time, the comparison to Model 1 illustrates that the large decline in conception rates between 2011 and 2017 compared to 1998 to 2005 is only partly explained by controlling for changes in LAD characteristics, the time coefficient reducing from -17.59 (Model 1) to -10.03 after controls (Model 2). Reductions in area economic deprivation are associated with decreases in conception rates by 1.37 for each percentage of 18 to 24-year-olds claiming JSA. Increasing *educational attainment* is related to declining conception rates. House prices growing more unaffordable are associated with falling conception rates in the LAD. Each increase of social housing units per 100 people is associated with increased conception rates by 0.41. Increases in the percentages of Black teenagers or South Asian teenagers are associated with reduced conception rates by 0.31 and 0.55 respectively. *Most of the signs of the relationships between the area characteristics and conception rates are the same in both the random effects models and the fixed effect models. Having the same signs in both models mean that, for example, areas with a higher prevalence of Jobseeker's Allowance claimants have higher conception rates but also that growth in these claimants is associated with growing conception rates. The exception is the measure for the percentage of Black pupils in the area which had a positive sign in the random effect models but a negative sign in the fixed effect models. This different sign is likely because the percentage of Black pupils became insignificant from 2006 in the random effect model.*

Model 3 considers only 1998-2010 to be able to control for TPS funding alterations alongside changes in LAD characteristics, where increased TPS funding is related to larger reductions in conception rates. Areas not on track to achieve their reduction targets were given additional funding and support after the mid-course review in 2005 (Author et al., 2017), which may explain why each increase of TPS funding in a LAD by one pound per female aged 13-17 is associated with a -0.12 reduction in the conception rate.

Table 3.3 The fixed effect models of the relationships between Local Authority District under-18 conception rates and the Local Authority District characteristics, between 1998 and 2017 in England

VARIABLES	Model 1 Time period only - 1998-2017	Model 2 Time period, and area characteristics (without TPS funding) - 1998-2017	Model 3 Time period, and area characteristics (with TPS funding) - 1998-2010
Time Period (Ref. = 1998-2005)			
2006-2010	-3.73 ***	-0.64 **	1.25 ***
2011-2017	-17.59 ***	-10.03 ***	
% of 18-24 year-olds claiming Jobseeker's Allowance		1.37 ***	0.13
% of Pupils Attaining at least 5 GCSEs A-C		-0.18 ***	-0.29 ***
Median House Price to Workplace Earnings Ratio		-0.19 ***	-0.06
Total Number of Social Housing Units for each LAD per 100 people (18 and over)		0.41 ***	0.13 **
% Pupils in Secondary Schools who are Black		-0.31 ***	-0.26 **
% Pupils in Secondary Schools who are South Asian		-0.55 ***	-0.16 **
TPS Funding per each Female aged 13-17			-0.12 ***
Constant		44.42 ***	55.63 ***
Random Effects			
σ_u Between LAD variation	10.54	9.63	12.81
σ_e Within LAD variation	6.44	5.72	5.13
Rho	0.73	0.74	0.86
R-squared			
Within	0.61	0.69	0.22
Between	0.00	0.16	0.00
Overall	0.29	0.40	0.02
*** p<0.01, ** p<0.05, * p<0.1			

3.4 Discussion

This analysis explored the relationships between the characteristics of England's LADs with their spatially varying under-18 conception rates over a 19-year period, and how they altered between 1998 and 2017. England has experienced recent transformations in the contexts teenagers grow up in so we examined whether quantifiable societal changes within local authorities can account for the differential declines in conception rates.

We found differences in teenage conception rates by whether local areas were urban or rural. Humby (2013) examined the variation in teenage conception rates in 2008 and 2010 by the urban/rural classification used by the ONS, which was also used in the analyses in this research. The work by Humby (2013) found that these urban/rural classifications did not explain a high percentage of the variation in under-18 conception rates (at under 25 per cent) and noted how this was an interesting finding given that there had been consistent differences in conception rates in urban areas over time. The analyses in this chapter did find significant differences in teenage conception rates by whether the local area was urban or rural, particularly by whether a local area was in London which had very different experiences of both teenage fertility measures. The lack of variation in teenage conceptions explained by the urban/rural categorisation used in Humby (2013) may be due to Humby not differentiating between the most urban areas and London. The local authorities in Inner London had much higher initial rates of teenage conception rates in the 1990s and early 2000s, but these higher conception rates disappeared when controlling for the area characteristics. This is consistent with the finding by McLeod (2001) in which the 1980s and 1990s teenage pregnancy rates in Scotland were higher in urban areas, but controlling for the level of deprivation removed this effect.

Whilst most of the relationships between LAD characteristics and conception rates continued throughout the period, the size of the coefficients/effects altered. For example, we found areas with higher youth unemployment still had higher rates of teenage conception than their less deprived counterparts, but that area-level unemployment rates had larger effects between 1998 and 2005 and 2011 and 2017 compared to between 2006 and 2010. *This weakening effect of deprivation was also found when considering the*

association between deprivation and under-18 conception rates when comparing the 1999-01 to the 2010-12 individual-level Natsal surveys (Wellings et al., 2016). We also discovered weakening coefficients between conceptions and housing unaffordability, and time-varying relationships with educational attainment and ethnic diversity. *While the weakened effect of the youth unemployment measure appeared to be temporary for 2006 to 2010, most likely due to the economic recession, the weakening of housing and ethnic composition measures continued until 2017.* These changing relationships are evidence that areas with contrasting characteristics became less diverse in terms of their teenage conception rates.

In the random effect models, the area characteristics were better able to explain the differences in conception rates *between* LADs as opposed to the within-LAD *changes* over time, and the majority of these within-LAD changes were not even explained in the fixed effect model. Changes in teenage conception rates are, thus, not only due to the contextual societal changes that we could measure but from other factors that could not be captured by this paper. Nonetheless, of the change *within*-LADs that was explained by the characteristics in the fixed effect models, larger declines in local authority under-18 conception rates were related to areas experiencing *growing* Black or South Asian teenage populations, *less* youth unemployment, *more* educational attainment, *increased* housing unaffordability, and reductions in social housing availability. Most of the relationships had the same direction in the random and fixed effect models, with exceptions being the prevalence of Black teenagers and TPS funding.

We went beyond past works that had used more imprecise measures of ethnic composition. Areas with higher proportions of South Asian pupils had lower conception rates throughout 1998-2017. This may be due to later sexual debut by Pakistani and Indian teenagers (Fenton et al., 2005), and because ethnicity may act as a proxy for religion; teenage Muslim or Hindu women are less likely to have had intercourse by age 18 than their Christian or non-religious counterparts (Coleman and Testa, 2008). The associations between both of the ethnic composition variables and conceptions were mainly removed when London LADs were not included in the analysis, which highlights the need for the careful consideration of the distinction between London and other LADs.

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However, growing Black or South Asian populations were both associated with declines in conception rates regardless of including London. The fixed effect model may represent Black teenagers becoming less distinctive in their likelihood to conceive than White or South Asian teenagers. Ethnic minority teenagers in certain areas may have more reason to avoid pregnancy as a result of being more likely to aspire to higher education; both Black African and Caribbean teenagers had lower GCSE attainment than their White British counterparts in 2003 but by 2013, had closed this gap (Strand, 2015). Young people from ethnic minority groups are more likely to attend university now than in the past (Crawford and Greaves, 2015). The historical relationships with ethnicity are changing; ethnic groups may now represent growing populations of those less likely to conceive as teenagers.

Both education and employment for young people changed dramatically during this time period, including rising higher education participation and the 2008 economic recession. Improvements in educational attainment occurred amongst all ethnic groups (Berrington et al., 2016), and therefore the relationship between rising attainment and avoiding teenage conceptions may represent the higher improvements in certain ethnic minority groups and within the general White British population. Young people were most affected by the financial crisis, and the positive coefficient for youth unemployment did reduce between 2006 and 2010. With our particular analyses we were not able to isolate any direct effect of the crisis on teenage fertility, but Goldstein and colleagues found that unemployment resulting from the 2008 recession was associated with fertility declines at younger ages (aged 15-19) (Goldstein et al., 2013), particularly in Western Europe (Comolli, 2017). The financial crisis occurred during the period in which the rate of decline in under-18 conception rates increased.

The housing stock became less affordable throughout the 2000/2010s at the same time as a rising age of leaving education and the postponement of other young adult transitions (Berrington and Stone, 2014). We found areas with less affordable housing had lower conception rates and that increasing unaffordability was associated with larger declines in conception rates. The mechanism behind the relationship between living in an area with an expensive housing market and teenage pregnancy avoidance is unclear, particularly as housing affordability may capture gentrification or the changing

characteristics of residents in areas which have rapidly become unaffordable. The effect of gentrification within areas in regard to teenagers is difficult to measure as families are likely to have entered the area when they were children or prior to birth.

It was not the aim of this paper to identify the contribution of the TPS towards reductions of teenage childbearing. We have seen that there is a possible reverse causation between areas with higher conception rates being given more money; however, the actual amount spent did not alter the other relationships in the models.

This paper provides evidence that the associations between traditional variables – like overall economic deprivation in an area – more recently had smaller, but still positive, relationships with under-18 conception rates. However, since the current study was based on area-level analyses we cannot assume the existence of these relationships at the individual level, as they may be acting as a proxy for heterogeneity that we have not measured elsewhere. England can be taken as an example of a country that has had declining teenage fertility from behaviour changes, but this paper highlights how countries should keep in mind how populations of teenagers and their areas have also changed.

3.4.1 Further research

Teenagers living in areas which had high rates in the early 2000s have altered their sexual behaviour in some way compared to the cohorts before them and, from our work, it is not enough to say that it is just because the characteristics of teenagers living there have changed. There are many unmeasured and unavailable characteristics related to sexual behaviour that may further explain the spatial differences, such as varying teenage contraceptive use, contrasting teenage fertility desires over time, and use of emergency contraception from all settings, all at the local authority level. There are also immeasurable characteristics like the quality of sex and relationships education and TPS efforts; it is a limitation that we measure the amount of funding rather than assessments of local TPS quality as in other works (Blackman, 2013; Coleman and Testa, 2008).

Chapter 4 Decomposing the teenage fertility decline: the contribution of the proportion of conceptions resulting in abortion to changes in fertility rates

So far, the work in this thesis has considered the associations between exosystem/area-level characteristics and under-18 conception rates. Under-18 fertility rates are determined by the proportion of conceptions ending in births versus abortions. The analysis in the previous chapter emphasised that conception rates varied by rurality and region with Inner London having the highest conception rate in the late 1990s which declined to one of the lowest by the late 2010s. However, this research also found that the contrasting trend in Inner London is mostly explained by the differing area characteristics of local areas in London. Differences in conception rates between urban and rural areas are also partly explained by controlling for area characteristics.

4.1 Introduction

Although teenage abortion ratios are published as official statistics alongside teenage conception rates and fertility rates in England, the role of abortion in the reduction of teenage fertility in England has received less attention during the 2000s and 2010s than conception rate decline. The research in this chapter aims to explore what abortion ratios represent and contribute before the subsequent chapter considers the relationships between exosystem/area-level characteristics and under-18 abortion ratios across England in 1998 to 2017. The research in this chapter first provides some background by presenting the trends in abortion ratios in England. This chapter will then discuss some of the theoretical reasons as to why abortion ratios deserve more attention when discussing under-18 fertility decline. Rising abortion ratios may be more difficult to interpret than rising abortion rates and other more commonly used measures, and so we discuss what changing abortion ratios represent for policymakers. Finally, a

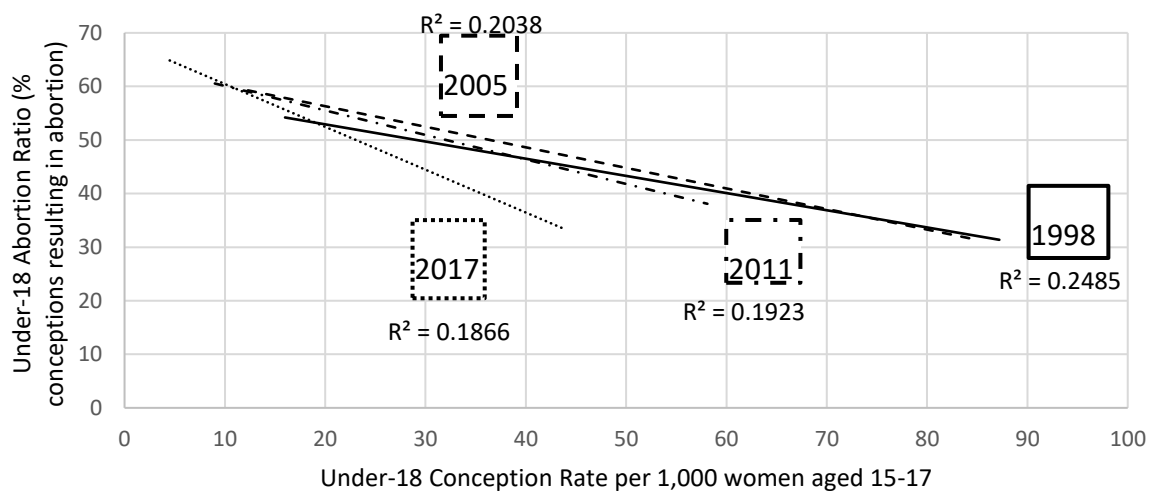
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decomposition analysis will be used to provide a statistical justification of including abortion ratios through quantifying the role of abortion ratios in fertility decline. As rurality and regional trends were important considerations from Chapter 3, the decomposition analysis will also be conducted separately by rurality and region to consider whether abortion ratio change had different contributions by these area characteristics.

Teenage abortion ratio trends

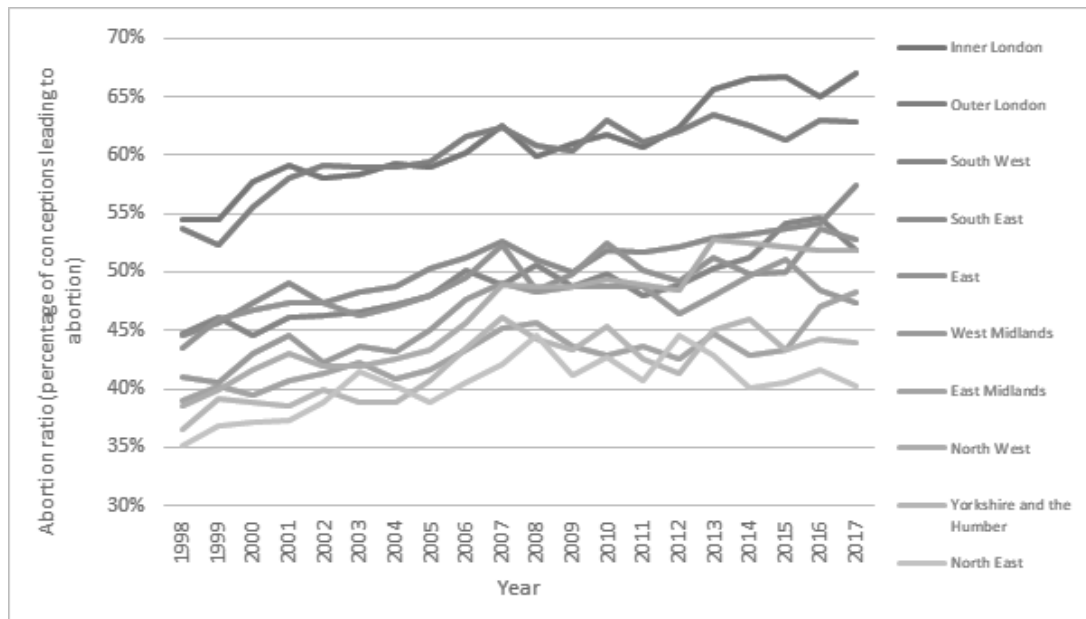
High abortion ratios (over 65% in 2011) are behind the low teenage fertility rates in certain countries like Denmark and Sweden in 2011, whilst other countries such as the Netherlands have low fertility rates due to low conception rates (Sedgh et al., 2015). In contrast, England and Wales have relatively low abortion ratios (around 40% in 2011) alongside a higher conception rate, which means that England and Wales have the highest teenage fertility rates in Western Europe. Across high-income countries, there is a trend that countries with higher teenage conception rates have lower proportions of these conceptions leading to abortion (Sedgh et al., 2015), including England and Wales, Scotland, the United States, and New Zealand. This trend is also present within countries and Figure 4.1 illustrates this relationship where LADs in England with higher under-18 conception rates have lower abortion ratios between 1998 and 2017. Trendlines are presented for 1998, 2005, 2011, and 2017. The relationship between the 2017 conception rates and abortion ratios is steeper than in previous years which highlights that, after the under-18 fertility declines, each unit increase in conception rates is related to a larger increase in abortion ratio. Conception rates have converged so that under-18 conception rates are more similar across the country, whilst abortion ratios have continued or grown in variation across the country. All Local Authority Districts in England have experienced reductions in under-18 conception rates between 1998 and 2017, and the majority (266 of 324, 82%) of areas have also experienced rising under-18 abortion ratios.

Figure 4.1 The lines of best fit for the relationships between under-18 conception rates and under-18 abortion ratios for Local Authority Districts in England, 1998-2017



Like conception rates, abortion ratios also vary across England with clear regional patterns. Certain regions like Inner and Outer London have much higher proportions of conceptions resulting in abortion than the rest of England (Figure 4.2). Regions in the north of England such as the North East, Yorkshire and the Humber, and the North West consistently have the lowest abortion ratios throughout 1998 to 2017. Regions in the South of England have the highest abortion ratios outside of London. While Chapter 3 presented the north-south divide in conception rates as regions in the north of England had higher under-18 conception rates, the north-south divide for abortion ratios is that northern regions have lower proportions of these conceptions resulting in abortion.

Figure 4.2 Annual under-18 abortion ratios from 1998 to 2017, by region



Reasons for including teenage abortion ratios in discussions

Although abortion ratios have been shown to be important in determining the teenage fertility rates in low teenage fertility countries like Denmark and Sweden, abortion ratios have often been excluded from discussions around teenage fertility decline in England. The bypassing of the contribution of abortion to teenage fertility decline has also occurred even though the English government introduced two relevant national strategies during this time with the TPS in 1999 (Hadley, Ingham and Chandra-Mouli, 2017) and the SHHS in 2001 (Department of Health, 2001). The focus on a young person’s sexual health through these two strategies from the early 2000s include abortion-related aspects: a model to link various sexual health, contraception and abortion services to improve access to such services and knowledge of sexual health (Adler et al., 2002); the development of more young-person-friendly sexual health services including abortion services; an SHHS target to reduce the level of later-term abortions amongst young women; and guidance on incorporating abortion into lessons within schools by the NGO Education for Choice (Hadley, Ingham and Chandra-Mouli, 2017). The 2013 Framework for Sexual Health Improvement in England stressed the importance of early access to abortion, improved access to contraceptive options at

abortion services to avoid repeat abortions, and offered access to a 'trained counsellor' for those engaging with the abortion service but, although the framework specifically notes the aim of continuing the reduction in under-18 and under-16 conceptions, it does not directly mention abortion rates or ratios (Department of Health, 2013).

Although a number of aims have been proposed, abortion ratios are neglected in the literature. The attention on the conception rates and the relative lack of focus toward the abortion rates/ratios may stem, in part, from the TPS. Although the discussions about the TPS was about teenage motherhood, the TPS focused on under-18 conception rates as the main targeted Government outcome and reductions in conceptions were used to measure 'success' in the strategy (Ma, 2016). The decision of whether to continue or end a teenage pregnancy was only briefly mentioned in the initial Social Exclusion Unit report (1999); it has been suggested that this was due to the Government's reluctance to specifically address the topic of teenage abortion (Tabberer et al., 2000). Lee (2013) categorised the New Labour governmental policies as using 'abortion pragmatism', as this government simultaneously portrayed abortion as a marker of poor sexual health whilst presenting it as necessary to avoid teenage motherhood among those who conceived. Other reasons for avoiding attention on abortion trends may have been that the promotion of rising proportions of teenagers opting for abortion could have also incited attention from anti-abortion groups, and the measure itself can be easily misinterpreted, which will be discussed later on in this chapter.

It is important as a researcher or policymaker to avoid value judgements when studying highly politicised and potentially controversial topics like teenage sexual and reproductive health. Using a framework can allow researchers to bypass personal moral judgements. This chapter will briefly discuss how the importance of including discussions about abortion ratios is justified by the reproductive justice framework. Reproductive justice was created to discuss reproductive rights and reproductive health but considers how the ability of persons to achieve control over their reproductive lives is influenced by inequality in the social, political and economic spheres (Ross and Solinger, 2017). Reproductive justice as a framework was created by a group of women of colour activists in the 1990s. Reproductive justice has roots in Black feminism whereby the 'intersectional' experiences of people differ not just due to their gender and sex, but also

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race, class, sexuality, age, disability, and other aspects of their identity which interact with one another. This framework has therefore been able to represent that the reproductive autonomy of each person is differently enabled or limited by the inequalities that relate to each person's position in society, related to their intersectional characteristics.

Reproductive justice is formulated in a similar way to universal human rights, in that it puts forward that all persons have the right to have children (in whatever conditions they choose), the right to not have children (through access to contraception, safe birth control, abortion, or being able to choose abstinence), and the right to parent children in environments which are safe and healthy (Ross and Solinger, 2017, p.62).

The reproductive justice framework has been applied to many different areas of reproductive behaviour. This framework has been used for content analysis and was used to examine the way that media has framed sexual behaviours with negative associations by Jaworski (2009). This research found that when examining popular media using the reproductive justice framework, there were many negative portrayals of women using contraception. A commentary by Higgins (2014) examined the role of Long-Acting Reversible Contraception (LARCs) in reproductive health and suggested that the promotion of LARCs would benefit from employing the reproductive justice framework. Higgins states that, while LARCs have been widely celebrated and encouraged due to their lower failure rate, public health professionals can use the reproductive justice framework to keep the decisions of the individual at the forefront (even if LARCs provide an option that is, in theory, more reliable). The framework has also been used by Hans and White (2019) to reframe the role of teenage childbearing in poorer infant mental health. Abortion research is especially suited to the reproductive justice framework due to the physical, societal, moral, and even legal boundaries to accessing an abortion. The framework was used by Romanis et al. (2020) to consider the impact of the COVID-19 pandemic on access to abortion in Great Britain from the closure of services to the increases in caring responsibilities.

This chapter uses the framework to examine the ways in which changes in abortion ratios have and can be interpreted, much like the work by Higgins (2014) who examined LARC promotion through the reproductive justice framework. Through these definitions of reproductive justice, only statistics that represent a rise in persons being able to

autonomise these rights should be ascribed with positivity. This brings us to some of the issues around discussions and research around teenage fertility behaviours. The author of this thesis argues that, particularly in the specific realm of youth sexual and reproductive health, there are rampant positive value judgements that are attached to the decline in teenage conception rates, as it is often used as an easy way to represent 'success' from the TPS (Ma, 2016). This is not to say that the TPS was not a success: the way that the TPS achieved the targets for access to sexual health services and information, and the manner of the joined-up approach (Hadley, Ingham and Chandra-Mouli, 2017) is undeniably positive in terms of public health. Yet, the use of conception rate decline as a positive outcome, alongside the continued demonisation of teenage motherhood that has continued *outside* of the TPS in the media and community (as discussed in a thesis which applied qualitative content analysis to British media mentions of teenage pregnancy (Moore, 2018)), means that these statements have more than just this meaning ascribed to them. As observed by Hans and White (2019), even how reductions in teenage pregnancies are justified by poor health outcomes to those born to younger mothers lends itself to judgement that teenage motherhood is a negative outcome, rather than focusing on how teenage mothers may be in need of additional support. Carabine (2007) and Wilson and Huntington (2005) also noted how the late 1990s and 2000s represented a large shift in the way the government discussed teenage fertility through needing to help young people to access contraception and improve knowledge, but that the narrative continued to include that teenage pregnancy is a 'risk' to young women with negative connotations.

Much like teenage parenthood, abortion at any age is often framed negatively in the UK media. Articles about abortion in the UK print media in 2010 were examined using qualitative content analysis by Purcell, Hilton and McDaid (2014) who found common themes of negative language and connotations between 'risky' behaviours and abortion. Abortion has many value judgements within the general public, and sometimes it appears that this also influences the provision of services that, under the thinking of reproductive justice, should be free of value judgement. While doctors can conscientiously object to abortion, they are able to refer the patient to another professional without overtly communicating their opinions and values on abortion. The sample of young women who

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experienced a teenage pregnancy in Lee et al. (2004) included a teenager who reported being referred to another practitioner in the same practice due to conscientious objection. However, while some health professionals do not conscientiously object, they impart their value judgements on abortion to patients. This study by Lee et al. (2004) found that multiple teenagers reported that health professionals (ranging from a family planning clinic doctor, GPs, and other GP staff members) clearly communicated their disapproval of abortion. Health professionals may also impart the opposite opinion, and just as many teenagers in this study reported that the doctors seemed to attempt to encourage terminating the pregnancy.

The interpretation of rising abortion ratios

Regardless of whether persons are for or against the TPS and teenagers choosing abortion when faced with an under 18 conception, conceptualising what the trend in rising abortion ratios *means* is important in terms of policymaking. Yet rising abortion ratios alongside rapid declines in teenage fertility highlight that the story of declining teenage fertility is more complex than simply witnessing fewer teenagers becoming pregnant through the plummeting conception rates. Before using abortion ratios as an outcome in this analysis, and later in Chapter 5, this part of the thesis aims to consider what rising abortion ratios mean in the context of reproductive justice. Reproductive justice means that teenagers are able to fulfil whichever outcome of pregnancy they desire. Teenagers require physical access to services and support but also need to be able to have autonomy in their decision-making process.

Teenage abortions can traditionally be measured in two ways; under-18 abortion rates describing the *number* of terminations/abortions of conceptions that occurred per thousand women aged between 15 and 17-years old; and the *proportions* of under-18 conceptions leading to abortions captured by abortion ratios. The terms rate and ratio are not interchangeable and represent different aspects of abortion. Abortion rates depend on the number of conceptions and, therefore, signify the actual numbers of abortions in an area, and therefore demand for services. Rising abortion rates mean that more abortions are occurring per 1,000 women in that area than in the past. Conversely,

abortion ratios capture the frequency of abortions compared to births from teenage conceptions and can, therefore, convey the components of recent declines in fertility rates. Changes in abortion ratios are more difficult to interpret. The less intuitive nature of abortion ratios may be why they have been neglected in discussions around teenage fertility decline as audiences may take figures of abortion ratio growth as a negative outcome from misinterpretation or a general bias against teenage abortion.

Rising abortion ratios mean that a higher proportion of pregnancies are terminated than in the past, and the simplest interpretation of such is that there may have been an improvement in greater access to abortion services that allow persons to choose to end their pregnancy. Equally, rising abortion ratios could represent a higher desire to not have a baby if a pregnancy occurs in error. Assuming most teenagers could access abortion when they desired to do so, rising under 18 abortion ratios may represent a shift in how wanted or planned pregnancies are towards avoidance of teenage *parenthood*. So, if abortion is a sign of an unplanned and/or unwanted pregnancy¹⁵ in teenagers who want to avoid parenthood, then an increase in the abortion ratio could represent a rising unmet need for pregnancy avoidance through safe contraception. For example, Hadley, and colleagues (2017) suggested that the abortion ratio may be interpreted as representing the level of pregnancy planning. As under 18 conception rates have declined (in all local authorities) during the last two decades, this current research proposes that rises in the abortion ratio are unlikely to be a representation of the rising unmet need for pregnancy avoidance but, rather, a representation of the shift towards pregnancy avoidance pre- *and* post-conception. Therefore, teenagers are increasingly avoiding pregnancy, which can be seen in the declining conception rates and, of the pregnancies that were not avoided for one reason or another, a larger proportion of them are terminated to avoid teenage parenthood. In terms of reproductive justice, these trends in teenage conceptions and abortions paint a picture of improvements in the agency of teenagers in having the rights to choose to not have children at that time that should be

¹⁵ The complexity of the measurement of whether pregnancies are unplanned/unwanted are discussed in Chapter 2 of the literature review

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continued. It must be acknowledged that some teenagers who fall pregnant do want to do so, or want parenthood once they find out they are pregnant, and so reproductive justice in their sense would be to enable their teenage childbearing to be realised (Coleman and Cater, 2006).

4.1.1 Aims and research questions

This chapter has already included theoretical support for research and policy to include abortion ratios in discussions about teenage fertility through the reproductive justice framework. This research will now investigate whether there is statistical support for including abortion ratios through using decomposition analysis to quantify the contribution of abortion ratio increases. Firstly, this research considers the role of the abortion ratio change in under-18 fertility rate change between 1998 and 2017. The declines in under-18 fertility and conception rate were faster in the late 2000s and 2010s, and so the analysis examines whether the decomposition varies by time period (1998-00 to 2004-6, 2004-6 to 2009-11, and 2009-11 to 2015-17). The analysis then goes on to investigate whether changes in abortion ratios have more or less of a contribution to fertility rate change in LADs which had a larger decline in under-18 fertility rates than those who had smaller fertility declines over 1998 to 2017.

Finally, as found in Chapter 3, teenage conception rates vary by region and whether LADs were urban/rural and abortion ratios also have regional and urban/rural trends. It is quite clear that conception rates have driven declines in fertility rates in areas like Inner London, as it had one of the highest rates of conceptions in the late 1990s but declined to one of the lowest in the late 2010s, alongside a smaller increase in abortion ratios during this time. However, for the rest of England it is not as clear how important abortion ratios were to the fertility rate declines. The analysis in the current chapter first considers whether the role of abortion ratios in teenage fertility rate decline differ by region and then by whether the LAD is urban or rural.

The research questions for such analysis are:

RQ1 - What contribution do the Local Authority District (LAD) changes in under-18 conception rates and under-18 abortion ratios provide to the associated LAD-level change in under-18 fertility rates?

RQ1a - Do these contributions differ during the time periods of faster teenage fertility decline?

RQ1b - Do these contributions differ by region?

RQ1c - Do these contributions differ by rurality?

RQ1d - Do these contributions differ by the degree of change in under-18 fertility rates?

4.2 Methods

The analysis in this chapter uses the same 326 Local Authority District under-18 conceptions data from the ONS that is detailed in Section 3.2, including how conceptions data are collected. While the previous chapter only used under-18 conception rates, this chapter is interested in the contribution of the rising likelihood of opting for abortion over a conception to fertility rate change and so also uses under-18 abortion ratios, which represent the proportion of conceptions resulting in abortion. This measure of abortion only represents *elective* abortions and the ONS does not include miscarriages in the under-18 abortion statistics. While this chapter uses abortion ratios in the title, it technically must use birth ratios in the analysis. As fertility rates are calculated by the total conception rates multiplied by the proportion ending in birth, this analysis must use birth ratios rather than abortion ratios (seen in Equation 1). Together, abortion ratios and birth ratios equal one where a rise in the abortion ratio equals a decline in the birth ratio. For consistency, this chapter discusses the findings in terms of abortion ratio increases where the analysis has measured birth ratio declines.

Equation 1 The components of fertility rates

$$\text{Fertility rate} = \text{conception rate} \times \frac{\text{total births}}{\text{total conceptions}}$$

$$\text{Fertility rate} = \text{conception rate} \times (\text{birth ratio})$$

$$\text{Fertility rate} = \text{conception rate} \times (1 - \text{abortion ratio})$$

This research uses decomposition analysis using the Das Gupta method (Gupta, 1993; Li, 2017). The author found an example of the use of the Das Gupta method by Lindberg et al. (2016) that used decomposition to measure the contribution of the pregnancy risk index to declines in adolescent fertility. This analysis inspired the author of this thesis to consider the use of this form of decomposition analysis to measure the contribution of birth/abortion ratio change. The Das Gupta method of decomposition allows the comparison of two crude aggregate rates of the same population. This method of decomposition is quite simplistic compared to others as it uses algebraic relationships rather than econometric estimations (Li, 2017). The algebraic relationship for the analysis in this research is that the under-18 conception rates multiplied by the proportion of conceptions ending in births (1-abortion ratio) equals the outcome of interest, the fertility rate. The contributions for each of the explanatory factors add up to 100 per cent and represent the average contribution across the LADs.

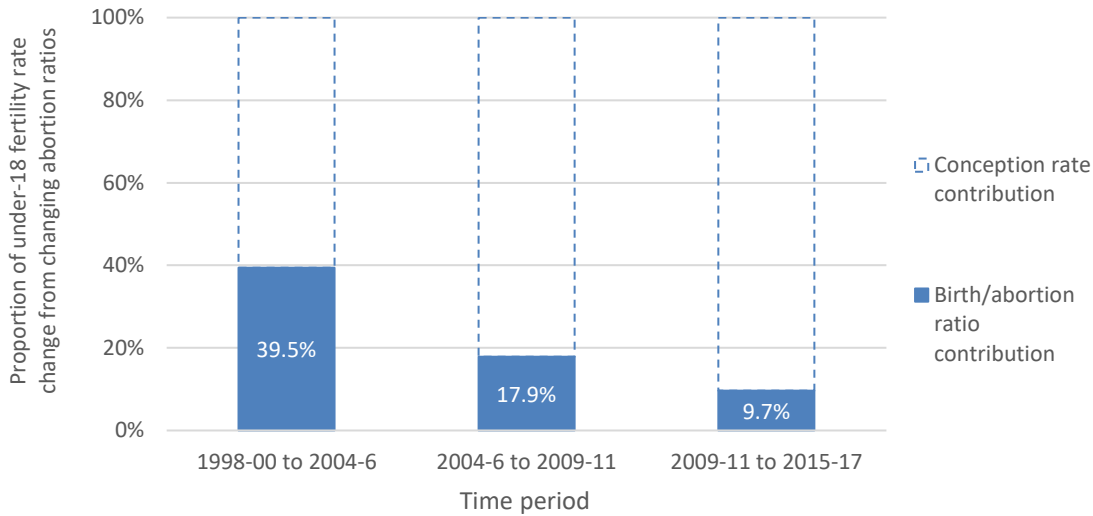
The analysis in this chapter uses the **rdecompose** command in Stata to compare the contribution of the two explanatory factors (conception rates and birth/abortion ratios) at two set points in time (for example, 1998 and 2017). As this method of decomposition compares two specific time points, the analysis uses three-year averages of the under-18 conception rates, and birth/abortion ratios to avoid bias from minor fluctuations in individual years. Therefore, to consider the changing role of the contributions in the abortion ratio for the fertility rate change, the analysis was replicated for each time period of 1998-00 to 2004-6, 2004-6 to 2009-11, and 2009-11 to 2015-17. The decomposition analysis was also conducted for LADs in each quartile of percentage decline in under-18 rates between 1998 and 2017, LADs in each region, and LADs in each

urban/rural category (the explanation for the urban/rural category is discussed in section 3.2).

4.3 Results

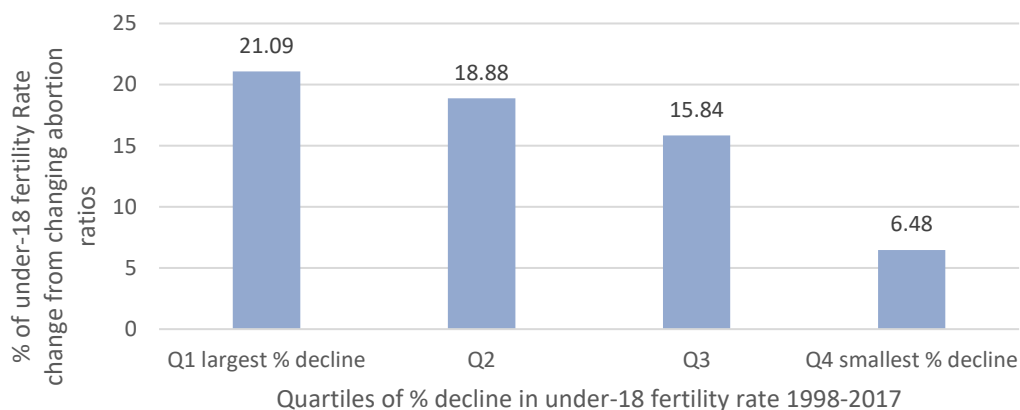
The decomposition used in this analysis considers the extent to which changes in abortion ratios and the rates of teenage conceptions explain the changes in teenage fertility rate. Overall, 17 per cent of the change in under-18 fertility rates between 1998-00 and 2015-16 are due to *reductions* in birth ratios (*increases* in the proportions of conceptions resulting in abortion). The teenage fertility rate in England had distinctive trends through the late 1990s to the 2010s, whereby the speed of decline increased after 2006. To consider the phases of teenage fertility decline, Figure 4.3 presents the contribution of abortion ratio and conception rate change to the change of under-18 fertility rates within each time period. Nearly 40 per cent of the decline in the under-18 fertility rate from 1998-00 to 2004-06 is due to the decline in the percentage of conceptions leading to births. In other words, the rise in abortion ratios account for just under 40 per cent of the decline in fertility rate during this period. When fertility rates were falling at a much more rapid speed in the late 2000s and 2010s, abortion ratio change accounted for a lower percentage of the decline in fertility rate at 18 per cent in 2004-04 to 2009-11 and 10 per cent in 2009-11 to 2015-17

Figure 4.3 The contribution of under-18 abortion ratio change to under-18 fertility rate change in the whole of England using decomposition analysis



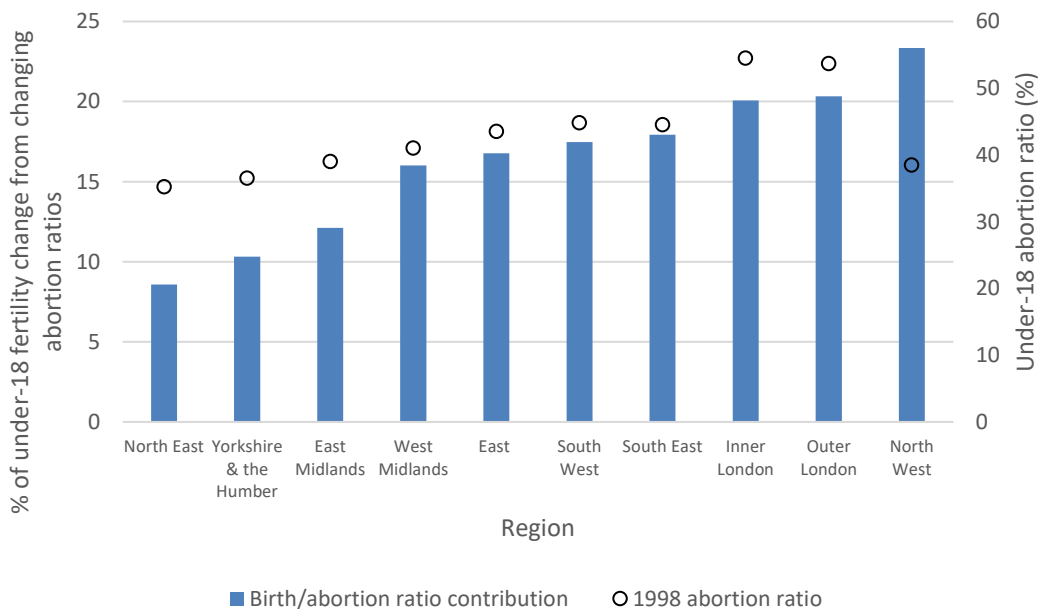
Research question 1b asks whether LADs which experienced the greatest change in under-18 fertility rates from 1998 to 2017 have larger or smaller contributions made by abortion ratio change than LADs whose fertility rates did not change as drastically. LADs in the quartile with the highest percentage change between 1998 and 2017 had the highest contributions made by abortion ratio change at 21 per cent (Figure 4.4). In other words, changes in conception rates drove the fertility rate declines less in areas with the smallest reductions in fertility rates compared to LADs which had larger fertility declines. Abortion ratios contributed to 18.9 per cent of the fertility decline in LADs in the second-highest quartile of fertility change, alongside 15.8 per cent for the third quartile, and 6.5 per cent in areas with the smallest fertility rate change between 1998 and 2017.

Figure 4.4 The contribution of three-year-average under-18 abortion ratio change to under-18 fertility rate change in England by quartiles of the percentage change between 1998 and 2017 in under-18 fertility rates



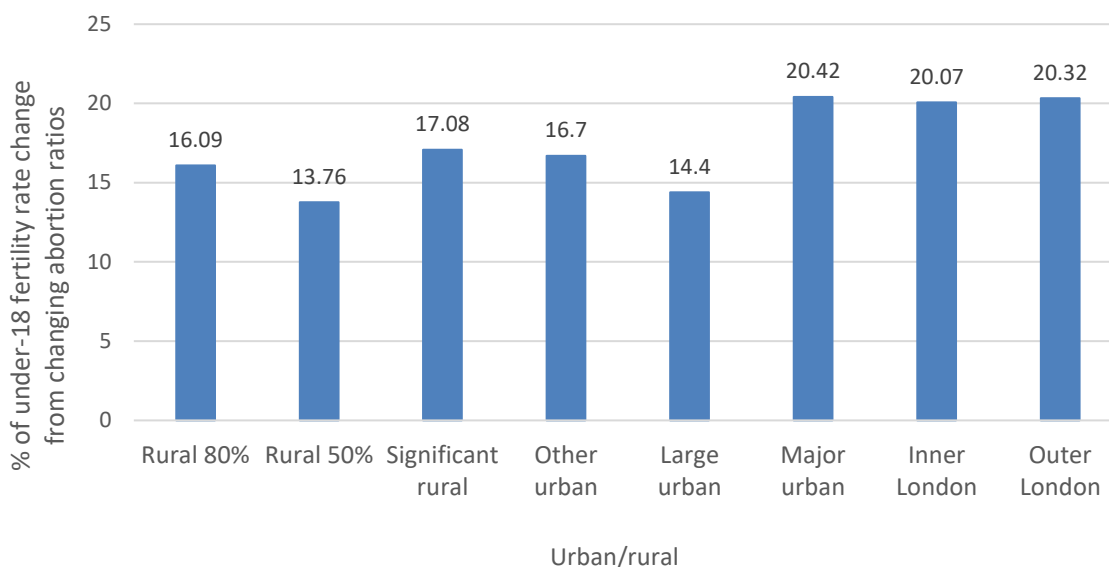
Research question 1c asked whether the contribution of abortion ratio change varies by region. To answer this question, the decomposition analysis was conducted separately for each region between 1998 and 2017 and is presented alongside the regional 1998 abortion ratios in Figure 4.5. The regions with the largest contribution made by abortion ratio change are the North West (22%), Outer London (20%), and Inner London (20%). In contrast, under 9 per cent of the change in fertility was due to change in abortion ratios in the North East, 10 per cent in Yorkshire and the Humber, and 12 per cent in the East Midlands. The general trend is that the higher the initial 1998 abortion ratios for each region, the higher the contribution that was made by changing abortion ratios to fertility rate change. This trend was consistent apart from the North West which has the greatest contribution made by abortion ratio change but with the lowest initial abortion ratio.

Figure 4.5 The decomposition of under-18 fertility rate change between 1998-00 and 2015-17 by region – represented by the percentages of fertility rate change attributed to abortion ratio change in England



The contribution of abortion ratio change appears to vary by region but research question 1d is concerned with whether the decomposition may vary by how urban or rural LADs are, whilst separating London LADs. As previously shown in Figure 4.5 of the regional differences, abortion ratio changes in LADs in Inner and Outer London have some of the highest contributions to the change in fertility rates at 20.1 and 20.3 per cent respectively. Figure 4.6 finds that the only urban/rural category whose abortion ratios contribute to more fertility rate change than in London are LADs in the most urban category (major urban) at 20.4 per cent. Abortion ratios in all other urban/rural categories have lower contributions to fertility rate change at under 17.1 per cent. LADs in the second most rural category (rural 50%) have the smallest contribution of abortion ratio change to fertility rates at 13.8 per cent, but there does not appear to be a trend among these urban/rural groups as the second most urban LADs (large urban) have the second-lowest contribution at 14.4 per cent. Therefore, while there is a clear regional trend, there is not a clear urban/rural trend in the contribution of abortion ratios to fertility decline beyond higher contributions in London LADs.

Figure 4.6 The contribution of under-18 abortion ratio change to under-18 fertility rate change between 1998-00 to 2015-17 in England by region



4.4 Discussion and conclusion

The reductions in teenage conception rates across England can be seen to have contributed to more of the teenage fertility rate decline than abortion ratios as it is evident that when conception rates dropped, so did fertility rates. Yet the contribution can be considered in more detail. To the author's knowledge, decomposition has not previously been used to quantify the contribution of under-18 conception rates and abortion ratios to fertility decline in England in this manner. The research in this chapter has quantified that the proportions of conceptions resulting in abortion *have* played a part in the fertility decline, but that it varied over the period of fertility decline. Abortion ratio increases (birth ratio decline) played a much larger role during the earliest period of the analysis, 1998 to 2005, where the fertility rate decline was much slower. During the much more rapid period of teenage fertility decline of the late 2000s and 2010s, changing abortion ratios played a much smaller role and so the commentary that plummeting conception rates are the main drivers of this rapid decline appears to be correct.

This chapter started with a discussion around how, under the reproductive justice framework, abortion ratios should be brought into more discussions about fertility

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decline as they represent an aspect of teenage reproductive need that receive less attention. The analysis in this chapter, therefore, provided theoretical *and* statistical support for abortion ratios to be part of the conversation about teenage fertility trends. The analysis in this chapter is largely a starting point, with the decomposition comparing two set time points and running separate analyses by area characteristics like urban/rural rather than considering year-on-year trends and multiple area characteristics. This chapter was born out of the author questioning throughout this research why policy mentions and studies about abortion ratios were so difficult to find. Due to this gap in the literature, the author also found a need to conceptualise what trends in abortion ratios represent and why they may have been neglected in the literature. This chapter discussed how rising abortion ratios may represent an unmet need for ways to avoid pregnancy in the population. This chapter also presented that the rising abortion ratios alongside halving conception rates may instead represent a higher proportion of teenagers wanting to avoid motherhood and who are doing so by avoiding pregnancy and being more likely to opt for abortion if they do become pregnant. This picture of the trends in teenage fertility is much more informative than just considering conception rates as it communicates that teenage pregnancies are less common and that such pregnancies are now more likely to result in abortion than in previous years.

Further work could consider much more complex decomposition methods but that was not the aim of this chapter. This analysis is a starting point but still found that the contribution that abortion ratio change makes to fertility rates does vary by time period, region, whether a LAD is urban or rural, and the level of overall fertility change. The next chapter considers how under-18 abortion ratios are associated with area characteristics and how these relationships have varied over time.

Chapter 5 Factors associated with teenage abortion ratios: the associations between local authority district characteristics and the proportions of teenage conceptions resulting in abortion in England, 1998 to 2017

The research in this chapter has been prepared for submission to an epidemiological-style journal. To keep the integrity of this version which has benefitted from the most feedback, this chapter includes the version of the paper that is nearly ready for submission with some in-text additions. The author has also included appendices that include descriptive analyses of the relationships between area characteristics and abortion ratios, and appendices that elaborate on relevant aspects of the paper.

5.1 Introduction

The findings from the previous chapter provided support for including abortion ratios in discussions about teenage fertility decline. This analysis found that the change in proportion of conceptions resulting in abortion explained higher amounts of the under-18 fertility rate decline before the increased speed of the fertility decline post-2006. The previous chapter discussed how higher abortion ratios have been interpreted as representing lower levels of pregnancy planning (Wellings et al., 2013). However, as contraceptive failure is not uncommon for such pregnancies (Lee et al., 2004), higher abortion ratios may indicate that teenagers wish to avoid pregnancy but require more effective use of contraception. Conversely, if more unplanned pregnancies are avoided due to the increased use of effective contraception, then it could be the case that a higher proportion of teenage pregnancies are planned (or viewed as ambivalent). In such

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a scenario we might expect to see decreasing abortion ratios over time, but this is not the case in England.

The overall under-18 abortion ratio for England increased from 42 per cent in 1998 to 52 per cent in 2017, (as presented in the thesis Introduction in Figure 1.1). The abortion ratio rose steadily during the 2000s when under-18 conception rates declined slowly, as well as later years when conception rates declined rapidly. Most Local Authority Districts (LADs) saw increases in abortion ratios, however, abortion ratios continue to vary widely between LADs in England with ranges from 37 per cent to 54 per cent respectively in 1998, and 46 per cent to 64 per cent in 2017. There is a need, therefore, to understand the factors associated with the wide variation in levels and trends in abortion ratios. Past research has focused on geographical differences in conception rates (Uren, Sheers and Dattani, 2007; Connolly et al., 2014; Girma and Paton, 2015), and abortion rates (Connolly et al., 2014; Girma and Paton, 2015), which are closely linked (Girma and Paton, 2015). Geographical differences in England's abortion ratios have not previously been examined for the 2010s; an important oversight given that rising abortion ratios contributed to a decline in under-18 fertility (as found in Chapter 4).

Whilst factors associated with geographical variations in teenage abortion *rates* have previously been explored, such relationships do not mirror those with abortion *ratios* as the latter are independent of the overall number of conceptions. A previous study from 1994-2003 found higher under-18 abortion ratios in English areas with higher educational attainment (Wilkinson et al., 2006), whilst a similar association with education was found for under-25s around the year 2000 (Virgo and Sear, 2016). However, past findings may no longer hold given widespread increases in educational aspirations (Berrington et al., 2016), and higher education enrolment (Universities UK, 2018). In 1999, the English government launched the 10-year TPS which aimed to half under-18 conception rates. Abortion was not mentioned within the TPS aims, but the programme did improve sexual health knowledge and sexual health services (Hadley, Ingham and Chandra-Mouli, 2017) and the ways in which these changes are measured are discussed in Section 2.3.2. Alongside the TPS, the 2002 national SHHS had widespread aims to join up sexual health services and had a specific aim of access to abortion (for all ages) within three weeks of the first appointment (Department of Health, 2001).

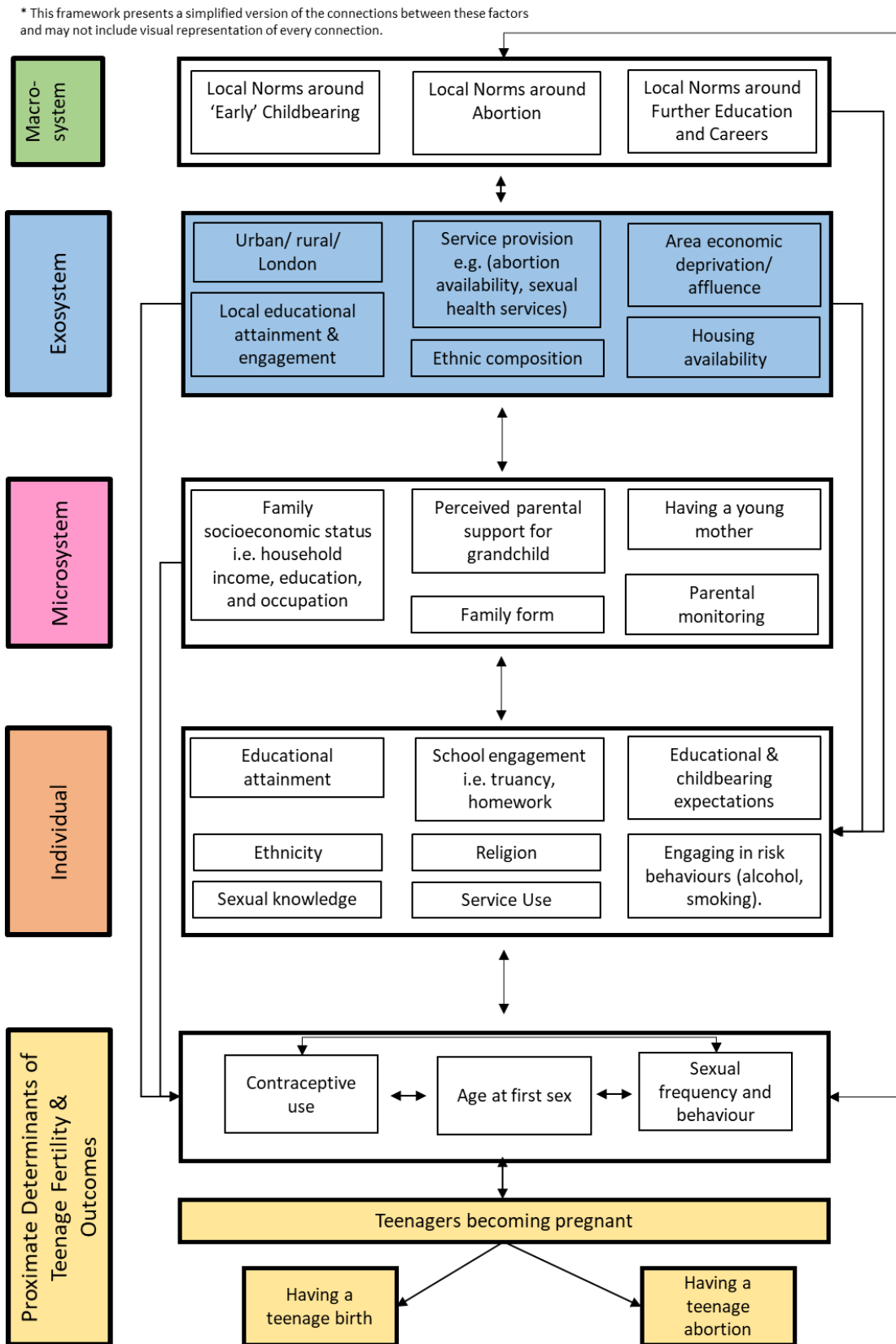
Local teenage pregnancy coordinators who were employed by the TPS and young mothers themselves highlighted low educational and career opportunities as reasons for higher teenage fertility rates (Arai, 2003). Quantitative studies using area-based deprivation indexes (Conrad, 2012; Uren et al., 2007; Wilkinson et al., 2006), and unemployment rates (Lee et al., 2004; Virgo and Sear, 2016; Wilkinson et al., 2006), found that deprived areas have higher teenage pregnancy rates, but lower abortion ratios. Housing availability through affordability and stock represents the ability for young people to establish residential independence. Higher abortion ratios have previously been found in areas with lower housing deprivation (Bradshaw et al., 2005). Areas with fewer people living in social housing have been found to be associated with higher under-20 abortion ratios (Virgo and Sear, 2016). Whilst studies (and Chapter 3 of this thesis) have shown conception rates to be associated with ethnic compositions of local areas (Bradshaw, Finch and Miles, 2005; Blackman, 2013) no contemporary research has examined how ethnic composition relates to abortion ratios.

5.1.1 Conceptual framework

This empirical chapter considers the variation in teenage conceptions resulting in abortion throughout England from 1998 to 2017, including the period where teenage fertility halved. As abortion ratios have not been as widely considered as teenage conception rates, there are less established relationships between exosystem/area-level characteristics and the proportion of conceptions resulting in abortion. Teenage conception rates have been found to be lower in areas with high abortion ratios. Therefore, factors which are related to higher conception rates may also have associations with under-18 abortion ratios but have not been previously studied. This chapter is focused on the factors at the exosystem/area-level and many of the measures at this level in the conceptual framework for this chapter in Figure 5.1 are available for this analysis.

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Figure 5.1 The conceptual framework for the thesis, where the variables available for the third empirical chapter are in colour



5.1.2 Aims and research questions

This analysis is the first to examine under-18 abortion ratio data in England since 2010, during which there has been a rapid decline in teenage conception rates. The halving of the conception rate means that becoming pregnant as a teenager is much less common than in the past and so areas which have higher rates may have most distinctive characteristics and this could well strengthen relationships between area characteristics and abortion ratios. This research fills a gap in the literature by examining how area characteristics are associated with differences in abortion ratios across LADs in England during 1998 to 2017 using a wide variety of measure of area characteristics which include teenage-specific measures that go beyond indexes of deprivation. Using random intercept and fixed effects models for repeated measures we consider how exosystem/area-level unemployment, educational attainment, housing accessibility and ethnic composition are associated with variation between and within LADs over 19 years. We extend previous work by testing whether the effects of the relationships have altered over time as teenage pregnancy becomes less common and whether changes in characteristics are associated with changes in abortion ratios. The research questions are:

RQ1 – How are LAD characteristics associated with under-18 abortion ratios between 1998 and 2017, and have these relationships altered over time?

RQ2 – How are changes in LAD characteristics associated with changes in under-18 abortion ratios between 1998 and 2017?

5.2 Methods

This research uses under-18 abortion ratios from 1998 to 2017 published by the ONS for each LAD in England, calculated by dividing the number of legal *elective* abortions by the total number of live births, stillbirths and legal elective abortions (Office for National Statistics, 2019). Place of usual residence is obtained from the submitted abortion data (or birth data) after estimating the date of conception and woman's age at conception. The counts do not include estimates of births avoided with Emergency

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Contraception (EC), since it is not known if each use of EC would otherwise have ended in a viable conception.

Descriptive analyses were completed to explore the associations between the area characteristics and under-18 abortion ratios and are presented in Appendix C. To avoid repetition, the variables of interest are briefly mentioned here and the reasons behind why certain measures were chosen and analytical decisions were made can be found in section 3.2 and Appendix A. The 324 LADs represent local governments¹⁶. Data for two pairs of LADs (Hackney and City of London, and Cornwall and Isles of Scilly) are merged due to low counts of teenage conceptions. Whilst most covariates are reported for LADs, educational attainment and teenage ethnic composition are published for LEAs. Given LADs are generally nested within LEAs, we assign values from LEA data to the LADs falling within them.

The data sources for the explanatory variables are presented in Table 3.1 of Chapter 3. The decision-making processes behind the measure of economic deprivation, educational attainment, and house price are discussed in more detail in Appendix A. We use the ONS urban-rural categories, ranging from 'Major urban' to 'Rural 80%', and create two additional categories of Inner London and Outer London as London has higher abortion ratios throughout 1998 to 2017 (Figure 4.2). Youth unemployment¹⁷ (the percentage of those aged 18 to 24 claiming Jobseeker's Allowance) is used to represent difficulties in finding a job, economic uncertainty, and area disadvantage. Educational

¹⁶ Local Authority Districts include Unitary Authorities, Metropolitan Districts and London Boroughs.

¹⁷ This chapter also tested the percentage of secondary school state-funded students eligible for Free School Meals as an alternative measure of deprivation. The model including youth unemployment was found to explain more of the variation in under-18 abortion ratios compared to the identical model but using Free School Meals instead.

attainment¹⁸ is measured by the percentage of secondary-school students obtaining five passes in their nationally standardised GCSEs (around age 16) (Department for Education, 2020). To examine the potentially different roles of Black and South Asian youth on local teenage abortion ratios, we identify the percentage of state-funded secondary school pupils registered as Black, and the percentage registered as South Asian in each LAD (Department for Education, 2020). Housing availability is measured in two ways. Firstly, the availability of social housing is measured per 100 adults by dividing the stock of social housing units among each LAD (Ministry of Housing, Communities & Local Government, 2020), by the ONS adult population. Secondly, (un)affordability is identified using the ratio of the median house price to the median workplace earnings (Office for National Statistics, 2020).

This analysis controls for the level of TPS funding given to each local area from 1999 to 2010 (data obtained directly from the Department for Education). TPS funding per female aged 13-17 was calculated using ONS population estimates for local areas. Since there was no funding in 1998, and the programme finished in 2010, values are set at zero outside of these years. Time periods were chosen to represent different stages of the TPS and different rates of under-18 fertility decline¹⁹; 1998-2005 represents the initial level and first half of the TPS; 2006-2010 represents the period following the TPS mid-course review when LADs not on track to achieve the target of halving conception rate received additional funding and assistance (Hadley, Ingham and Chandra-Mouli, 2017). The period 2011-2016 is after the TPS and includes the faster declines in teenage fertility rates.

¹⁸ Data for 2016 and 2017 were extrapolated based on previous years due to the change in GCSE classifications in 2016.

¹⁹ The time periods in this analysis differ to those used in Chapter 3 (1998, 1999-2005, 2006-2010, and 2011-2017). This is because the measure for TPS was not significant in the abortion ratio models (and so could be removed) which meant that 1998 did not have to be separated for the analysis in Chapter 5. The models in Table C.1 include the time period with 1998 as the reference category (rather than 1998-2005) and the results are largely unchanged.

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Random intercept models are used for the first research question which cluster annual ratios (observations) within each LAD and consider between-LAD and within-LAD variation in ratios. The random intercept models first only include rurality (model 1), but model 2 includes rurality, time, unemployment, education, ethnic compositions, housing availability, and TPS-funding. To measure whether relationships between LAD characteristics and abortion ratios alter over time, model 3 includes interactions with time.

The second research question examines the predictors of within-LAD change in under-18 abortion ratios. Fixed effect models are used as they control for time-constant differences between LADs. Fixed effect models differ from random intercept models by only measuring change within LADs over time. Model 3 measures the relationships between changes in unemployment, education, ethnic composition, and housing availability and changes in the abortion ratio from 1998 to 2017. TPS funding was also included in the fixed effect models from 1999 to 2010 but were found to be insignificant and made little difference to the other relationships in the model (analysis not shown).

5.3 Results

Under-18 abortion ratios in the most urban LADs are more similar to those in rural LADs than the significantly lower ratios in 'large urban' or 'other urban' LADs in models 1 and 2. However, the interactions with time in model 3 show that after 2005 rural LADs have significantly lower abortion ratios than the most urban LADs. Inner and Outer London LADs have abortion ratios over 10 percentage points higher than other major urban areas before controlling for the LAD characteristics. Yet, comparing the coefficients from model 1 and model 2 suggests higher ratios in London are only partly explained by LAD characteristics, and this does not alter over time (model 3).

Each additional percentage of 18-24-year-olds seeking Jobseeker's Allowance is associated with a decrease of 0.55 in the abortion ratio (model 2). From the interaction with time in model 3 ($p < 0.10$), we see the effect of local area unemployment has become larger (-0.24) in the most recent period (although this was only at the 10% significance

level). The positive associations between LAD educational attainment and abortion ratios are unchanged over time; each percentage of teenagers attaining five passes at GCSE is associated with higher abortion ratios by 0.09 (model 2). Local housing market characteristics are significantly associated with abortion ratios; each per 100 capita stock of social housing is related to a lower abortion ratio by around -0.22 and LADs with increased ratios of house prices to workplace earnings have higher abortion ratios by 0.53 (model 2) and 0.59 (model 3). Alongside rurality and unemployment, the only variables with significant interactions with time are the two ethnic composition measures. LADs with higher proportions of teenagers who are Black have larger abortion ratios and, in model 3, this coefficient declines from 0.23 in 1998 to 2005 to 0.06 in 2011 to 2017 (from the -0.17 interaction effect). However, LADs with higher proportions of South Asian teenagers have lower abortion ratios at -0.08 ($p < 0.10$) which weakens within 2006 to 2010. We find no significant relationship between the level of TPS funding and LAD under-18 abortion ratios.

The percentage of variation in abortion ratios explained by the LAD characteristics (R^2) increases from 1 per cent in model 1 with only rurality, to 10 per cent for model 2 in the model with all LAD characteristics, to 12 per cent for model 3 including interactions with time. The interaction effects between the area characteristics and time period, therefore, do not have much explanatory power in predicting the variation in abortion ratios. The LAD characteristics explain more of the between-LAD variation in abortion ratios at 58 per cent than the within-LAD variation over time within each LAD at 35 per cent (model 3).

Table 5.1 Random effect models of the relationships between Local Authority District characteristics with under-18 abortion ratios in England, 1998-2017

VARIABLES	Model 1 Rurality only - 1998-2017	Model 2 Time period and area characteristics – 1998-2017	Model 3 Time period, rurality, and area characteristics – 1998-2017
Time Period (Ref. = 1998-2005)			
2006-2010		1.39 **	1.23
2011-2017		0.73	2.92
Urban/ Rural Measure (Ref. = Major Urban)			
Large Urban	-1.51	-2.80 ***	-1.83 *
Other Urban	-5.49 ***	-4.00 ***	-2.83 **
Significant Rural	-0.75	-1.11	-0.37
Rural-50%	-0.72	-1.04	0.21
Rural-80%	0.39	-0.16	1.07
Inner London	11.72 **	8.48 ***	8.69 **
Outer London	10.21 **	7.57 ***	8.35 **
Urban/Rural Interactions with Time Period			
Large Urban * 2006-2010			-1.31
Large Urban * 2011-2017			-1.80 *
Other Urban * 2006-2010			-0.70
Other Urban * 2011-2017			-4.43 **
Significant Rural * 2006-2010			-0.99
Significant Rural * 2011-2017			-1.23
Rural-50% * 2006-2010			-1.23
Rural-50% * 2011-2017			-2.58 **
Rural-80% * 2006-2010			-2.11 *
Rural-80% * 2011-2017			-2.14 *
Inner London * 2006-2010			-2.78
Inner London * 2011-2017			-0.14
Outer London * 2006-2010			-0.51
Outer London * 2011-2017			-1.73
% of 18-24-year-olds claiming Jobseeker's Allowance		-0.55 **	-0.45 **
2006-2010 * Jobseekers Allowance			0.03
2011-2017 * Jobseekers Allowance			0.24 *
% of Pupils Attaining at least 5 GCSEs A*-C		0.09 ***	0.11 **
2006-2010 * GCSE			-0.02
2011-2017 * GCSE			0.01
Median House Price to Workplace Earnings Ratio		0.53 ***	0.59 **
2006-2010 * Housing Unaffordability			0.20
2011-2017 * Housing Unaffordability			-0.05
Total Number of Social Housing Units for each LAD per 100 people (18 and over)		-0.22 ***	-0.23 **
2006-2010 * Social Housing			0.07
2011-2017 * Social Housing			0.01
% Pupils in Secondary Schools who are Black		0.13 **	0.23 **
2006-2010 * % Black			-0.10

VARIABLES		Model 1 Rurality only - 1998-2017	Model 2 Time period and area characteristics – 1998-2017	Model 3 Time period, rurality, and area characteristics – 1998-2017
2011-2017 * % Black				-0.17 *
% Pupils in Secondary Schools who are South Asian			-0.03	-0.08 *
2006-2010 * % South Asian				0.06 *
2011-2017 * % South Asian				0.04
TPS Funding per each Female aged 13-17			0.00	-0.02
2006-2010 * TPS Funding (REF. = 1999-2005)				0.00
Constant		50.66	44.19	41.65 **
Random Effects	Between LAD variation	7.00	4.49	4.49
	Within LAD variation	7.72	7.36	7.36
	Rho	0.45	0.27	0.27
R- squared	Within	0.01	0.10	0.11
	Between	0.25	0.57	0.58
	Overall	0.14	0.35	0.35
*** p<0.01, ** p<0.05, * p<0.1				

The fixed effect models presented in Table 5.2 examine how changes in LAD characteristics are associated with the change in the under-18 abortion ratio. In the final fixed effect model, changes in LAD characteristics account for 10 per cent of the variation in under-18 abortion ratios over time. Increases in the under-18 abortion ratio are associated with decreases in the level of youth unemployment, rising educational attainment, growing proportions of Black or South Asian secondary school pupils, increasing house price unaffordability, and reductions in social housing provision. *All of the signs of the associations between the area characteristics and abortion ratios are the same in the random effect models and the fixed effect model. Having the same signs in both models mean that, for example, areas with a higher educational attainment have higher abortion ratios but that improvements in educational attainment are also associated with growing abortion ratios over time.*

Table 5.2 The fixed effect models of the Local Authority District under-18 abortion ratios' relationships with the Local Authority District characteristics, between 1998 and 2017 in England

VARIABLES		Coef.	P-value
% of 18-24-year-olds claiming Jobseeker's Allowance		-0.36	***
% of Pupils Attaining at least 5 GCSEs A*-C		0.10	***
Median House Price to Workplace Earnings Ratio		0.46	***
Total Number of Social Housing Units for each LAD per 100 people (18 and over)		-0.22	***
% Pupils in Secondary Schools who are Black		0.22	**
% Pupils in Secondary Schools who are South Asian		0.14	**
Constant		42.22	***
Random Effects	σ_u Between LAD variation	6.47	
	σ_e Within LAD variation	7.39	
	Rho	0.43	
R-squared	Within	0.10	
	Between	0.52	
	Overall	0.30	
*** p<0.01, ** p<0.05, * p<0.1			

5.4 Discussion and conclusion

This chapter provides new insight into the spatial variation in teenage fertility decline by examining geographical differences in the outcome of under-18 conceptions. This analysis goes beyond past literature by examining a wider range of contextual factors and their association with abortion ratios at the LAD level in an extended time period, which includes the 2010s. Areas had higher proportions of conceptions resulting in abortion if they had higher educational attainment, less affordable housing, lower amounts of social housing stock, higher proportions of Black teenagers, and less youth unemployment. Past research found that the IMD became less correlated with abortion ratios through 1998 to 2010 (Conrad, 2012). Yet, in contrast, this chapter uses a repeated

measures design and controls for other factors but shows that local area unemployment rates remain consistently associated with the likelihood of a conception resulting in abortion from 1998 to 2010. In contrast, this research found that from 2011 to 2017, the effect of the relationship between youth unemployment and abortion ratios weakened. In general, however, most factors were consistent across the whole period 1998-2011 in their relationship with the likelihood of abortion for teenage pregnancies.

Teenage women cite aspirations for further and higher education or job prospects as reasons for choosing abortion to avoid teenage births (Lee et al., 2004; Tabberer et al., 2000). Abortion ratio differences may be due to pregnancy planning or ambivalence being more common in certain populations and has been found to be related to aspirations for being a younger parent, a dislike of school, and feeling as if education or job options are limited (Coleman and Cater, 2006; Greene, 2006; Hoggart and Phillips, 2011; Lee et al., 2004; Tabberer et al., 2000). We found LAD educational *attainment* is associated with lower abortion ratios, even in the 2010s after widespread educational improvements and rising aspirations. Similarly, higher proportions of certain ethnic minority populations may now represent groups of teenagers more likely to opt for abortion; White British, Black Caribbean, and Mixed ethnicity teenagers were found to be more likely to conceive but White British teenagers were less likely than all other ethnicities to opt for abortion once pregnant (Crawford, Cribb, and Kelly, 2013).

We found that LAD characteristics are better at explaining under-18 abortion ratio variation between areas rather than over time, much like the findings for conception rates in Chapter 3. Nonetheless, youth unemployment reductions, educational attainment improvements, and growing Black and South Asian teenage populations are associated with rising under-18 abortion ratios. Housing availability in England has altered over the last two decades from issues ranging from rising house prices to austerity and substantial cuts to the provision of state-funded social housing (Berrington and Stone, 2014), and social housing decline and rising housing unaffordability are related to growing abortion ratios.

We consider ecological relationships, as individual-level data are not available, and these trends toward abortion may represent more complex processes that cannot be

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captured when not viewing individual-level decisions. For example, teenage contraceptive use and emergency contraceptive use are not available for LADs and abortion service provision is not available over this extended period but may provide insight into this spatial variation. While past works have qualitatively examined abortion reasoning and norms (Lee et al., 2004; Tabberer et al., 2000), this should be studied within this period of less common teenage pregnancies to consider changes over time. Nonetheless, factors like youth employment in areas continue to be important in explaining geographical abortion ratio variations after conception rates have halved. In conclusion, this chapter highlights that considering abortion ratios should be included in future work to consider the shifts away from motherhood after experiencing a teenage conception.

5.4.1 Ongoing conclusions

This research has found that area characteristics can predict the levels of abortion ratios in local areas but, akin to the relationships between area characteristics and conception rates in Chapter 3, there are significant amounts of variation which cannot be captured by these variables. Conception rates were better explained by area characteristics than abortion ratios and this may be due to abortion ratios being more determined by access to services. Indeed, research in the late 1990s and early 2000s by Wilkinson et al. (2006) found that areas which had poorer access to general sexual health services had higher conception rates and abortion ratios. The role of distance to abortion services and less physical barriers to such services have not been widely researched in terms of teenagers in England through the 2010s. This unexplained variation in abortion ratios may also be due to varying norms so that the local culture of teenage childbearing differs from low to high abortion ratio areas. While the ongoing research in this thesis has provided evidence that area characteristics can be important and useful predictors of area reproductive behaviour, this unexplained variation also presents the reality that policy can only use area characteristics to predict teenage reproductive behaviours to a certain extent as many nuances are not included. The next chapter will examine the role of behaviours alongside area characteristics.

Chapter 6 Neighbourhood characteristics, educational expectations, and teenage conceptions in England

6.1 Introduction and motivation

The analyses reported in the previous empirical chapters revealed that area characteristics can explain significant proportions of the variation in teenage conception rates and abortion ratios. In areas with more youth unemployment or education, skills, and training deprivation, teenage conception rates are higher and the proportion of teenage pregnancies resulting in abortion are lower. These relationships are consistent with research at the individual level, which suggests that living in a deprived area is associated with being more likely to have a teenage conception or birth over and above family disadvantage and school-level disadvantage (Crawford, Cribb, and Kelly, 2013). The relationships between area disadvantage and teenage fertility are often explained in terms of teenagers in these areas having lower aspirations/expectations (and prospects) for education and career opportunities. This is the view of the English ten-year governmental Teenage Pregnancy Strategy (TPS) (Social Exclusion Unit, 1999) and teenage pregnancy coordinators (Arai, 2001). The initial report by the Social Exclusion Unit (1999) suggested:

“Throughout the developed world, teenage pregnancy is more common amongst young people who have been disadvantaged in childhood and have poor expectations of education or the job market. One reason why the UK has such high teenage pregnancy rates is that there are more young people who see no prospect of a job and fear they will end up on benefit one way or the other. Put simply, they see no reason not to get pregnant” (p.7).

The TPS' aims of raising educational aspirations and expectations are much repeated within the policy document but have been critiqued by several authors. For example, it is argued that such narratives place the responsibility onto individual young people by suggesting aspirations can be elevated by teenagers themselves (St Clair and Benjamin, 2011). By

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focusing on aspirations, such policies dismiss the role of structural and institutional barriers in affecting educational aspirations and expectations (Bok, 2010; Harrison and Waller, 2018). Clair, Kintrea and Houston (2013) found that young people in disadvantaged areas had high aspirations for careers but that the main barriers related to limited knowledge as to how to make their aspirations a reality.

Nevertheless, empirical studies at the individual level have shown how increased educational enrolment (e.g. Blossfield and Huinik, 1991) and attainment (e.g. Berrington et al., 2015) are associated with delayed childbearing. Education is likely to affect the timing of entry into motherhood via a number of mechanisms: role incompatibility whilst a student; by increasing the economic opportunity costs of childbearing via increased earnings; and by encouraging more liberal attitudes regarding the role of women and the importance of personal goals beyond family formation. However, past research examining the link between education and early parenthood tends to record educational outcomes retrospectively, once the individual has reached adulthood, and there is a possibility that pregnancy and childbirth in the teenage years act to curtail education. This chapter aims to add to the less examined, prospectively measured, role of educational expectations on early childbearing in England. Moreover, there is little research that has examined the relationships between local neighbourhood characteristics, educational aspirations, and early pregnancy. This chapter fills this gap.

Previous empirical chapters in this thesis consider how areas in England have varied in terms of their teenage pregnancy rates and abortion ratios over the past decades. This fourth empirical chapter aims to continue the investigation into the spatial differences in teenagers' reproductive behaviour, this time using individual-level data linked to local area characteristics. The role of neighbourhood effects on educational expectations and experiencing a teenage conception will be examined using data from the Next Steps study. Using the remote facilities of the UK Data Service Secure Lab at the University of Essex, the author has linked selected local area characteristics to a unique cohort of students in Year 9 of school (age 14) across England who have been followed up with their pregnancy outcomes at age 19 and beyond. In this way, the analysis examines the relationships

between macro/area-level characteristics, such as neighbourhood deprivation, with experiencing a conception while being able to observe whether these relationships are explained by controlling for personal educational expectations and family and personal characteristics. This chapter is also able to consider the macro-micro interactions between neighbourhood characteristics and microsystem/family-level characteristics on experiencing a teenage conception. These include the interactions between LSOA income deprivation and household occupation; LSOA education, skills, and training deprivation with mother's education; LSOA education, skills, and training deprivation with personal educational expectations; and the LAD prevalence of persons employed in the mining, quarrying, and construction sectors with household occupation. Finally, this research contributes to the literature by examining a wider range of neighbourhood factors and their relationship to teenage conceptions and educational expectations. This research considers education, skills, and training deprivation, income deprivation, housing and services deprivation and also the ethnic composition of areas as well as whether areas are rural or urban.

6.2 Conceptual framework

In Chapter 2, the conceptual framework for the whole of the thesis was discussed. This framework, inspired by Bronfenbrenner (1979), considers the exosystem (macro-level, area characteristics like deprivation and composition), microsystem (such as family level of education, family form, and other characteristics), and individual factors (like ethnicity, truancy, or the educational expectations of the teenagers) previously found to be associated with teenage conception or motherhood. The subset of variables analysed in this chapter are shown in colour in Figure 6.1, whilst variables not included are shown in white.

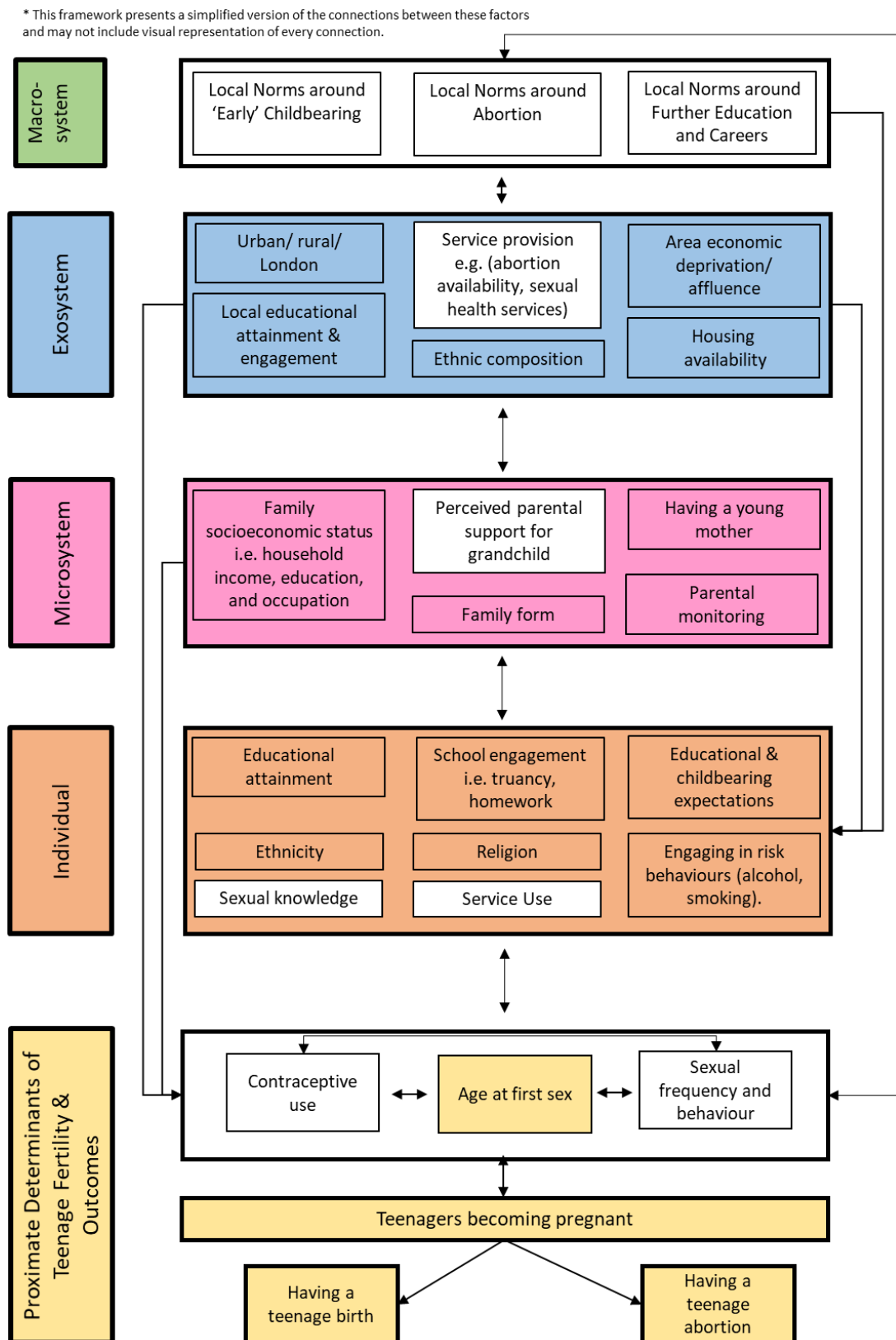
This chapter focuses on the associations between neighbourhood characteristics and experiencing a conception as a teenager and has aimed to capture many of the exosystem/area-level factors in the conceptual framework. Of particular interest is the role of educational expectations. Policy makers repeatedly refer to raising expectations as a lever to reduce levels of teenage conceptions. This chapter provides new evidence to inform

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such policies. The analysis, therefore, first considers the ways in which these area characteristics, family characteristics, and individual characteristics are associated with expecting to attend university. Many of the determinants of educational expectations have also been found to be predictors of teenage conception. This research then considers whether the relationships between neighbourhood characteristics and teenage conceptions are explained by controlling for personal educational expectations, microsystem/family-level characteristics, and individual-level characteristics. These family-level and individual-level characteristics have been used to represent the microsystem and individual levels of the conceptual framework and to ensure that the area-level relationships with conceptions are not acting as proxies for the family background of young women. The conceptual framework has presented a somewhat simplified relationship between all of the variables to be able to present the framework clearly. So, going beyond what is simply presented by the conceptual framework, which shows how family or individual factors are associated with where young women live, this research captures the macro-micro interactions between area characteristics and young women's family characteristics.

Yet, limited research has found that young women living in certain areas may have larger effects if they are also from a disadvantaged family (Crawford, Cribb, and Kelly, 2013). Being from a disadvantaged family may have a larger effect of increasing the likelihood of experiencing a conception if young women live in an area which is economically deprived because they are also not surrounded by the influence of more affluent persons. To investigate relationships such as this, the research uses individual-level data from a secure version of the Next Steps cohort survey data (detailed in section 6.5.1), which included geographical identifiers at the Lower Super Output Area (LSOA) of the cohort member's place of residence at age 14 (University College London, UCL Institute of Education and Centre for Longitudinal Studies, 2017). On the basis of the associations between area characteristics and local under-18 conception rates that were established in Chapter 3, a variety of area characteristics (shown in blue in Figure 6.1) were selected and extracted from the components of the Index of Multiple Deprivation and the ONS area classifications. These were then passed to the UKDS and linked by the author to the Next Steps data.

Figure 6.1 The conceptual framework for the thesis, where the variables available for the analysis in the fourth empirical chapter are in colour



6.3 Review of the literature

This chapter is focused on the associations between exosystem/area-level characteristics and teenage conceptions. This research considers whether such relationships are moderated by educational expectations and are explained by controlling for microsystem/family-level and individual-level characteristics. Therefore, this review of the literature needs to include a wide variety of variables of interest but efforts have been made to keep this succinct. This research also involves macro-micro interactions between where young women live and their personal educational expectations, and between their family characteristics and personal educational expectations on the associations with teenage conceptions. Relevant macro-micro findings are examined in each section.

The review of the literature has four parts. The first part reviews evidence of associations between local area characteristics and sexual and reproductive behaviour. The second part focuses on local area characteristics found to be associated with educational expectations. The third section summarises the associations between educational expectations and teenage fertility. This part also includes a discussion of previous findings concerning the role of educational expectations on the proximate determinants of conception – early sexual debut and contraception use. Finally, the fourth part of the literature review summarises relevant findings of the associations between the control variables at the microsystem/family-level and individual-level in this chapter with educational expectations and teenage fertility.

Before the review of the literature, it is important to distinguish between educational *aspirations* and *expectations*, as they are measures that may not align (Khattab, 2014). While aspirations may represent what someone wishes to achieve, expectations are grounded in the context of the lives of young people (Khattab, 2014). Khattab (2014) created typologies of teenage aspirations, expectations, and attainment using the 2004 age 13 to 14 Longitudinal Research of Young People in England and found that 28 per cent of this sample of teenagers had aspirations for university which did not match their expectations, with 25 of the 28 per cent representing teenagers with higher aspirations than expectations. These typologies varied not only by parental occupational class, but also

ethnicity. A lack of access to further and higher education as a result of financial limitations or the lack of family support can affect aspirations, but particularly expectations. The analyses in this research use educational expectations as they capture the future that teenagers imagine, rather than aspirations which may be less grounded in their own contexts. However, this literature review considers both educational expectations *and* aspirations as studies which consider expectations are less common and the determinants of aspirations can provide some insight into what the determinants of expectations might be.

6.3.1 Existing literature regarding the effect of area characteristics on sexual and reproductive behaviour

How teenage pregnancy and motherhood vary by area has been examined by quantitative research that considers the ecological relationships between area characteristics and local reproductive measures (such as Chapter 3 and Chapter 5), quantitative research which considers the role of neighbourhood characteristics on individual reproductive behaviours, and by qualitative research about neighbourhoods. This review will focus mainly on the quantitative findings.

As discussed, teenage pregnancy coordinators in Arai (2003) cited local deprivation as a reason for high teenage motherhood in certain areas, although the women who became pregnant as teenagers discussed family disruption as being an influence, rather than living in a deprived area. Similarly, qualitative interviews by Tabberer (2000) found that while young women in affluent schools of the same city discussed the link between poverty and teenage motherhood, young women in less affluent school environments did not acknowledge this link. Nonetheless, as discussed in section 2.3.3, local areas with greater socioeconomic deprivation have been consistently found to have higher rates of under-18 conception rates (Conrad, 2012; Wright et al., 2016) and many of these studies used various indexes of deprivation, from the IMD to the Carstairs Index. The association between living in an area with greater deprivation has also been found to be associated with a greater

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likelihood of teenage fertility using individual-level data, although these studies are much less frequent. Wellings et al. (2016) examined the relationship between living in an area in the highest quartile of deprivation and conceiving before the age of 18 in the Natsal surveys 1999-01 and 2010-12. This research found that women living in areas with greater deprivation were more likely to experience a teenage conception before the age of 18. Local characteristics have also been found to predict general fertility postponement in teenagers and reproductive age women. Malmberg and Andersson (2019) identified 'elite' areas which had high proportions of the population with tertiary education and more disposable income which were found to have associations with postponed first births in Sweden. While it does appear that local deprivation does have relationships with fertility, these relationships may be acting as proxies for other characteristics or behaviours. Johns (2011), for example, found that IMD quartiles significantly predicted teenage motherhood in a non-representative sample of young women in Gloucestershire. Yet, Johns also found that this relationship between local deprivation and teenage motherhood was explained by perceived environmental risk and family stress. This suggests that deprivation may be acting as a proxy for other variables and that family factors are more important than some of the characteristics of where young women live as a teenager. Indeed, Hedman (2014) found supporting evidence that the relationships between area-level characteristics and teenage childbearing are very small or insignificant after correcting for selection bias. This study by Hedman did, however, focus on Sweden which has very low teenage fertility rates and so this may not be replicated in a high fertility setting like England.

The role of area characteristics and family characteristics, and how they may interact, has only been investigated in England by an ambitious research project by Crawford, Cribb and Kelly (2013) which linked the National Pupil Database (NPD) to individual-level conception records from the ONS. Through this extensive dataset, this research examined individual, school, and area characteristics on the likelihood of teenagers in England experiencing a conception for women born between 1989 and 1992. Attending a school that had a greater proportion of students receiving Free School Meals (FSM) was associated with greater odds of a conception, but this association weakened after controlling for whether the pupil themselves were eligible for FSM. Crawford, Cribb and

Kelly (2013, p.33) did, however, find that being eligible for FSMs has a larger effect on women who lived in the most deprived quartile; women living in an area in the most deprived quartile who were eligible for FSMs were 40 per cent more likely to experience a conception than their non-FSM counterparts, whilst FSM-eligible women were twice as likely to conceive if they lived in an area in the least deprived quartile; teenage births were 76 per cent and three times more likely respectively. Smith and Elander (2006), used a non-representative sample of young women aged 13 to 15 to find that family circumstances moderated the relationship between living in an area with higher socioeconomic deprivation and how many educational and career milestones that they believed were important to achieve *before* having a baby. These studies show that the relationships between area characteristics and teenage reproductive behaviour are complex and the importance of considering family and individual contexts of teenagers alongside area factors.

Living in a more deprived area has also been found to be associated with teenage sexual behaviours that may make conception more likely. Smith and Elander (2006) used a non-representative sample of 13- to -15-year-old girls in the United Kingdom and found that living in an area of greater deprivation was associated with increased early sexual activity. As this research also controlled for family circumstances, it was also able to find that the effect of living in a deprived area on sexual behaviour also varies by the socioeconomic status of the family. Young women from the deprived area had higher early sexual activity but this varied by family affluence, as the women from less affluent families in the deprived area had an even higher likelihood of early sexual activity. These trends in behaviours may explain why certain areas have higher rates of teenage pregnancy and why, in qualitative research like Tabberer et al. (2000), there continues to be a distinction between the reproductive behaviours of young women from different socioeconomic backgrounds even when they are all from a relatively disadvantaged part of the country.

Certain more wide-ranging characteristics of areas have been found to be associated with teenage conception rates, as discussed in section 2.3. For example, Humby (2013, p.2) found that local authorities in England and Wales in 2008 to 2010 'containing seaside towns,

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the Welsh Valleys, major urban centres and in bands in the north of England' had higher under-18 conception rates. Lee et al. (2004) found that the ONS area classifications were strong predictors of under-18 abortion ratios by local authorities in England in the late 1990s. Local authorities in the Mining, Manufacturing and Industry ONS classification have the lowest mean under-18 abortion ratio at around 34 per cent of conceptions leading to abortions. This is compared to the three classification groups with the highest abortion ratios, Inner London, Education Centres and Outer London, and Prosperous England, which had average abortion ratios over 50 per cent. The ONS area classifications may have been underutilised because they are only produced every decade due to being census-based and that the categories are not the same for each census. Therefore, comparisons cannot be made in the categories for the 2001 and 2011 census, which restricts what this measure can communicate for long term trends. Nevertheless, area classifications have also been found to be predictive of experiencing teenage motherhood in an individual-level dataset by Wellings et al. (1999), using the 1990-1 Natsal survey, with women in mining and industrial areas being more likely to have experienced a teenage birth. The uses of these kinds of measures highlight how the differences in areas can encompass more than just characteristics like economic deprivation, but also that the sectors in which people are employed or the cultures which exist in different types of areas may explain variation in teenage reproductive behaviour.

Section 2.3.1 summarised how past research has found that urban areas had higher teenage conception rates and that rurality can act as a proxy for affluence (Humby, 2013) but qualitative interviews with women who became teenage mothers cited their isolation from services due to rurality as reasons for their parenthood (Coleman and Cater, 2006). Fewer studies on teenage fertility at the individual-level have controlled for whether individuals live in an urban area. However, in a representative cohort of women aged 14 to 16 in 1993 in Australia, Gaudie et al. (2010) found that teenage pregnancy before the age of 20 was associated with living in a non-metropolitan area at the time of the interview whilst controlling for family characteristics and risk behaviours. The differences between urban and rural areas in Australia are likely to differ in context to urban and rural areas in England and so may not be relevant in this context.

This section of the literature review has summarised relevant literature on the associations between area characteristics and teenage conceptions/fertility and highlights that there are limited studies which use individual-level data to investigate these relationships. Even fewer studies have been able to consider the macro-micro interaction effects on teenage reproductive behaviour. The rest of the literature review will summarise the body of research around the relationships between area characteristics and educational expectations, before going on to discuss the literature on the associations between educational expectations and teenage reproductive behaviour.

6.3.2 Existing literature regarding the effect of area characteristics on educational expectations

There is limited research which empirically considers the specific role of exosystem/area characteristics of where teenagers live on their educational expectations/aspirations, and studies that do consider the wider environment of pupils beyond their families often consider schools (Khattab, 2014) or peer/friendship groups (Burgess and Umaña-Aponte, 2011; Maragkou, 2019) rather than neighbourhoods/areas. Where appropriate, this review of the literature includes school-based findings due to the lack of research which has considered area-level characteristics. In research of 13- to 14-year-olds using the 2004 Longitudinal Research of Young People in England, Khattab (2014) classified combinations of university expectations and aspirations, alongside achievement at GCSE, and examined whether school-level and family-level characteristics explained differences in experiencing a teenage conception. The only significant *school-level* characteristic associated with high educational expectations, aspirations, and attainment was school-level academic achievement at Key Stage 3 (around 14) even after controlling for socioeconomic background characteristics.

Not only has local area school attainment been found to be associated with greater educational expectations but, in research by Weßling and Bechler (2019) using the German National Educational Panel Study, teenagers who lived in a region with more research

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opportunities (i.e. universities in the area) were more likely to go on to attend university. Other research in Germany, using the GSOEP yearly panel study, also found that the percentage of university graduates in the area was associated with expectations of higher education at age 17 in Hartung and Hillmert (2019) even after accounting for socioeconomic background like occupation and parental education. The analysis in this second German research study also found that average spending power at place of residence was associated with greater education expectations, whilst the unemployment rate in the region was associated with lower expectations, but these associations became insignificant after controlling for individual-level variables like attainment, family socioeconomic characteristics, and school type. This research found that the association with living in a university area did not vary by whether young persons had a parent with high parental education, which suggests that these are both distinct protective factors against low educational expectations. These findings may be country-specific as the German context may vary from England, however, they do provide insight into this little considered area of research.

The relationships between local deprivation and individual educational expectations are less clear. In Khattab (2014), while school-level attainment was significant, the prevalence of pupils which were eligible for FSM was largely insignificant in predicting the profile of university expectations, aspirations, and attainment. Khattab suggested that the other school-level predictors may not be significantly associated with educational aspirations and expectations as they may be mediated by attainment, but the study did not test whether this was the case. Lupton and Kintrea (2011) examined the findings of a number of quantitative research studies but concluded that there is no clear consensus on whether young people from deprived areas have lower *aspirations*, and that the role of areas on aspirations (and expectations) have been undertheorised and under examined. University expectations are the focus of this chapter but various outcomes are used in the educational expectations/aspirations literature, some of which have also considered occupational choices ranging from vocational to academic. Hedges and Speckesser (2017) found that secondary school leavers in England in 2011 (age 16) who lived in more deprived areas (using the IMD deciles) were more likely to choose a vocational course than an

academic route, even after controlling for family socioeconomic status and achievement. In other research considering the role of area deprivation through the use of the IMD score, Baker et al. (2014) found that 14-year-olds in a non-representative sample in England living in more deprived areas were less likely to believe achieving an undergraduate degree to be 'very important' whilst controlling for family and school factors. This research found that young people living in areas with higher local employment deprivation were less likely to report that achieving an undergraduate degree was 'very important' after controlling for family and school factors. Baker and colleagues considered this outcome to represent low educational aspirations, but it is important to note that higher education is not only achieved through going to university. Nonetheless, Smith and Elander (2006) found, in a non-representative sample of young women aged 13 to 15 in England, that young women who lived in an area with less socioeconomic deprivation reported more educational and career milestones (such as plans for university or believing that it is important to have a house, money and career before having a baby) that they believed were important to achieve *before* having a baby. This relationship was moderated by family socioeconomic circumstances. Women from affluent families were more likely to report more educational and career milestones as being important to achieve before a baby if they lived in a more affluent area, but those living in the affluent areas from socioeconomically disadvantaged families did not experience this increase in the number of milestones pre-baby. Furthermore, while these studies have varied in the way that educational expectations or aspirations are measured, there appears to be a common theme whereby living in an area with greater disadvantage is associated with a lower likelihood of aspiring or expecting to attend higher education. Also, similar to what was found in the literature around teenage conceptions in the previous section of this literature review, the effect of living in a more affluent area may also not be protective against low educational expectations if family circumstances are disadvantaged.

Other studies have examined other area classifications beyond deprivation and their association with teenage fertility. Office for National Statistics (ONS) area classifications are outputs from the census whereby areas are grouped by their characteristics (such as demographics and housing), and employment (such as unemployment) to the type of job

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sectors prominent in the area (Office for National Statistics, 2018). Area classifications describe areas beyond traditional measures of area characteristics and are 'non-propriety area type'. Baars (2014) investigated the associations between a similar variable to the ONS area classifications and educational aspirations. Baars used Understanding Society and found that young people who lived in areas categorised as City Living or Multicultural were most likely to have high educational aspirations, whilst young people in Blue Collar Communities and Constrained By Circumstances were the least likely to report high aspirations. Khattab (2014) only used school-level characteristics but did not find that the ethnic composition of the school significantly predicted the profile of university expectations, aspirations, and attainment. Nevertheless, these studies show that it may be important to consider the role of area beyond traditional measures of economic disadvantage and that cultures may play a role in educational aspirations and expectations.

6.3.3 Existing literature on the relationship between educational expectations and teenage pregnancy and sexual behaviour

Studies which have examined the quantitative relationships between educational expectations and the likelihood of experiencing a conception as a teenager are now relatively old as they included young women who were teenagers in the late 1990s and so do not consider the relationships in the context of the expansion in further and higher education. Nonetheless, Bonell et al. (2005) using the RIPPLE trial accompanying dataset found that women aged 13 or 14 who did not expect to be in education at the age of 20 were significantly more likely to have a child by age 15 or 16 even after controlling for attitude to school, family characteristics, and confidence around rejecting unwanted sex and communicating about sex. Allen et al. (2007) also used the RIPPLE trial accompanying dataset but controlled for different characteristics. This latter research still found that women who did not expect to be in education at 20 years old were significantly more likely to report pregnancy at follow up after controlling for socioeconomic characteristics, dislike of school, measures of greater alcohol use, lower parental communication, and a belief that peers were sexually active. This latter research found that, while these characteristics did

not explain the association between expecting to be in education at age 20 and going on to experience a teenage conception, the positive association between expecting motherhood by the age of 20 and having a child by 16 disappeared when controlling for such factors. So, while expectations for early motherhood may be associated with not expecting to be in education at age 20, background factors are much more predictive of childbearing expectations than educational expectations. These findings highlight that the link between expectations for motherhood and teenage pregnancy are largely driven by background factors, while the link between educational expectations and teenage pregnancy represent an association that goes beyond having certain background characteristics. There has been limited research that has specifically and statistically tested the relationships between educational expectations and teenage fertility/pregnancy and this research provides some evidence that this association exists, particularly before the expansion of further and higher education of the 2000s and 2010s.

Low educational expectations and/or aspirations have emerged as trends in qualitative studies of teenage motherhood (Arai, 2003; Coleman and Cater, 2006; Smith and Roberts, 2011; Wiggins et al., 2005). While educational aspirations reportedly deter some women from teenage childbearing, others hold specific aspirations for teenage or early motherhood (Lee et al., 2004; Wiggins et al., 2005) whereby young motherhood is felt to be a central part of their imagined futures with education, or with education fitting into their lives as mothers rather than the other way around (Lee et al., 2004). For such women, the timing of motherhood is more important than the potentially disruptive effect of motherhood on their education or careers, compared to other women for whom the plans for further education or careers have been cited as motivations for avoiding teenage pregnancy and/or opting for abortion. The lack of such expectations or aspirations or a dislike of school have been found within those who went on to teenage motherhood (Arai, 2003; Lee et al., 2004; Coleman and Cater, 2006; Greene, 2006; Hosie, 2007) and teenagers who expect earlier childbearing (Bonell et al., 2005). Truancy at age 15 was associated with pregnancy by age 19 in England in Zhou et al. (2015). Disengagement with school can be represented by truancy in quantitative studies and Allen et al. (2007) found that truanting women were more likely to go on to have a teenage pregnancy by 16 in a sample of

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teenagers from schools in central and southern England. High educational aspirations while pregnant, even among teenagers who went on to have a birth, was quantitatively found to be associated with greater 'unwantedness' of the pregnancy and stress post-birth (East and Barber, 2014). A theme of current or imagined future disengagement with education appears to be associated with being more likely to experience a teenage conception or motherhood across both qualitative and quantitative studies. The experience of disengagement may not continue and, indeed, teenage mothers who were previously disengaged with education have reported that their child motivated them to reengage with education and increased aspirations (Anwar and Statistreet, 2014; Hosie, 2007; Tabberer et al., 2000) and highlighted how, for some, educational aspirations can span the life course beyond the teenage years.

If educational expectations influence teenage fertility, they must do so directly through differences in sexual behaviour leading to teenage fertility, i.e. the proximate determinants of (teenage) fertility (Bongaarts, 1978). The determinants of fertility include being sexually active (through age at sexual debut and the frequency of acts that could result in pregnancy), effectiveness of contraceptive use, and abortion. There are few existing studies which consider educational expectations on the variation in teenage sexual behaviour in England because there are limited nationally representative surveys which include questions about teenage sex and, those which do so (like Natsal), do not also measure aspirations or feelings around education (as they are not teenage focused). Studies may also consider the ways in which educational expectations influence sexual behaviour (Parkes et al., 2010; Sipsma et al., 2015; Soller and Haynie, 2013) but this is the opposite causal pathway than the focus of this chapter. More research has occurred in the US, but it must be noted that due to the differences in the US university fees and access to higher education, such relationships may differ from the situation in England. Teenagers who engage in earlier first sex have a longer period of time in which they can experience a teenage conception (assuming they continue having sex after this one event), and earlier first sex has been found to be associated with lower educational expectations. In the US, having friends with greater educational aspirations had a greater effect than one's own expectations on the likelihood of teenagers not having sex or postponing their sex until later

in a relationship (Soller and Haymie, 2013). These peer effects of educational aspirations may represent the importance of the effect of local norms around the timing of education and motherhood on individual sexual behaviours.

Age at first sex does describe when persons start their sexual behaviour, but the measure is limited in that it cannot define sexual behaviour beyond this event. The greater likelihood of conceiving as a teenager amongst young women who do not like school may be due to different contraceptive behaviour. Bonell et al. (2005) found that teenagers were less likely to have used contraception at first or last sex if they disliked school, expected motherhood by the age of 20, or lacked expectation of education/training. Unfortunately, the Next Steps study does not collect information about contraceptive use until age 19, and so contraceptive behaviour cannot be studied in the analyses for this chapter.

6.3.4 Existing evidence of microsystem and individual-level control variables associations with educational expectations and teenage fertility

The overarching literature review for the thesis in Chapter 2 and the subsequent conceptual framework for this chapter also examined microsystem (family-level) factors and individual-level factors of teenage fertility. This research aims to consider whether the relationships between area-level factors of teenage conceptions are actually representing the associations with background factors. To avoid repetition, this section briefly summarises these established relationships with teenage fertility and provides signposting to the sections of the literature review chapter, whilst also including relevant literature on the relationships between these control variables and educational expectations.

The microsystem/family-level variables in the conceptual framework which will be used in these analyses measure socioeconomic status and family form. Young women with more educated parents or with parents with a higher occupational class have been found to want to postpone parenthood in Berrington and Pattaro (2014). However, this study found that the relationships between these socioeconomic characteristics and expected age at first birth is explained by reading ability and expectations for school leaving age. These

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factors appear to be related as parental educational level has been found to be significantly associated with greater expectations of attending and completing university in a stratified sample of 11th-grade students in Spain in 2006/7 (Gil-Flores et al., 2011). Gil-Flores and colleagues highlighted that family environment (having a place to study and the total number of books in the home) is highly predictive of educational expectations alongside parental education. Therefore, environments that encourage young people to learn may explain some of the relationships between socioeconomic status and expectations. Having a parent of higher education or professional occupational status may represent a source of more knowledge about accessing post-compulsory education. Smyth (2020) considered teenagers in Ireland and found that both social class and mother's education were associated with greater higher educational expectations whilst controlling for other socioeconomic characteristics. Khattab (2014) found that 13- to 14-year-olds in England who had parents in occupational classes below 'professional class' were more likely to have low university aspirations, university expectations, and low GCSE attainment, or high aspirations alongside low expectations and achievement, than their peers from professional class families who were more likely to have high aspirations, expectations, and achievement. Educational expectations may also be influenced by connections with a person who has experienced higher education who does not exclusively need to be a parent. For example, Burgess and Umaña-Aponte (2011) found that individuals from lower-income families with a connection to a high-income family were more likely to aspire to stay in further education in an English sample.

From examining the past literature spanning many decades, there appears to be evidence that young women in families with lower socioeconomic characteristics are less likely to hold educational expectations as high as their more socioeconomically advantaged peers. However, the 2000s and 2010s saw an expansion in further and higher education across England (detailed in section 2.3.4) and so such relationships between socioeconomic status and educational expectations may have weakened if the expansion has also affected the disadvantaged youth. Two studies using British cohort studies have considered this relationship over time. Schoon (2010) found that parental education is less strongly associated with educational expectations of 16-year-olds in the 1989/90 cohort than in the

1958 and 1970 birth cohorts. Maragkou (2019) also compared the 1970 and 1989/90 birth cohorts but used occupational class and still found that the relationships between socioeconomic status and educational expectations declined between the two samples. This study does not test whether these changes have occurred, but it adds to this literature by using a cohort of young women who were born around 1990 whilst considering a range of socioeconomic factors.

Living with two parents (not including step-parents) has been found to be associated with lower chances of experiencing a teenage conception (Buston, Williamson and Hart, 2007) and motherhood (Wright et al., 2016) than being from other family forms and this relationship is discussed further in section 2.4.4. Although Wright and colleagues found that this association between family form and teenage reproductive behaviour was explained by accounting for socioeconomic characteristics like social class and the employment status of the families young women were in. Being from a family which does not have two parents (not including step-parents) has also been found to be associated with lower educational expectations. Khattab (2014) found that young people aged 13 to 14 in England with one step-parent or a single parent were more likely to have low educational aspirations, expectations, and achievement than their counterparts in households with two biological parents. Garg, Melanson and Levin (2007) found that, in Canada, teenagers in biological two-parent families were more likely to plan to go for graduate or professional studies whilst teenagers with single-parents made up more of the group not aiming for a university degree even whilst controlling for parental socioeconomic status and parenting style. The disruptive role of divorce and family separation itself has been discussed in section 2.4.5 as a way that these family forms may influence teenage reproduction. Divorce itself was considered in Flemish students aged 14 to 18 by Havermans, Swicegood and Matthijs (2020), who found that young people with less educated parents experienced a greater negative effect of divorce on their school engagement than their peers with highly educated parents. Due to this, measures of educational engagement like truancy or doing homework will also be controlled for in this analysis.

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Teenage childbearing differs by ethnicity in England. Dubuc and Haskey (2010) found that fertility postponement occurred through the late 1980s to the early 2000s across ethnic groups, and in particular for White British and Indian women. Black Caribbean and Mixed ethnicity women were found to have early childbearing in this time period. While teenage fertility was historically higher in certain ethnic groups in England, second- and third-generation women have been found to have less early childbearing and expect older ages at first birth (Berrington, 2020) than their predecessors. Berrington found that young women aged 16 to 21 in 2014/15 had an average estimated age at first parenthood of at least 23 within all ethnic groups (including White British, Black Caribbean, Black African, Indian, Pakistani, and Bangladeshi). Ethnic minority teenagers have also experienced rising educational outcomes and engagement during this shift to later childbearing. Strand (2011) considered the ethnic differences in national test results at age 14 of those born around 1990 in England and found that family and area socioeconomic variables largely explained the trend of White British students having higher results than their minority ethnic counterparts. The only ethnic group whose lower attainment at age 14 was not explained by family and area socioeconomic characteristics were Black Caribbean teenagers. Nonetheless, educational attainment has increased in young women from most non-White ethnicities so that these minority ethnic women had higher academic achievement by GCSE (age 16) than their White British counterparts by the 2010s (Greaves et al., 2014). Ethnic minority young people in England are now more likely to attend university than ever before (Crawford and Greaves, 2015).

These findings suggest that there has been a shift in which many ethnic minority groups are achieving high educational attainment, and educational expectations reflect this move towards education. Indeed, Autiero and Nese (2021) found that most ethnic minority teenagers in a recent cohort of teenagers born around 2000 – the MCS – had greater educational expectations than their White British counterparts, with particularly higher expectations among second-generation teenagers. Berrington, Roberts and Tammes (2016), using the UK Household Longitudinal Survey, found that White or ‘Mixed & Other’ teenagers had significantly lower odds of reporting these positive educational aspirations than their Indian counterparts even when controlling for individual and family characteristics and

school happiness. Black Caribbean, Black African, Pakistani, and Bangladeshi teenagers did not have significantly different educational aspirations to their Indian counterparts, which represent how contemporary ethnic minority teenagers are now reporting greater educational aspiration than their White peers.

Finally, many behaviours have been examined under the term 'risky behaviours' and they can encompass substance use, criminal activity, and some studies even consider teenage sex to be a risky behaviour (particularly unprotected sex). These 'risky behaviours' were discussed further in section 2.5.6 and have been found to cluster in quantitative research (Jackson et al., 2012; Meader et al., 2016; Wright et al., 2020). Young women who regularly smoked cigarettes in their early teenage years were found to be more likely to experience a conception as a teenager in Scotland (Buston et al., 2007). An increased likelihood of experiencing a conception if a young person engages in substance use may be due to also being more likely to have unprotected sex. Indeed, Bellis et al. (2008) found that 15- to 16-year-olds in nine European cities including Liverpool in England who used alcohol, cannabis, or ecstasy before the age of 16 were also more likely to have had sex before 16. Teenagers who engage in binge drinking were also found to have lower school engagement and attainment in Patte et al. (2017). It is interesting, however, that this research also found that future educational aspirations and expectations were largely uninterrupted by starting to engage in binge drinking. Risk-taking behaviour like substance use may therefore increase the likelihood of unplanned pregnancy rather than decreasing educational expectations and encouraging earlier childbearing.

6.4 Research questions

This chapter considers the role of local area characteristics on teenager's educational expectations and how these both relate to the likelihood of experiencing a teenage conception. First, this chapter examines whether educational expectations for attending university measured at age 14 are related to the characteristics of where the young women live at age 14, and whether these relationships are explained by the individual and family

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characteristics of those living in different areas. The second aim of this chapter is to examine the relationship between expecting to go to university at age 14 and the likelihood of experiencing a pregnancy by the wave at age 19. The third aim considers whether the relationships between neighbourhood characteristics and experiencing a conception by the wave at age 19 are explained by controlling for educational expectations at age 14 and whether they persist once controlling for individual and family characteristics. Finally, whether living in an educationally deprived area or having a mother with higher education alters the relationship between educational expectations at age 14 and experiencing a teenage conception. The research questions for this chapter are:

RQ1 – Are area-level characteristics associated with individual educational expectations at age 14, net of individual and family characteristics?

RQ2 – Are individual expectations of going to university at age 14 associated with the likelihood of experiencing a conception by the survey wave at age 19?

RQ3 – Are the associations between area-level characteristics and the likelihood of experiencing a conception by the survey wave at age 19 explained by individual educational expectations and family and individual characteristics?

RQ4 – Do the relationships between area characteristics (income deprivation; education, skills, and training deprivation; and the prevalence of persons working in mining, quarrying, and construction in the neighbourhood) and experiencing a conception by the age 19 wave vary by the socioeconomic characteristics of the young women?

6.5 Data and methods

The analysis in this chapter received ethical approval from the University of Southampton and the application is shown in Appendix D.

6.5.1 The Next Steps study

The Next Steps cohort study (NS) (University College London, UCL Institute of Education and Centre for Longitudinal Studies, 2017) is uniquely suited to this analysis because it includes a) information about teenagers' educational expectations at age 14 together with detailed information about themselves and their families, b) pregnancy history information reported at the wave at age 19, and c) geocoded data that enables examination of the role of neighbourhood characteristics at age 14.

NS started in 2004 with the first sweep including 15,770 teenagers in Year 9 of maintained schools, independent schools, and pupil referral units in England. All of the cohort sample were born between the 1st September 1989 and the 31st August 1990, meaning that the mean age of this sample at interview was 14. The sample for the NS sample was drawn using a two-stage probability proportional to size (PPS) sampling procedure so that schools were the primary sampling unit (PSU). The first stage sampling of school was then stratified by deprivation (deprived versus non-deprived) whereby the deprived schools were over-sampled by 1.5. The second stage of sampling also considered the pupils within the schools whereby those Indian, Pakistani, Bangladeshi, Black African, Black Caribbean, and Mixed pupils were oversampled to achieve over 1,000 pupils in each ethnic group (of male and female students).

The first wave sampled 21,000 young people and reached 74 per cent of the households to collect full interviews of 66 per cent of the sample (13,914) and partial interviews of 9 per cent (1,856). Wave six sampled all of those in wave five (11,225) and reached 87 per cent of households (9,799). Wave five had sampled all of those reached in wave 4 (11,801) but also reintroduced 34 young people who had previously refused to take part in either Wave 2, 3, or 4. As the analyses focus on women, it can only use around half of these samples but this still consists of over 4000 women (attrition is detailed in Table 6.1). All analyses in this chapter use weights to account for this complex survey design and attrition. The NS survey suggests weighting for the most recent wave included in the analysis (wave 6 in the case of this chapter) to account for both sample design and attrition (Department for Education, 2011). To account for this complex survey weighting, the

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analysis in this chapter applied the weights at wave 6 to account for initial oversampling *and* later attrition. The weighting, therefore, accounts for the primary sampling unit of schools (the sample used in this paper included data from just over 600 schools/PSUs), and the sampling stratum from wave 6 to account for attrition for more robust estimates. As some of the sample for this chapter analysis (detailed further in the next section) were the only respondent for their school/PSU by wave 6, the analysis treats these respondents as certainty units in the survey weighting so that they do not contribute to the standard error but can remain in the sample.

6.5.2 Sample for analyses

The sample used for the analyses in this chapter includes women from English LSOAs who took part in the age 14 (wave 1) and age 19 (wave 6) sweeps and also had a parental interview at age 14 (wave 1). To create the dataset necessary for analysis, these various sweeps of the NS research were linked together and this process has been presented in Table 6.1. The response rates for each of the explanatory variables have also been presented in this table and shows that the measure of household occupation had the lowest response rate in this sample, but this was still 4029 out of 4467. Although smoking and truancy may be considered 'risky' behaviours, both questions received over 4200 responses in the sample. Young women who did not respond to the explanatory variables were still included in the overall sample. Due to the generally high response rates, the explanatory variables do not have sufficient numbers of responses to create a 'no response' category and so the analysis uses a complete case approach. The response rate for the sample of women for each of the variables is also included in Table 6.1.

All of the research questions use the same sample. Of the 7,229 women who responded to the sweep at age 14, all of these respondents also had a parental interview at age 14. A smaller sample of women also responded at age 19 and so, of the women with the young person and parental responses at age 14, only 4,485 of these women also took part at age 19. Finally, the responses by the women in this sample have been linked by the

author to neighbourhood area characteristics using the 2001 census LSOA geographical identifiers. Of these women, 18 could not be linked to area characteristics due to being in LSOAs that did not have area characteristic data, such as Westminster in London, so that the final sample for every research question in this chapter includes 4,467 women.

To consider how attrition between age 14 and 19 affects sample characteristics, the author compared the age 14 characteristics of the whole sample at age 14 and the subsample successfully followed up to age 19 in Table E.1 in Appendix E. There were only slight differences in the sample characteristics, such as 24 per cent (unweighted) of respondents not reporting university expectations in the sample for the analysis compared to 27 per cent in the sample in the attrition. Related to this, women from areas in the least income deprived and least educationally deprived quartiles are slightly overrepresented in the sample in the analysis at 24 per cent compared to the sample without the attrition at 21 per cent respectively. These differences are minimal and are unlikely to largely influence the results as each category in this variable has more than 1,000 respondents. The variable with the largest difference between the two samples is family form and attrition at the wave at age 19 has meant that the sample used in the analysis is made up of a higher proportion of women from two parent households at 69 per cent compared to before attrition at 63 per cent. As a sensitivity analysis (not shown), the multiple logistic regression analysis with the outcome of university expectations was also run with the sample before the age 19 attrition (with the wave 1 weighting). The only difference in the associations between the variables of interest and expectations of university attendance found by this sensitivity analysis is that the 3rd quartile of the prevalence of the population in mining, quarrying, and construction sectors was significant at the 5% level but is insignificant in the final model which is presented later in this chapter. Largely, the relationships remain the same and the relationships continue to be in the same direction.

Table 6.1 The attrition, data loss, and response rates of the sample

Attrition and data loss:	
Total women ¹ who took part in the wave at age 14	7229
Total women who took part in the age 14 wave and had an age 14 parental interview	7229
Total women who took part in the age 14 interview, had an age 14 parental interview, and an age 19 interview	4485
Total women with the above three interviews that could be geographically matched ² by the author to LSOA and LAD characteristics	4467
Final sample	4467
Responses to individual questions in the final analytical sample (out of 4467):	
Number of the sample with a response to ever having sex	4082
Number of the sample with a response to ever being pregnant by the wave at age 19 (plus those who never had sex)	4066
Number of the sample with a response to university expectations	3956
Number of the sample with a recorded ethnicity	4461
Number of the sample with a response to ever smoking more than once	4214
Number of the sample with a response to how often they went out with friends in the last 7 days	4456
Number of the sample with a response to truancy in the last 12 months	4213
Number of the sample with a response to whether they are currently considered SEN	4403
Number of the sample with a response to ever doing homework on weekdays	4436
Number of the sample with a response to mother's highest education at the sweep at age 14	4102
Number of the sample with a response to occupation of household reference person	4029
Number of the sample with a response to family composition	4439
<p><i>1 The sex of the young person was decided by the interviewer. This meant that 350 'females' at age 14 had been coded as 'male' at one or more other waves. 138 of these had only been coded as 'male' at age 19 (and not in any of the previous or subsequent waves they appeared in), whereas 212 of these were coded as 'male' more than once. These 350 individuals have been, regrettably, excluded from the analysis as 'male' respondents were not asked about their conception history.</i></p>	
<p><i>2 Some LADs did not have data available, for example, Westminster in London.</i></p>	

6.5.3 Analytical strategy

This chapter includes four research questions and the analytical strategies for each research question will be explained in this section. Multiple logistic regression will be used for research questions 1, 3 and 4, and uses the following model (Agresti, 2003):

Equation 2

$$\text{Logit}(\pi_i) = \beta_0 + \beta_1 x_{1i} + \beta_2 x_{2i} + \dots + \beta_k x_{ki}$$

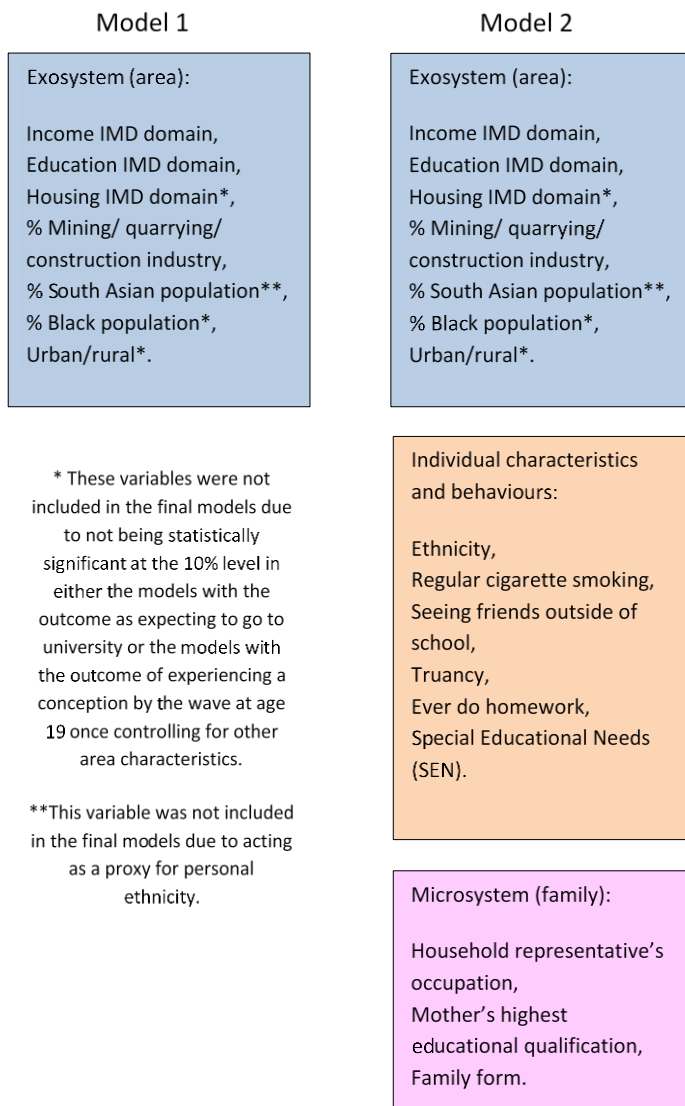
The $x_{1i}, x_{2i}, \dots, x_{ki}$ denote the explanatory variable (k) in the regression for each woman (i). $\beta_1, \beta_2, \dots, \beta_k$ represent the effect of the explanatory variable (k) on the probability of 'success'. In terms of the analysis in this chapter, 'success' is expecting to attend university for research question 1, and experiencing a conception for research questions 3 and 4. The log-odds are the $\text{Logit}(\pi_i)$, and represents the probability of a 'success' given the explanatory variables. The results in this chapter will be presented using odds ratios which are calculated by $\frac{\pi(x)}{1-\pi(x)}$ and a value of 1 represents an odds ratio that has no difference in the probability of 'success' between a category when compared to the reference category (i.e. a 'success' is equally likely for women in both categories) (Agresti, 2003).

RQ1 – Are area-level characteristics associated with educational expectations, net of individual and family characteristics?

The analysis for the first research question uses nested models to examine the role of area characteristics on individual expectations for university. The blocks of variables included in each stage of the modelling process are presented in Figure 6.2. Model 1 only includes neighbourhood area characteristics. Model 2 additionally includes family and individual characteristics of the young women at age 14.

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Figure 6.2 The grouping of the variables included in the model selection process for the outcome of expecting to attend university (research question 1)



As noted in Figure 6.2, the variables are included in the analyses for research questions 1, 3 and 4 if they were significantly associated at the 10% level in at least one of the multiple logistic models which only included neighbourhood area characteristics (before controlling for individual and family characteristics) with either educational expectations or experiencing a conception as the outcome. The urban/rural measure, IMD domain of barriers to accessing housing and services, and the percentage of Black persons in the LAD

variables are not significantly associated with university expectations or experiencing a conception in these models, which only contained area characteristics and so are excluded from the final models. The percentage of South Asian persons in the population was significantly associated with expecting to attend university, however, this variable was acting as a proxy for personal ethnicity and was removed when controlling for this. The sample boosted ethnic minority pupils by oversampling areas/schools with more ethnic minority teenagers and so the cell counts for certain ethnic groups were under the disclosure threshold for the UK Data Service output controls. The local measure of South Asians was not a significant predictor at the 10% level of experiencing a conception and so this measure was not included in either model.

RQ2 – Are individual expectations of going to university at age 14 associated with the likelihood of experiencing a conception by the survey wave at age 19?

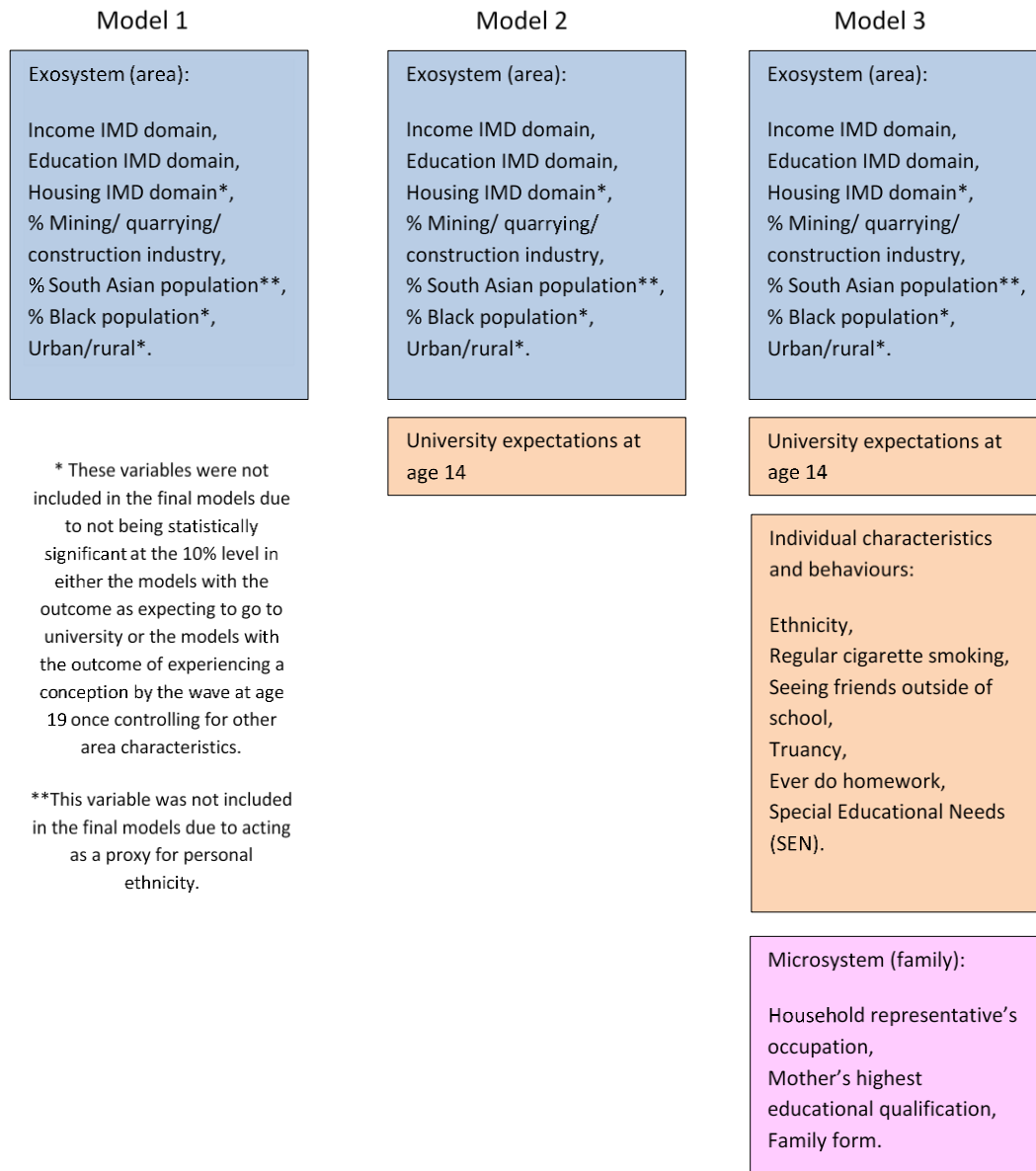
For the second research question, the bivariate relationship between university expectations and pregnancy by the interview at age 19 is examined.

RQ3 – Are the associations between area-level characteristics and the likelihood of experiencing a conception by the survey wave at age 19 explained by individual educational expectations and family and individual characteristics?

Research question 3 examines the relationship between neighbourhood area characteristics and experiencing a conception by the age 19 wave, and whether such associations alter when controlling for individual educational expectations, individual characteristics, and family characteristics. This research question uses nested multiple regression models with similar groupings to research question 1 and these blocks of variables are presented in Figure 6.3. Model 1 includes the neighbourhood area characteristics. Model 2 additionally includes the individual educational expectations of young women at age 14. Model 3 then additionally controls for the family and individual characteristics of the young women at age 14.

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Figure 6.3 The grouping of the variables included in the model selection process for the outcome of experiencing a conception by the wave at age 19 (RQ3)



RQ4 – Do the relationships between area characteristics (income deprivation; education, skills, and training deprivation; and the prevalence of persons working in mining, quarrying, and construction in the neighbourhood) and experiencing a conception by the age 19 wave vary by the socioeconomic characteristics of the young women?

For this final research question, the macro-micro interactions were of interest. The interaction effects are added separately to the final model predicting experiencing a conception by the wave at age 19 for research question 3 which included neighbourhood area characteristics, individual educational expectations, family characteristics, and individual characteristics as explanatory variables. The first interaction considers the macro-micro interaction between income deprivation in the area and the occupational class of the household reference person at age 14 on their likelihood of experiencing a conception by the wave at age 19. The second interaction effect measures whether the association between neighbourhood education, skills, and training deprivation in the area and the likelihood of experiencing a conception by the age 19 wave is altered by mother's highest education. The third interaction effect measures whether the association between neighbourhood education, skills, and training deprivation and experiencing a conception by the age 19 wave varies by individual educational expectations for university at age 14. Finally, the fourth interaction effect considers the interaction effect between the local prevalence of persons working in mining, quarrying, and construction sectors and occupational class of the household reference person on their likelihood of experiencing a conception by the age 19 wave.

6.5.4 RQ1 dependent variable: Expectations for university attendance

For the first research question, educational expectations as measured at age 14 are examined. The sweep at age 14 has been picked over age 17 as becoming pregnant at or before the age of 14 is much less common than between 15 and 17. Therefore, for most of the sample used in this chapter, educational expectations at age 14 capture expectations before young people have started to engage in sexual acts that may result in pregnancy.

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The expectation of going to university variable had been derived by the two following questions: 1) *How likely do you think it is that you will ever apply to go to university to do a degree?* and 2) *How likely do you think it is that if you do apply to go to university that you will get in?* Those who were 'not very likely' or 'not at all likely' to apply for university were coded as unlikely to attend, whilst the responses to whether they believed they would get into university were considered for those who were 'very likely' or 'fairly likely' to apply. Table 6.2 presents how this variable is coded. Parental responses were also collected at age 14 to a question that had a specific wording about expectations of university attendance and was compared to the measure that was created for the teenagers in this analysis. The parental measure was found to largely match the young person's educational expectations at age 14.

Table 6.2 A physical representation of the two steps of recoding for the expectations at age 14 of attending university variable using whether the young person would apply and then if they believe they would then get accepted (weighted % and unweighted n)

		Likelihood of young person applying for university				
			Very likely	Fairly likely	Not very likely	Not at all likely
			36.2% (n=1780)	36.3% (n=1570)	17.1% (n=633)	10.5% (n=321)
Likelihood of young person getting into university if they apply*	Very likely	15.8% (n=866)	Likely	Likely	Unlikely	Unlikely
	Fairly likely	51.3% (n=2374)	Likely	Likely	Unlikely	Unlikely
	Not very likely	11.6% (n=432)	Unlikely	Unlikely	Unlikely	Unlikely
	Not at all likely	1.1% (n=37)	Unlikely	Unlikely	Unlikely	Unlikely
*Those who responded that they were 'Not at all likely' to apply for university were not asked about their likelihood of getting in and so 13.7% (n=484) had no response and 6% (n=274) did not know.						

6.5.5 RQ2 to RQ4 dependent variable: Experiencing pregnancy by age 19 survey

The rest of the research questions in this chapter have the outcome of experiencing a teenage conception. The NS age 19 sweep asked respondents whether they had ever had sex. Those who were coded as female (by the interviewer) who reported ever having sex were then asked whether they had ever been pregnant and if they were currently pregnant. The age at which pregnancy occurred was not recorded and so while we can identify those women who had a conception by the age 19 sweep, we do not know the date of this conception. Therefore, we cannot use an outcome measure of experiencing under-18 pregnancy that would be consistent with the earlier chapters of the thesis. The outcome is therefore whether or not a woman had a conception by their interview around the age of

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19, and the 1,037 women who reported never having sex at the sweep at age 19 are coded as never being pregnant. Just over 15 per cent reported ever being pregnant of the 4,066 women with responses to ever having sex or being pregnant. The sweep at age 19 did ask about the outcome of the pregnancy and 180 women reported experiencing at least one pregnancy resulting in birth, 144 women reported only experiencing an abortion, and 77 reported only experiencing a miscarriage.

As the outcome is ever experiencing a conception, it relies on self-reports of abortion, miscarriage, and birth. Studies have investigated whether abortion is underreported in surveys in Britain (Scott et al., 2019) and the US (Lindberg et al., 2020). Scott et al. (2019) did not find evidence of underreporting in the Natsal surveys, but could not conclude that there was no underreporting. The NS survey specifically asked about ever being pregnant as a separate question before asking for the outcome of the pregnancy. On one hand, this may have avoided some of the abortion underreporting if young women would not directly disclose abortion. Indeed, there were some individuals (n not shown due to low counts) who reported ever being pregnant without disclosing the outcome of the pregnancy. On the other hand, women may have omitted pregnancies which resulted in abortion from their pregnancy history by not including these events in their response to ever being pregnant and because they were only being asked about abortion after stating they had been pregnant.

6.5.6 Key explanatory variables: neighbourhood area characteristics

This chapter used Lower Super Output Areas (LSOAs) to identify the geographical area of the location of interview by the sample members. These LSOAs were then linked by the author to handpicked area characteristics at the LSOA and LAD levels. The interviews

were conducted at home²⁰ and so the geographical identifier represents where young women live at age 14. LSOAs in 2001 were designed to include approximately equal numbers of the census population per area and there are over 34,000 areas in England and Wales (although this chapter only uses England). LSOAs are used in this chapter to represent a more localised measure of the neighbourhood where young women are living at age 14. Measures of area socioeconomic deprivation (IMD domains) were available at the LSOA level but information regarding other area characteristics were not available at this small geographical level. The area classification measures were only available at the Local Authority District (LAD) level. Therefore, where area characteristics were not available at the LSOAs, the area characteristics at the LAD level of geography (326 areas in England) were used. LSOAs are located within LADs and so the overall LAD figures were given to each LSOA that fell into the area.

For data linkage between the survey data and the area characteristics, each cohort member had a recorded location at which they conducted their interview at age 14 which was represented in the dataset by the census LSOA geographical boundaries for 2001. The LSOAs for each cohort member have been linked by the author to the relevant area characteristic, which have been collected from various official statistics at the LSOA and LAD levels. As noted in Table 6.1, only 18 out of the 4,485 sample could not be linked to area characteristics due to some of the area characteristics not being available for the area (e.g. Westminster). The weighted proportions of the sample for the explanatory variable are presented in Table 6.3, Table 6.4, Table 6.6, and Table 6.7.

LSOA level area characteristics

Indexes of Multiple Deprivation (IMD) were calculated at the LSOA level for 2004 and used indicators from 2001 where possible. The overall IMD captures a range of aspects of

²⁰ The information about the geographical identifier and the location of interviews was directly sought from the NS survey team.

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area-level derivation from poor employment to physical barriers to services (Department for Communities and Local Government, 2015; Neighbourhood Renewal Unit, 2004). This chapter utilises the LSOA-level domains of the IMD to consider the specific parts of deprivation that may be related to teenage educational expectations and teenage conceptions. While Chapter 3 and Chapter 5 did not use the domains of IMD due to wanting to measure year-on-year changes in area characteristics, the current research is able to use these domains as they focus on 2004. For every LSOA in England, the scores for each domain are available. For this chapter, the author has separated the LSOAs of England into quartiles for each domain so that the upper quartiles of the domains represent the LSOAs with the highest deprivation in the country once they are linked to the NS survey data. The income deprivation domain represents the proportion of the adult and child population experiencing income deprivation in the area and is captured using various measures of income support and tax credits. The income deprivation domain collects the proportion of households using Income Support, Income Based Job Seekers Allowance, certain Working Families Tax Credits, Disabled Person's Tax Credits, and the National Asylum Support Service. Due to high correlation, the analysis would not include both the income and employment deprivation domain which represents the involuntary exclusion of the working-age population from research and is measured by the population using unemployment claimant counts, Incapacity Benefit claimants, Severe Disablement Allowance claimants, and various participants in the New Deal.

The education, skills and training deprivation domain summarises the average Key Stage 2, 3, and 4 attainment; the proportion of young people not staying in school post age 16 and higher education under 21; secondary school absence rate; and adults with no or low qualifications for each area.

The barriers to accessing housing and services domain represent geographical and wider barriers to housing and local services. The barriers to housing included in this measure are household overcrowding, homelessness provisions, and the difficulty of access to owner-occupation. The barriers to services in this measure include distance to GP surgery, general store or supermarket, primary schools, and Post Offices. This measure of barriers to

accessing housing and services is not significantly associated in the multiple logistic regression models for university expectations or conceiving by the age 19 sweep when other area characteristics are included, and so this variable is excluded from the final analysis.

LAD level area characteristics

Components of the 2001 census were also used to represent area-level characteristics in these analyses. This chapter uses some of the measures used to calculate the ONS area classifications for England. Specifically, this chapter considers the percentage of the population in mining, quarrying, and construction industries, as areas with such industry have been found to have higher rates of teenage fertility in the UK (Johns, 2011). The analysis also considered the percentage of the population who are Black (all ages) and South Asian (all ages) per LAD but these measures are not significant in the multiple logistic regression models, which included other area characteristics, and so are excluded from the final models. Unfortunately, the teenage specific ethnic composition is not available by such small geographical areas.

Finally, an urban/rural measure is included in the NS survey at the output area²¹ level of geography and categorises the areas in which the teenagers had their interview at age 14 from Urban 10k, Town and Fringe, Village, and Hamlet Isolated Dwelling. The Output Area (OA) level is another census geography, but it is much more localised than the LSOA as it considers areas which each include around 110 and 139 households. This urban/rural measure is not significantly associated with university expectations or experiencing a conception in the multiple logistic regression models which include area characteristics and so is excluded during the model selection stage.

²¹ The author obtained the information about the way in which the urban/rural measure was calculated direct from the NS research team.

6.5.7 Control variables

As shown in the analytical framework, the aim is to consider whether there are associations between area characteristics and experiencing a conception, net of individual-level characteristics and those of their family. These individual and family level characteristics are entered into the models as controls. The weighted proportions of the sample in each category in the explanatory variables, measured at age 14, are presented in Table 6.3, Table 6.4, Table 6.7 and Table 6.8 alongside the p-values from the chi-squared tests.

Women's ethnicity is grouped from the young person's question into White, South Asian (Bangladeshi, Indian, and Pakistani), Black (Black Caribbean and Black African), Mixed, and other. Religion was not included in this analysis due to being closely related to ethnicity for certain groups.

This chapter includes some variables to represent behaviours that are often grouped with teenage sexual activity and fertility. These behaviours are often deemed 'risky behaviours' and include substance use and are discussed in terms of measuring risk-taking propensity (Meader et al., 2016). The analysis in this chapter includes ever trying a cigarette more than once as the measure for substance use. The survey did ask 'Have you ever had a proper alcoholic drink? That is a whole drink, not just a sip. Please do not count drinks labelled low alcohol'. However, over half (1992) of the young women had tried alcohol by the sweep at age 14 and so this did not capture this higher level of risk-taking as much as cigarette use. In the World Health Organization report on Adolescent alcohol-related behaviours in Europe from 2002 to 2015 (Inchley et al., 2018), data trends from 15-year-olds in Ireland and Great Britain showed that while women in these countries reported the highest prevalence of 'early' alcohol initiation in Europe, at around 55 per cent in 2002, less than 30 per cent of women reported 'early' drunkenness in this same year. This shows that while young teenagers may have tried alcohol, they have not consumed enough to feel drunkenness. NS did also ask how often teenagers at age 14 had alcohol in the last 12 months, but as the responses were 'Most days, Once or twice a week, 2 or 3 times a

month...' the author felt that such categories are more arbitrary than knowing whether a teenager had tried cigarettes more than once.

Teenagers with parents who exhibited lower behavioural control through parental monitoring were more likely to report being pregnant under 16 (Buston et al., 2007) and more likely to have sex (Roche et al., 2005) than their counterparts whose parents knew more about their activities. While the NS survey did ask 'How often do you know where cohort member is when she does out in the evening?', the majority of responses were 'always' or 'usually' at 85 per cent (3,617) and 12 per cent (694) reported never going out and so this measure did not include enough responses in other categories. The analysis instead controls for the frequency of seeing friends outside of the home. While studies such as Roche et al. (2005) and Roche and Leventhal (2009) use multiple measures of the freedom of teenagers, this analysis is more limited but uses seeing friends outside of the home as this suggests some level of freedom which could logistically allow young women to engage in sexual activity more easily. In NS, seeing friends outside of the home is measured by 'Thinking back over the last 7 days, how many times have you gone out with friends – is it...' and has been recoded into never, sometimes, and most days.

Three variables to represent experiences in school are included. Engagement in school is measured by whether the individual has ever recently truanted 'In the last 12 months, have you ever played truant, that is missed school without permission, even if it was only for half a day or a single lesson?' The analysis also controls for whether respondents spend any time doing homework 'in a typical term-time week'. Finally, the analysis controls for whether young women are thought to have Special Educational Needs (SEN) at age 14 'either by... her school or by someone else... Gifted young people should not be included' from the parental interview. SEN status is included as these young women may be less likely to attend university than the non-SEN population, but this relationship may be separate to also being more likely to experience a conception.

Three family-level contextual variables are included. This analysis uses mother's highest educational qualification when the teenager is aged 14 which has been recoded into: degree and equivalent; below degree level but at least equivalent to GCSE A-C; and no

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educational qualifications, below GCSE A-C, or the level of education was not reported. Mother's highest education had a higher response rate than father's due to mothers being more likely to be the main parent in the survey, and there are more single mothers than single fathers. Schoon (2010) considered 16-year-olds in the 1958 National Child Development Study, 1970 British Cohort Study, and 1989/90 Longitudinal Research of Young People in England and found that mother's education had more of an association with educational expectations than father's education. Household income was initially considered to be included in the analysis but was found to act as a proxy for whether there were one or two people in the household, even after controlling for family form. Therefore, the occupational class of the household representative has been used instead of household income to represent the socioeconomic status of the family. The NS research included a derived variable for occupation with the extended NS-SEC with 8 categories (Office for National Statistics, 2016) and the author has combined these categories into 4 classes: 1) Higher managerial, administrative and professional occupations, 2) Intermediate occupations, 3) Routine and manual occupations, and 4) Never worked and long-term unemployed. The family form variable consists of two-parent household (including natural parents and adoptive parents); step-parents in the household; single-parent household; and other. While the number of siblings were recorded in NS at age 14, this did not distinguish between biological and step-siblings and so this could not be recorded alongside family form. The lack of detailed information on siblings also means that mother's age at first birth could not be calculated. Mother's age at first birth was a desired control variable but the NS survey only included the age of the mother at the time of the cohort member's birth. After looking at the data, the author therefore concluded that including this variable could give misleading results for varying parity children.

6.6 Results

6.6.1 RQ1 – Are area-level characteristics associated with educational expectations, net of individual and family characteristics?

RQ1 Descriptive results

Table 6.3 presents the proportion of women expecting to attend university at age 14 per each category of the area characteristics. Young women who live in LSOAs which are in the least deprived quartile of income deprivation have the highest proportion to expect to attend university at 77 per cent compared to 70, 67, and 65 per cent in each subsequent quartile ($p < 0.00$). For each quartile of IMD education, skills and training deprivation ($p < 0.00$), the proportion of young women who expect to go to university declines, therefore young women living in areas with the most education, skills, and training deprivation at age 14 are the least likely to believe they will go to university at 60 per cent compared to 80 per cent in the least deprived quartile. Young women who live in LADs in the quartile with the highest proportion of the population employed in mining, quarrying, and construction ($p < 0.00$) in England have the lowest proportion expecting to attend university at 60 per cent. Over 69 per cent of women living in areas in two middle quartiles of the measure for mining, quarrying, and construction expect to attend university, whilst around 77 per cent of those in areas with the smallest populations in these sectors expect to attend. Young women who live in LSOAs in the lowest quartile of the IMD domain with the most barriers to accessing housing and services ($p < 0.05$) are the most likely to expect to go to university at 75 per cent than their counterparts who lived in the other quartiles which have 70 per cent expecting to attend. For each quartile of the prevalence of Black persons in the LAD population ($p < 0.00$), the proportion of young women who expect to go to university increases; over three in four who live women in LADs with the highest proportion of Black persons expect to go to university compared to 71, 68, and 64 per cent for each quartile of less Black persons in the population. Young women in LADs with the highest prevalence of South Asians ($p < 0.00$) in the population are the most likely to expect to go to university at 77 per cent, compared to 65 per cent in the lowest quartile. The measure of urban or rural is

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the only area characteristic which is not significantly associated with university expectations at the 10% level in these bivariate analyses. Respondents in town and fringe areas are slightly more likely to report expecting to attend university at 71 per cent, although 70 per cent expected university in the urban 10k, 70 per cent in village areas, and 69 per cent in hamlet isolated dwellings.

Table 6.3 The distribution of neighbourhood area characteristics and their associations with expectations for university at age 14

Variables	% Uni likely per cat.	Total % (weighted)	Unweighted n
Income deprivation IMD quartiles ***			
LQ (LSOA in the 25% lowest levels of income deprivation)	76.9	25.8	1054
2	70.3	24	975
3	66.7	23.5	990
UQ (LSOA in the 25% highest levels of income deprivation)	65	26.8	1448
Education, skills and training IMD quartiles ***			
LQ (LSOA in the 25% lowest levels of education deprivation)	80.1	24.3	1049
2	74.7	24.7	1048
3	65.2	22.2	1045
UQ (LSOA in the 25% highest levels of educational deprivation)	59.9	28.8	1325
The percentage of population employed in the mining, quarrying, and construction sectors in quartiles ***			
LQ (LAD with the 25% lowest population in these sectors)	77	27.5	1549
2	71.9	26.3	1098
3	68.8	22.7	920
UQ (LAD with the 25% most population in these sectors)	60.4	23.5	900
Barriers to accessing housing and services IMD quartiles **			
LQ (LSOA with the 25% least barriers to accessing housing and services)	67.5	23.1	953
2	67.8	27.9	1197
3	69.3	24.8	1091
UQ (LSOA with the 25% most barriers to accessing housing and services)	74.9	24.3	1226
The percentage of Black persons in the population, in quartiles ***			
LQ (LAD with the lowest 25% of Black population)	64.1	26.2	962
2	67.6	24.9	953
3	70.7	26.6	1189
UQ (LAD with the 25% most population who are Black)	78	22.4	1363
The percentage of South Asians in the population, in quartiles ***			
LQ (LAD with the lowest 25% of South Asian population)	64.6	26.4	958
2	65.7	24.2	906
3	72.4	24.4	1024
UQ (LAD with the 25% most population who are South Asian)	77	25.1	1579
Urban/rural categorisation of the interview area (OA)			
Urban 10k	69.7	79.2	3689
Town and fringe	71.1	9.2	342
Village	70.2	8	305
Hamlet isolated dwelling	69	3.5	131
* (<0.10) ** (<0.05) ***(<0.01)			

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Table 6.4 presents the proportion of women expecting to attend university at age 14 per each category of the explanatory individual and family characteristics. The ethnicity of young women is associated with university expectations at the 1% level. Black and South Asian women are significantly more likely to expect to attend university – at around 89 per cent compared to just 67 per cent of White, 80 per cent of Mixed, and 87 per cent of other ethnicity women. Fewer than 6 in 10 of those who report having smoked cigarettes more than once by age 14 expect to attend university compared to 7 in 10 who have never smoked/smoked only once ($p < 0.01$). While the proportion of teenagers who never or only ‘sometimes’ see their friends outside of school at age 14 who expect to attend university are similar at over 71 and 74 per cent respectively, only 53 per cent of young women who saw their friends ‘most days’ expect to attend university ($p < 0.01$). Around 56 per cent of young women who report truanting at age 14 expect to attend university compared to around 73 per cent who report never truanting in the last 12 months ($p < 0.01$). Women with Special Educational Needs (SEN) at age 14 have a lower proportion expecting to attend university at around 42 per cent compared to around 73 per cent in those who are not SEN at age 14 ($p < 0.01$). Around 72 per cent of young women that report doing homework on weekdays at age 14 expect to attend university at the same age, compared to just 40 per cent of those who report never doing homework on weekdays ($p < 0.01$).

All three microsystem/family-level characteristics are associated with university expectations at the 1% level. Over 90 per cent of young women with degree-educated mothers expect to attend university compared to 71 per cent of women with mothers who hold qualifications below degree level but equivalent to at least a pass at GCSE, and 60 per cent of women with mothers with no qualifications or those equivalent to below GCSE pass. Over 80 per cent of young women with a reference person in a higher managerial, administrative and professional occupation expect to attend university compared to 68 per cent in intermediate occupations, 59 per cent in routine and manual occupations, and 70

per cent who have never worked or have been long term unemployed²². Just under three quarters of women living with both of their parents at age 14 (including adoptive parents but excluding step-parents) expect to attend university, whilst 67 per cent of women living with a step-parent expected university, and 62 per cent of women living a single-parent.

²² The reason behind young women with unemployed household reference persons having such a high prevalence of expecting to attend university may be because this category overrepresents South Asian young women. Although South Asian young women represent under 6 per cent of the sample, over 20 per cent of those with a representative who have never worked or are long term unemployed are South Asian. Women who are South Asian are more likely to expect to attend university and so this may be driving this higher prevalence in this occupational category. This effect was removed after controlling for family and individual characteristics in the multiple logistic regression.

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Table 6.4 The distribution of the individual and family characteristics control variables and their associations with expectations for university at age 14

Variables	% Uni likely per cat.	Total % (weighted)	Unweighted n
Ethnicity of young person ***			
White	67.1	86.5	3073
Black	89.8	2.7	241
South Asian	89.2	5.9	807
Mixed	80.2	2.8	222
Other	87	2.2	118
Ever smoked more than once ***			
No	72.8	89.3	3887
Yes	53.1	10.7	327
In last 7 days, how often gone out with friends ***			
Never	71.3	21.3	1151
Sometimes	74	61.2	2688
Most days	53.4	17.5	617
Truancy in the last 12 months ***			
No	73.1	85.5	3690
Yes	55.5	14.5	523
Currently considered Special Educational Needs (SEN) ***			
No	72.5	90.7	4089
Yes	42	9.3	314
Ever do homework on weekdays ***			
No	40	6.2	208
Yes	72.2	93.8	4228
Highest qualification of mother ***			
Degree-level	91.2	13.1	512
Below degree but at least GCSE grade A-C or equivalent	70.9	61.4	2342
None, qualifications level 1 or below, or qualifications with no reported level	59.9	25.5	1248
Occupation of household reference person, NS-SEC class ***			
Higher managerial, administrative, and professional occupations	81.2	40.9	1623
Intermediate occupations	68.3	18.9	772
Routine and manual occupations	58.9	35.9	1383
Never worked/ long term unemployed	69.9	4.3	251
Family composition ***			
Two parent household, including adoptive parents but excluding step-parents	73.4	64.6	3044
Step-parent	67.4	11.2	393
Single-parent	61.6	23.5	968
Other	63.6	1	34
* (<0.10) ** (<0.05) ***(<0.01)			

RQ1 The logistic regression results for expectations for university

Logistic regression models in Table 6.5 investigate whether the neighbourhood area characteristics of respondents at age 14 have associations with their university expectations at this age and if such relationships remain significant after controlling for individual and family characteristics. Model 1 includes the area characteristics: quartiles of the IMD income deprivation domain scores; the IMD education, skills and training deprivation domain; and the quartiles of the percentage employed in mining, quarrying, and construction. The two ethnic composition variables for LADs (% South Asian and % Black), the IMD barriers to accessing housing and services, and the urban/rural measures are not significant and so are excluded from the analysis. Model 2 additionally includes the individual and family characteristics as control variables to consider whether these characteristics explain the associations between area characteristics and expecting to attend university.

Of the characteristics of areas, only the neighbourhood education, skills and training deprivation measure remains significant when controlling for the other macrosystem/area, microsystem/family, and individual characteristics in model 2. The likelihood of expecting to go to university declines as the education, skills, and training deprivation quartiles increase. The differences between the educational deprivation quartiles do decline by controlling for family and individual characteristics (in model 2 compared to model 1), although women in the two highest quartiles of deprivation continue to be significantly less likely at the 5% level to report expecting to attend university than their counterparts living in an area in most educationally deprived quartile. Women living in the most educationally deprived LSOAs have over 55 per cent lower odds of believing they would attend university than their counterparts living in areas with the least education, skills, and training deprivation, even in the model including all of the personal and family control variables (model 2). Women living in the second highest quartile of educational deprivation have lower odds of expecting university attendance by 33 per cent compared to women living in the least income deprived areas.

The measure of the population working in mining, quarrying, and construction is a significant predictor of university expectations at the 1% level in model 1 but becomes

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insignificant in model 2 after controlling for family- and individual-level characteristics.

Living in an area in the highest quartile of the population working in the mining, quarrying, or construction sector is the only category which is consistently associated with lower odds of university expectations (by 30 per cent) after controlling for personal and family characteristics in model 2. Young women living in a LAD in the second highest quartile of the population working in these sectors do have significantly lower odds of expecting university attendance by 30 per cent in model 1 compared to those in an area with the least of the population in these sectors but, after controlling for family and individual characteristics in model 2, this difference reduces to 19 per cent and is no longer significant at the 10% level.

Income deprivation is associated with lower university expectations in the bivariate analyses in Table 6.3. However, once controlling for education, skills, and training deprivation in model 1 women living in more income deprived areas are not significantly more or less likely to expect that they would later attend university than those in LSOAs in the least income deprived quartile. Controlling for educational deprivation also causes the direction of the relationship between income deprivation and expecting to attend university to reverse, even though income deprivation becomes non-significant in the model at the 10% level overall.

Women of all ethnic groups that are not White are more likely to have university expectations than White women, even after controlling for the area, family and individual characteristics in model 2. South Asian women have an odds ratio of 4.80 of reporting university expectations compared to White young women, and odds ratios of 3.89 for Black and 2.74 for Mixed women. Women reporting ever regularly smoking, truanting in the last 12 months, doing homework on weekends, and being considered SEN at age 14 have lower odds of expecting to attend university in model 2. Although young women who never went outside with their friends in the last seven days do not have significantly different university expectations than those who see their friends sometimes or most days, the variable is significant. Compared to young women with mothers with a degree or an equivalent qualification, women with mothers whose highest qualifications are below degree level but at least equivalent to a GCSE pass have a 58 per cent lower odds of believing they would

attend university. Women with mothers with little to no education (below GCSE pass) have 73 per cent lower odds of expecting to go to university. Young women whose household representative in intermediate occupations have lower odds of university expectations by 33 per cent compared to those in higher managerial, administrative, and professional occupations. Women with families in routine and manual occupations have lower odds of university expectations by 55 per cent, and those with representatives who were never employed or were long-term unemployed have 38 per cent lower odds (not significant at the 10% level). Family form at age 14 is largely not significantly associated with expecting to attend university when controlling for the area, family, and individual characteristics in model 2. However, women living with a step-parent at age 14 have lower odds of expecting university attendance by 52 per cent compared to those in two parent households.

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Table 6.5 Multiple logistic regression of expectations for attending university at age 14

Variables	Model 1		Model 2		Unweighted n
	Odds Ratio	P Value	Odds Ratio	P Value	
Income deprivation IMD quartiles (ref= LSOA in the 25% lowest levels of income deprivation)					1054
2	0.98		0.93		975
3	1.16		1.22		990
UQ (LSOA in the 25% highest levels of income deprivation)	1.45	*	1.53		1448
Education, skills and training IMD quartiles (ref= LSOA in the 25% lowest levels of educational deprivation)		***		**	1049
2	0.78	*	0.88		1048
3	0.45	***	0.67	**	1045
UQ (LSOA in the 25% highest levels of educational deprivation)	0.29	***	0.45	***	1325
The percentage of population employed in the mining, quarrying, and construction sectors (ref= LAD with a low prevalence in these sectors)		***			1549
2	0.81		0.86		1098
3	0.70	**	0.81		920
UQ (LAD with a high prevalence in these sectors)	0.51	***	0.70	**	900
Ethnicity of young person (ref=White)				***	3073
Black			3.89	***	241
South Asian			4.80	***	807
Mixed			2.74	***	222
Other			2.77	**	118
Ever smoked more than once (ref=no)					3887
Yes			0.59	**	327
In last 7 days, how often gone out with friends (ref = never)				**	1151
Sometimes			1.21		2688
Most days			0.84		617
Truancy in the last 12 months (ref = no)					3690
Yes			0.66	**	523
Currently considered Special Educational Needs (SEN) (ref = no)					4089
Yes			0.26	***	314
Ever do homework on weekdays (ref = no)					208
Yes			2.78	***	4228
Highest qualification of mother (ref = degree)				***	512
Below degree but at least GCSE grade A-C or equivalent			0.42	***	2342
None, qualifications level 1 or below, or qualifications with no reported level			0.27	***	1248
Occupation of household reference person, NS-SEC class (ref = Higher managerial, administrative, and professional occupations)				***	1623
Intermediate occupations			0.57	***	772
Routine and manual occupations			0.45	***	1383
Never worked/ long term unemployed			0.62		251
Family composition (ref = two parent household, including adoptive parents but excluding step-parents)				**	3044
Step-parent			1.52	**	393
Single-parent			0.85		968
Other			1.42		34
* (<0.10) ** (<0.05) ***(<0.01)					

6.6.2 RQ2 – Are individual expectations of going to university at age 14 associated with the likelihood of experiencing a conception by the survey wave at age 19?

Next, this chapter examines if there is a relationship between expectations of university at the age of 14 and experiencing a conception by the wave at age 19. As presented in Table 6.6, a higher percentage of young women who reported a likelihood of attending university had not experienced a conception by the wave at age 19 at 88 per cent compared to 77 per cent in women who did not expect university attendance. The chi-squared test between personal educational expectations and experiencing a conception by the wave at age 19 has a p-value of 0.000 and so is significant at the 1% level before any controls.

Table 6.6 A cross-tabulation of the percentage of women reporting that they were likely to attend university at age 14 and whether they conceived by the wave at age 19

Likelihood of attending university at age 14:	Conception by the age 19 wave:		Unweighted	
	Never conceived	Conceived	Total	n
Likely	88.4%	11.6%	100%	2736
Unlikely	76.6%	23.4%	100%	862
The chi-squared test had a p-value of 0.000				

6.6.3 RQ3 - Are the associations between area-level characteristics and the likelihood of experiencing a conception by the age 19 wave explained by individual educational expectations and family and individual characteristics?

RQ3 Descriptive results

Table 6.7 presents the proportion of women experiencing a conception by the age 19 wave for each category of the area characteristics. Around 24 per cent of young women in LSOAs in the quartile with the most IMD income deprivation report conceiving by the wave at age 19, and this declines through the quartiles at 17 per cent, 12 per cent, and 9 per cent respectively ($p < 0.01$). Therefore, less than 1 in 10 women in areas in the least income deprived quartile of England at age 14 conceive by the wave at age 19 compared to over 2 in 10 in the most deprived quartile. Experiencing a conception is most common in women in LSOAs in the quartile with the most education, training and skills deprivation at around 24 per cent, and the prevalence of conceiving declines through these quartiles to 16 per cent, 12 per cent, and, finally, 8 per cent in women in the least educationally deprived LSOAs ($p < 0.01$). Young women in LADs in the quartile with the highest prevalence of the population employed in mining, quarrying, and construction sections have a higher proportion (17%) who experience a conception compared to around 15 per cent for women in the other quartiles but this is not significant at the 10% level. Young women in LSOAs which have the most barriers to accessing housing and services have the lowest proportion reporting a conception at 13 per cent, however, there is not a clear trend through the quartiles as they go from 15 per cent, 18 per cent, to 15 per cent of women in LSOAs with the least barriers to accessing housing and services ($p < 0.05$). Around 14 per cent of young women in LADs in the quartile with the highest prevalence of Black persons in the population report conceiving by the wave at age 19, and this slightly increases to 15 per cent for the middle two quartiles and 16 per cent in the quartile with the least Black persons ($p > 0.10$). Around 15 per cent of women in LADs in the quartile with the highest prevalence of South Asian persons in the population, compared to 13 per cent, 18 per cent, and 16 per cent through the quartiles ($p > 0.10$). Young women in the urban 10k areas have a similar prevalence of reporting a conception by the wave at age 19 as women in town and fringe

areas at 16 per cent, whilst 13 per cent of women in villages report conceptions, and just 8 per cent from hamlet and isolated dwellings report conceptions ($p>0.10$).

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Table 6.7 The distribution of neighbourhood area characteristics and their associations with experiencing a conception by the wave at age 19

Variables	% Conceived by age 19 wave	Total % (weighted)	Unweighted n
Income deprivation IMD quartiles ***			
LQ (LSOA in the 25% lowest levels of income deprivation)	9.3	25.8	1054
2	11.6	24.0	975
3	16.7	23.5	990
UQ (LSOA in the 25% highest levels of income deprivation)	23.7	26.8	1448
Education, skills and training IMD quartiles ***			
LQ (LSOA in the 25% lowest levels of educational deprivation)	8.4	24.3	1049
2	11.5	24.7	1048
3	16.1	22.2	1045
UQ (LSOA in the 25% highest levels of educational deprivation)	24.3	28.8	1325
The percentage of population employed in the mining, quarrying, and construction sectors in quartiles			
LQ (LAD with the 25% lowest population in these sectors)	14.0	27.5	1549
2	15.1	26.3	1098
3	15.3	22.7	920
UQ (LAD with the 25% most population in these sectors)	17.2	23.5	900
Barriers to accessing housing and services IMD quartiles **			
LQ (LSOA with the 25% least barriers to accessing housing and services)	14.7	23.1	953
2	18.3	27.9	1197
3	15.3	24.8	1091
UQ (LSOA in the 25% highest barriers to accessing housing and services)	12.8	24.3	1226
The percentage of Black persons in the population, in quartiles			
LQ (LAD with the lowest 25% of Black population)	16.1	26.2	962
2	15.4	24.9	953
3	15.3	26.6	1189
UQ (LAD with the highest 25% of Black population)	14.4	22.4	1363
The percentage of South Asians in the population, in quartiles			
LQ (LAD with the lowest 25% of South Asian population)	15.5	26.4	958
2	17.9	24.2	906
3	13.3	24.4	1024
UQ (LAD with the highest 25% of South Asian population)	14.8	25.1	1579
Urban/rural categorisation of the interview area (OA)			
Urban 10k	15.9	79.2	3689
Town and fringe	16.0	9.2	342
Village	12.7	8.0	305
Hamlet isolated dwelling	7.6	3.5	131
* (<0.10) ** (<0.05) ***(<0.01)			

Table 6.8 presents the proportion of women experiencing a conception by the wave at age 19 for each category of the control variables measuring individual and family characteristics. The ethnicity of young women is significantly associated with conceptions at

the 1% level. The White, Black, and Mixed ethnicity young women have the greatest prevalence of experiencing a conception by the wave at age 19 at 16 per cent, 14 per cent, and 13 per cent respectively. Conceiving by the wave at age 19 was relatively rare for South Asian women at just 4 per cent and over half of the Pakistani and Bangladeshi women who conceived had been married by this wave (analysis not shown in this chapter) compared to most White and Black women who conceived while never being married. Just under 40 per cent of young women who have smoked cigarettes more than once experience a conception by the wave at age 19 compared to just 12 per cent of those who had never regularly smoked ($p < 0.01$). Young women who never saw their friends outside of school at age 14 have a lower prevalence of conceptions at 8 per cent compared to 14 per cent of those who sometimes saw their friends and 30 per cent of those who saw their friends most days ($p < 0.01$). Around 30 per cent of women who report truanting around age 14 experienced a conception, compared to only 12 per cent of women who did not report truanting ($p < 0.01$). Young women with SEN at age 14 have a higher prevalence of experiencing a conception at 20 per cent compared to their counterparts without SEN at 15 per cent ($p < 0.10$). Young women who reported not doing homework on weekdays are more likely to report conceiving at 35 per cent compared to women who reported doing homework at 14 per cent ($p < 0.01$).

All three of the microsystem/family-level characteristics are associated with experiencing a conception at the 1% level in the bivariate associations. Just 6 per cent of women with degree-educated mothers report experiencing a conception by the wave at age 19 compared to 14 per cent of women whose mothers' highest qualification was below degree level but at least equivalent to a pass at GCSE, and 22 per cent of women with mothers with no qualifications, those below a pass at GCSE, or those who had qualifications without a reported level. Around 8 per cent of young women at age 14 with a household reference person in a higher managerial, administrative, and professional occupation report experiencing a conception by the wave at age 19, but this was much higher for intermediate occupations at 17 per cent, routine and manual occupations at 21 per cent, and never worked or long term unemployed at 26 per cent. Women living in a family with two parents (including adoptive parents but not including step-parents) at age 14 have the lowest

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prevalence of reporting a conception at just 10 per cent. Yet around 24 per cent of women with step-parents in their household or those living in a single-parent family report experiencing a conception.

Table 6.8 The distribution of individual and family characteristics control variables and their associations with experiencing a conception by the wave at age 19

Variables	% Conceived by age 19 wave	Total % (weighted)	Unweighted n
Individuals' likelihood of attending university at age 14 ***			
Unlikely	23.4	30.2	954
Likely	11.6	69.8	3003
Ethnicity of young person ***			
White	16.1	86.5	3073
Black	14.4	2.7	241
South Asian	3.7	5.9	807
Mixed	17.7	2.8	222
Other	12.9	2.2	118
Ever smoked more than once ***			
No	11.9	89.3	3887
Yes	37.9	10.7	327
In last 7 days, how often gone out with friends ***			
Never	7.8	21.3	1151
Sometimes	13.7	61.2	2688
Most days	30.0	17.5	617
Truancy in the last 12 months ***			
No	12.2	85.5	3690
Yes	31.5	14.5	523
Currently considered Special Educational Needs (SEN) *			
No	15.0	90.7	4089
Yes	20.3	9.3	314
Ever do homework on weekdays ***			
No	35.1	6.2	208
Yes	14.0	93.8	4228
Highest qualification of mother ***			
Degree level	6.3	13.1	512
Below degree but at least GCSE grade A-C or equivalent	13.6	61.4	2342
None, qualifications level 1 or below, or qualifications with no reported level	22.0	25.5	1248
Occupation of household reference person, NS-SEC class ***			
Higher managerial, administrative and professional occupations	8.3	40.9	1623
Intermediate occupations	17.3	18.9	772
Routine and manual occupations	20.9	35.9	1383
Never worked/ long term unemployed	26.1	4.3	251
Family composition ***			

Variables	% Conceived by age 19 wave	Total % (weighted)	Unweighted n
Two parent household, including adoptive parents but excluding step-parents	10.3	64.6	3044
Step-parent	24.6	11.2	393
Single-parent	24.0	23.5	968
Other	40.9	1.0	34
* (<0.10) ** (<0.05) ***(<0.01)			

RQ3 The logistic regression results for experiencing a conception by the age 19 wave

The logistic regression in model 1 (Table 6.9) considers the associations between area characteristics (quartiles of IMD domains of income deprivation; education, skills, and training deprivation; and the percentage of the population employed in the mining, quarrying, and construction sectors) and the odds of experiencing a conception. Four other area characteristics were included in the initial model selection but are excluded from the final models due to not being significant once other neighbourhood variables are controlled. The excluded variables are the urban/rural measure, the quartiles of the IMD domain that measures the barriers to accessing housing and services, the percentage of the overall population who are Black, and the percentage of the overall population who are South Asian. Model 2 includes the area characteristics from model 1 alongside individual expectations of university. Model 3 additionally includes the individual and family characteristics as control variables. Unshown analysis also examined the model which included all of the covariates from model 3 apart from individual expectations of university. As a sensitivity analysis (not shown), the multiple logistic models were also run on a sample which did not include young women who lived in London due to London having a large influence on the results in Chapter 3 and Chapter 5. The associations were largely unchanged when removing London residents from the analysis.

Young women living in LSOAs in the higher quartiles of income deprivation (more income deprived) do not have significantly different odds of conceiving than those in the least income deprived areas across all three models and the association is explained by controlling for LSOA education, skills, and training deprivation. Women living in LSOAs in the highest quartile of education, skills, and training deprivation at age 14 have consistently greater odds of experiencing a conception by the wave at age 19 by over 140 per cent than their counterparts in areas with the best education, skills, and training, even after controlling for university expectations in model 2. The relationship between neighbourhood education, skills, and training deprivation and experiencing a conception is, however, explained by controlling for individual and family characteristics in model 3. There is not one variable that explains the association between education, skills, and training deprivation and

conceptions; instead, controlling for the combination of ethnicity, smoking regularly, household reference person occupation, and family form explain this relationship. Finally, the measure of the prevalence of persons working in the mining, quarrying, and construction sectors are included in the model as it was a significant predictor for university expectations. However, this exosystem measure is not significantly associated with experiencing a conception by the wave at age 19 in the bivariate analysis (Table 6.7) or any of the logistic regression models.

Women who expect to attend university at age 14 are less likely to experience a conception by the age 19 wave in the bivariate analysis in Table 6.7 and the logistic regression model in Table 6.9 which controls for area characteristics. In model 2, young women who expect to attend university are 50 per cent less likely to experience a conception by the wave at age 19 than those who do not expect university attendance. This relationship between university expectations and having lower odds of experiencing a conception is not significant once the individual and family characteristics control variables are introduced in model 3. The author used backward model selection to observe which variable(s) explain the association between educational expectations and experiencing a conception. One variable does not explain the association between educational expectations and conception. Instead, controlling for ethnicity, ever smoking regularly, mother's highest qualification, occupational class, and family type cause university expectations to become insignificant at the 5% level (analysis not shown), whilst including all of the control variables apart from homework status and truancy cause educational expectations to be insignificant at the 10% level.

South Asian women have significantly lower odds of experiencing a conception by the wave at age 19 than White women by 61 per cent in model 3. Black and Mixed ethnicity women have greater odds of experiencing a conception than their White counterparts by 16 and 6 per cent respectively, but these differences are not significant at the 10% level. Young women who report ever smoking more than once at 14 have 195 per cent greater odds of experiencing a conception by age 19 than those never smoking more than once. Women who see their friends outside of school most days and women who sometimes see their

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friends have over 240 per cent and 95 per cent higher odds of experiencing a conception than those who never see friends. Although truanting in the last 12 months in the wave at age 14, and not doing homework on weekdays are significantly associated with experiencing a conception in the bivariate associations in Table 6.7, these variables are not significant predictors of experiencing a conception in model 3 which controls for area, individual, and family characteristics alongside educational expectations. Having SEN is associated with increased likelihood of experiencing a conception in the bivariate analysis at the 10% level, but this effect was explained by controlling for area, individual, and family characteristics alongside educational expectations.

Mother's education has a significant association with conception in the bivariate analysis at the 1% level, but it is not significantly associated with experiencing a conception at the 10% level in model 3 of the logistic analysis and this was because occupational class explained this association (analysis not shown). Occupational class is marginally insignificant in model 3 with a p-value of 0.11, and only young women with a household representative in a routine and manual occupation have significantly higher odds (at 65%) of experiencing a conception compared to women with their representative in a higher managerial, administrative, or professional occupation. The significant relationship between occupation and conception in the bivariate analysis in Table 6.7 appears to be explained by controlling for educational expectations in model 3, as the variable was significant at the 5% level in where educational expectations were removed from the model (analysis not shown). Finally, the family form at age 14 is significantly associated with experiencing a teenage conception in the logistic regression model at the 1% level. Compared to young women living with two parents (including adoptive parents), women living in a household including step-parents have higher odds of experiencing a conception by the wave at age 19 by 145 per cent, and living with a single-parent have higher odds by 105 per cent.

Table 6.9 Multiple logistic regression of factors associated with experiencing a conception by the age 19 wave

Variables	Model 1		Model 2		Model 3		Un-weighted n
	Odds Ratio	P Value	Odds Ratio	P Value	Odds Ratio	P Value	
Income deprivation IMD quartiles (ref= LSOA in the 25% lowest levels of income deprivation)							1054
2	1.04		0.86		0.86		975
3	1.26	*	1.12		1.04		990
UQ (LSOA in the 25% highest levels of income deprivation)	1.55		1.29		1.31		1448
Education, skills and training IMD quartiles (ref= LSOA in the 25% lowest levels of educational deprivation)		***		***			1049
2	1.30		1.57	**	1.39		1048
3	1.70	**	2.10	***	1.49		1045
UQ (LSOA in the 25% highest levels of educational deprivation)	2.43	***	2.68	***	1.56		1325
The percentage of population employed in the mining, quarrying, and construction sectors (ref= LAD with the 25% lowest population in these sectors)							1549
2	1.13		1.17		1.44		1098
3	1.14		1.02		1.04		920
UQ (LAD or LSOA with the 25% most population in these sectors)	1.30		1.08		1.05		900
Expectation of going to university (ref = unlikely)							954
Likely			0.50	***	0.74		3003
Ethnicity of young person (ref=White)						**	3073
Black					1.16		241
South Asian					0.39	***	807
Mixed					1.06		222
Other					0.81		118
Ever smoked more than once (ref=no)							3887
Yes					2.95	***	327
In last 7 days, how often gone out with friends (ref = never)						***	1151
Sometimes					1.95	***	2688
Most days					3.42	***	617
Truancy in the last 12 months (ref = no)							3690
Yes					1.15		523
Currently considered Special Educational Needs (SEN) (ref = no)							4089
Yes					1.25		314
Ever do homework on weekdays (ref = no)							208
Yes					0.94		4228
Highest qualification of mother (ref = degree)							512
Below degree but at least GCSE grade A-C or equivalent					1.29		2342
None, qualifications level 1 or below, or qualifications with no reported level					1.54		1248

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Variables	Model 1		Model 2		Model 3		Un-weighted n
	Odds Ratio	P Value	Odds Ratio	P Value	Odds Ratio	P Value	
Occupation of household reference person, NS-SEC class (ref = Higher managerial, administrative and professional occupations)							1623
Intermediate occupations					1.26		772
Routine and manual occupations					1.65	**	1383
Never worked/ long term unemployed					1.71		251
Family composition (ref = two parent household, including adoptive parents but excluding step-parents)						***	3044
Step-parent					2.45	***	393
Single-parent					2.05	***	968
Other					7.75	**	34
* (<0.10) ** (<0.05) ***(<0.01)							

6.6.4 RQ4 Do the relationships between area characteristics (income deprivation; education, skills, and training deprivation; and the prevalence of persons working in mining, quarrying, and construction in the neighbourhood) and experiencing a conception by the age 19 wave vary by the socioeconomic characteristics of the young women?

The final research question investigates the macro-micro interactions between area characteristics and family-level and individual-level characteristics on predicting experiencing a conception by the age 19 wave. Four interaction effects have been separately added to model 3 (which included all of the covariates) in Table 6.9 which include the area, family, and individual characteristics as control variables.

The only interaction effect that is significant in the multiple logistic models at the 10% level is between neighbourhood income deprivation and the occupational class of the household representative. Very few individuals with unemployed household representatives lived in the less income deprived quartile and so this category had to be removed from the analysis of the interaction effect. Therefore, the analysis in Table 6.10 only includes young women with an employed household representative. Model 1 presents the covariates of the model when only including young women who have an employed household representative and before the interaction effect in model 2 to enable comparison. All of the covariates in

this model are presented in Table E.2 of Appendix E. Women with a representative in a routine or manual occupation have a larger difference in odds to those with a representative in a higher managerial, administrative, or professional occupations in model 1 by 68 per cent, and 142 per cent in model 2 after including the interaction effect. The macro-micro interaction showed that young women with a representative in a routine and manual occupation have lower odds of experiencing a conception if they lived in the most deprived quartile of income deprivation by 61 per cent and 10 per cent for the second most deprived quartile ($p < 0.10$). Young women with representatives in intermediate occupations do not have significantly different odds of experiencing a conception across income deprivation quartiles.

The other three of the four macro-micro interaction effects are not significant at the 10% level when controlling for the other area-, family-, and individual-level characteristics. The interaction effects which are not significant are between neighbourhood education, skills, and training deprivation in the area and mother's highest education; neighbourhood education, skills, and training deprivation and individual educational expectations at age 14; and the local prevalence of persons working in the mining, quarrying, and construction sectors and the occupational class of the household reference person. Due to this, these analyses have not been presented in this chapter. The interaction effects between the neighbourhood education, skills, and training deprivation in the area and the family-level and individual-level educational measures are not significant at the 10% level even before controlling for the other area-, family-, and individual-level characteristics.

Table 6.10 The interaction effect between LSOA-level income deprivation and occupational class in the multiple logistic regression for experiencing a conception by the wave at age 19, of young women with a household representative that is employed

Variables	Model 1a		Model 2a		Unweighted n
	Odds Ratio	P Value	Odds Ratio	P Value	
Income deprivation IMD quartiles (ref= LSOA in the 25% lowest levels of income deprivation)					1054
2	0.86		0.87		975
3	0.99		0.98		990
UQ (LSOA with the highest 25% of income deprivation)	1.17		2.23	*	1448
Occupation of household reference person, NS-SEC class (ref = Higher managerial, administrative and professional occupations)		*		*	1623
Intermediate occupations	1.28		1.41		772
Routine and manual occupations	1.68	**	2.42	**	1383
Interaction - Income deprivation IMD quartiles * Occupation of household reference person				*	
Income quartile 2 * Intermediate occupations			1.67		208
Income quartile 3 * Intermediate occupations			0.90		185
UQ income quartile * Intermediate occupations			0.32		210
Income quartile 2 * Routine and manual occupations			0.52		222
Income quartile 3 * Routine and manual occupations			0.90	*	354
UQ income quartile * Routine and manual occupations			0.39	*	629
<p><i>a – Models 1 and 2 also control for the measures for income deprivation, the prevalence of the mining, quarrying and construction sectors, ethnicity, smoking, seeing friends, truancy, doing homework, SEN status, household occupational class, mother's highest qualification, and family form.</i></p> <p>* (<0.10) ** (<0.05) ***(<0.01)</p>					

6.7 Discussion and conclusion

The research in this chapter investigated the role of neighbourhood characteristics on the likelihood of experiencing a conception. Variables related to economic deprivation, educational attainment, housing, ethnic composition, and whether the area is urban/rural were all found to be associated with teenage pregnancy rates in the ecological analysis in Chapter 4. As this analysis linked the Next Steps survey data to area characteristics, this chapter was able to consider whether these relationships were mediated by microsystem/family and individual characteristics or whether there are macro-micro interactions in a sample of young women who were teenagers in the mid to late 2000s.

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This research went beyond past research by examining the role of various aspects of area characteristics *and* personal educational expectations on experiencing teenage pregnancy in England. This research was therefore able to, for the first time, test the narrative that the associations between neighbourhood deprivation and experiencing a conception operates through lower educational expectations (Arai, 2003). This research also adds contemporary findings to the two existing studies in the literature which have considered the quantitative associations between educational expectations and teenage pregnancy in England in teenage women in the 1990s (Allen et al., 2007; Bonell et al., 2005) which did not examine area characteristics.

This research first examined the associations exosystem/area characteristics, family-level characteristics and individual-level characteristics had with expectations of attending university. These findings were used in the model selection process to determine whether additional area characteristics should be included in the modelling experiencing a conception, and for context when interpreting the role of controlling for educational expectations when estimating experiencing a conception. This research found that neighbourhood income deprivation, educational deprivation and a high prevalence of persons in the mining, quarrying, and construction sectors were associated with lower expectations of university at age 14 before controlling for family-level and individual-level characteristics, and educational deprivation continued to be significantly associated with university expectations after the controls. The motivation behind the analysis in this chapter was to investigate whether there is an association between the characteristics of where young women live and their experiences of conceiving as a teenager, whether educational expectations are associated with experiences of conceiving as a teenager, and to examine whether educational expectations explain the relationships between area characteristics and experiencing a conception. Therefore, these findings provide evidence that there is a statistical relationship for the first part of the narrative - neighbourhood characteristics *are* associated with area characteristics. This research also finds evidence for the second part of the narrative - educational expectations *are* associated with experiencing a conception as a teenager. Yet, this research does *not* find that personal educational expectations explain the relationship between area characteristics and experiencing a conception. This finding suggests that area characteristics have a

relationship with experiencing a conception over and above being associated with educational expectations. It should be kept in mind that this research does not test the causal pathway of this narrative and so it cannot provide evidence that living in an educationally deprived area *causes* low educational expectations or *causes* teenagers to become pregnant, but simply shows that these factors are related and have separate predictive contributions.

Of all the area characteristics education, skills and training deprivation was by far the most important in explaining educational expectations *and* teenage conception. Women living in an area with greater education, skills, and training deprivation were less likely to believe they would attend university and more likely to experience a teenage conception. In many respects, the former makes intuitive sense as living in an area with higher education, skills, and training deprivation means that individuals are surrounded by peers with lower achievement and amongst an adult population with lower skills. Indeed, research in Germany by Hartung and Hillmert (2019) found that the percentage of university graduates in the area was associated with expectations of higher education at age 17. School-level average attainment in England has also been found to be related to higher university expectations and aspirations (Khattab, 2014). A higher prevalence of young women in full-time education in the ward young women lived in at age 16 was associated with being less likely to be a teenage mother in England by Lupton and Kneale (2012). The research in this chapter clearly found that educational environment and behaviours were important predictors of whether young women expected to attend university. Measures such as truancy, having SEN, doing homework, and mother's education also continued to be associated with university expectations even after controlling for area characteristics, socioeconomic measures, ethnicity, and smoking status.

In contrast, the roles of these educational variables on experiencing a teenage conception were less clear. Truancy, having SEN, doing homework and mother's highest education did significantly predict experiencing a conception in the bivariate associations. Yet, the associations between truancy and homework with experiencing a conception were explained by controlling for the other individual-level and family-level control variables, in particular, smoking status and occupational class (rather than individual

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educational expectations, local educational deprivation, and mother's education). Allen et al. (2007) also found that truancy was explained by controls but was able to account for socioeconomic status, future expectations, substance use, peer influences, and sexual knowledge. The findings from the research in this chapter may suggest that while background factors may influence individual educational expectations, the background factors themselves are more important than these educational behaviours in predicting conceptions. The aim of this chapter was to consider the macro-micro interactions for experiencing a conception, yet these findings highlight how further research could use datasets like the Next Steps study to consider the intricacies of micro-micro interactions such as whether the role of truancy is an equal determinant of teenage conception across all socioeconomic backgrounds. Further analysis could find, for example, that young women from families which had a higher socioeconomic status may be able to engage in such educational behaviours without an accompanying higher probability of teenage pregnancy.

With the pervasive narrative of low opportunities in areas, this research was expected to find that living in an area of poorer educational opportunities would have a relationship with teenage pregnancy beyond being more likely to have certain individual and family characteristics. However, this chapter found that living in an area with greater *education, skills, and training deprivation* was not associated with experiencing a teenage conception once ethnicity, ever smoking regularly, mother's highest qualification, occupational class, and family type were controlled for. While past research has found that associations between area deprivation and educational expectations were explained by family characteristics (Cross and Attwood, 2013), the research by Crawford, Cribb, and Kelly (2013) found that family and school deprivation had distinct relationships with experiencing a teenage conception/birth. The findings from the analysis in this chapter do not follow those from Crawford and colleagues even though both samples were born around 1990, but this may suggest that school-level deprivation is more associated with teenage pregnancy or births than deprivation at the relatively small LSOA area level. The findings from the research in this chapter, that a number of different variables explain the relationships between area characteristics and teenage conceptions, highlight that teenage conceptions are determined by a culmination of demographic, risk, and

structural factors rather than just one variable and aligns with the conceptual framework of the thesis that presents factors associated with teenage conceptions at multiple levels. These findings highlight that the individual and family backgrounds of young people have more direct associations with teenage conception, and that the relationships with area/exosystem contextual factors may represent the varying characteristics of populations and their educational expectations.

This research has, for the first time, tested whether the effect of living in a neighbourhood has interaction effects with individual educational expectations or mother's education for predicting conception. The relationship between educational deprivation and experiencing a conception did not significantly vary by individual educational expectations or mother's education when examining these macro-micro interaction effects (before or after the other area, family, and individual characteristics were included in the model). This means that young women with educated mothers who lived in more educationally deprived areas did not have lower likelihoods of experiencing a conception than their counterparts with more educated mothers who lived in less deprived areas. In light of educational deprivation being explained by family- and individual-level characteristics in this chapter, this finding provides further evidence which shows that mother's education is a consistently important protective factor against teenage conceptions, which is only explained by household occupation. Equally, even before controlling for any other area-, family-, and individual-level characteristics in this analysis, having higher educational expectations do not have a greater protective effect on teenagers in more educationally deprived areas who may have higher expectations than their neighbourhood norms. This may be due to the way educational expectations are already shaped by the limitations that young people feel rather than aspirations which represent dreams for the future that are not limited by opportunity (Khattab, 2014). Teenagers in this sample may already take into account their local educational deprivation which may limit their opportunities for university and may adjust their expectations accordingly so that they do not have greater effects across different areas. While Kintrea et al. (2011) found that occupational aspirations were higher than their surroundings, these authors did find that occupational aspirations became more realistic between the ages of 13 and 15 in a sample of young people in the UK, which matches

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with this theory. The cohort of young women used in this sample are also answering their expectations of university during a period of time of educational expansion alongside widespread publicity around the rising in the costs of university.

Education has altered since the late-2000s when this cohort were teenagers and in secondary school, further education, and starting university. Educational attainment has risen throughout England and studies like Girma and Paton (2015) have attributed the declines in teenage conceptions from 2004 to 2012 to this growth in educational attainment. While this chapter illustrated that teenage aspirations for university were relatively high in 2004 at over 60 per cent, country-wide participation in university for young women rose even further in the late 2000s and 2010s. Alongside increasing participation in higher education, there has also been a rise in the compulsory participation age in further education and/or training in 2013 (to 17) and 2015 (to 18). While these trends show how university expectations may be rising alongside the narratives of needing to raise aspirations, they paint a complex picture in conjunction with the changes in costs of attending university in England from the 1990s to the 2010s. This chapter is concerned with teenagers who were around eight when annual university fees were introduced in 1998 at £1,000, and around 14 when they were proposed to be raised to £3,000 in 2004 (Anderson, 2016). More recent teenagers are now faced with annual fees up to £9,000 following the 2010 election. The 1998 introduction of fees was accompanied by the change to student loans for living costs rather than maintenance grants which do not need to be repaid; the poorest students still received some means-tested maintenance grants until this was abolished for 2016 new starters. In the US, Goyette (2008) considered the educational expectations of teenagers from 1980 to 2002 and found that social background was less linked to educational expectations in the past. Whilst the English higher education sector is very different to the US, as well as England's drastic changes in university attendance and fees, it is unclear whether the relationships between area characteristics and teenage conceptions with expectations for university have remained the same. The most recent available wave of the MCS was collected at age 17 which is slightly too young to be able to capture the prevalence of teenage pregnancy (as England traditionally uses before the age of 18). These research questions would

benefit from future research that utilises the MCS to consider these relationships after transformations in the higher education sector and rates of teenage pregnancy.

Deprivation is an overarching term that can encompass a range of area disadvantages. This research considered a range of area characteristics such as income deprivation, educational deprivation, local employment sectors, barriers to accessing housing and services, ethnic composition, and whether the young women lived in an area which was urban or rural. Although neighbourhood deprivation most often refers to economic disadvantage, the analysis in this chapter found that the association between income deprivation and the likelihood of experiencing a teenage conception was explained by the measure of local educational deprivation. This suggests that the educational environment in which a young woman lives is more important than the affluence of their local area in predicting teenage conceptions. Areas which are income deprived may also be more likely to have more educational deprivation, and so the effect of local economic disadvantage may represent a poor educational environment alongside being more likely to be in a less affluent area. The importance of rising educational attainment has been cited as a reason for the decline in teenage fertility by Girma and Paton (2015) at the local level and so this research adds to the literature by highlighting that local educational deprivation is the most important area-level predictor of experiencing a conception at the individual level. The finding in this research that educational deprivation explains the associations between income deprivation and experiencing a conception contrasts with those in Crawford, Cribb, and Kelly (2013), who found distinct associations between school-level attainment and deprivation with experiencing a teenage conception/birth. However, the findings from the analysis in this chapter are consistent with Cubbin et al. (2005) who found affluent neighbourhood was not significantly associated with teenage contraceptive use, but that areas with higher percentages of NEET 16-19s were after controls. These conflicting results may simply be due to LSOA area characteristics being less predictive of teenage conceptions than school-level characteristics, but it may also represent the fact that the relationship is not consistent across time or area and so further work is needed for a clearer understanding of why the findings in this chapter contrast to those by Crawford and colleagues. Nonetheless, the lack of associations with income deprivation at the LSOA suggests that

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for this cohort of teenage women in the late 2000s and at this level of geography, economic deprivation is not a very good predictor of educational expectations and teenage pregnancy.

Although this research found that the relationship between neighbourhood income deprivation and experiencing a conception was explained by neighbourhood educational expectations, local income deprivation had the only significant macro-micro interaction in the analysis which included all of the other variables. Young women were more likely to experience a conception if they had a household representative (most likely a parent) who was in a manual or routine occupation than a representative in a higher managerial, administrative, or professional occupation. However, the effect of having a representative in a manual or routine occupation was not consistent across women living in different quartiles of neighbourhood income deprivation. Young women with a representative in a manual or routine occupation who lived in an area which was in the two most income deprived quartiles had higher odds of experiencing a conception than those living in a less income deprived quartile. Crawford, Cribb, and Kelly (2013) found that family disadvantage had a larger effect of predicting a teenage conception for women in schools with more deprivation. While there are no quantitative studies which specifically test occupation, this finding is also compatible with the theme that emerged in interviews with young women by Tabberer et al. (2000). In this past research study, young women discussed teenage pregnancy as 'understandable and justifiable' (p.18) in local areas that were going through economic decline and unemployment. While the economic measure in the current research project captured income deprivation rather than employment deprivation, the measures are correlated, and the finding suggests that living in an area with less economic disadvantage slightly offsets the increased odds of experiencing a conception when having a household representative who is in a manual or routine occupation. The literature review found that the effect of living in a more affluent area may also not be protective against these outcomes if family circumstances are disadvantaged for predicting teenage conceptions (Crawford, Cribb, and Kelly, 2013; Smith and Elander, 2006), teenage sexual behaviour (Smith and Elander, 2006), and educational expectations (Lupton and Kintrea, 2011). This analysis was not able to include young women with an unemployed household representative due to low counts in the

less income deprived areas but, based on these few past studies, future work should consider whether unemployment had a larger effect on teenage conceptions in more disadvantaged areas.

Although all other deprivation domains (apart from education) did not significantly explain the variation in personal educational expectations, young women who lived in an area with the highest proportion of employment in the mining, quarrying, and construction sectors continued to be much less likely to expect university even when personal, family and all other area characteristics were controlled for. The finding of poorer educational expectations within teenagers living in such areas corroborates the link that young people gave between limited opportunities and living in mining areas in qualitative research from Tabberer et al. (2000). However, in the analysis in this chapter, the quartiles of the population employed in the mining, quarrying, and construction sectors did not significantly predict experiencing a conception by the wave at age 19. So, while young women in Tabberer et al. (2000) discussed the link between living in a mining area with job losses and teenage motherhood, this mechanism could not be seen in the quantitative findings in this chapter, although this analysis did not account for area unemployment. Nonetheless, as this measure predicted university expectations but not conceptions, this may simply represent the fact that areas with high proportions in the mining, quarrying, and construction sectors may hold different norms around not attending university, which are not relevant to predicting conceptions. This presents one of the limitations of this study. While the expectation of university is the best measure available in the Next Steps study at age 14, it does overlook how educational aspirations beyond further education may not include attending university, particularly in such areas. The Next Steps survey included expectations of further education, however very few teenagers at age 14 did not expect to go on to further education which made the variable not as useful for this chapter's particular research questions. It would be interesting to consider these relationships with an outcome that measures educational or career expectations which include both academic and vocational futures and careers.

Barriers to services have been found to be associated with higher under-18 conception rates in past research (discussed in section 2.3.2) and less accessible housing was found to be associated with higher under-18 conception rates in Chapter 3. This

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chapter also considered the role of housing through the IMD domain of barriers to accessing housing and services. This measure was significantly associated with both individual university expectations and experiencing a conception in the bivariate associations, but the relationships were explained by controlling for local educational deprivation. Rurality was not significantly associated with university expectations or experiencing a conception even before controlling for other area-level characteristics. Rurality may also be represented by barriers to access services, but both of these measures did not significantly predict experiencing a conception. This suggests that local characteristics such as deprivation are better able to represent why women in certain areas are less likely to experience a conception than rurality or services when examining individual-level data.

Through using a number of family-level and individual-level control variables, the analysis in this study also shows how some of the relationships between these control variables and experiencing a conception are explained by other controls. While the only significant differences in family form when predicting expectations for university were between two parent families and step-parent families, women from all other family types were more likely to report experiencing a conception than those from two parent families. Family type was also one of the most predictive variables for experiencing a conception and helped to explain the associations between neighbourhood educational deprivation and conception, and personal educational expectations and conception. The findings are consistent with Buston, Williamson and Hart (2007) and Wright et al. (2016). While the results from this research show that family form is a very strong predictor of experiencing a conception, the analysis would have benefit from further detail on the timing of separation or divorce and feelings around family disruption, as qualitative works such as Coleman and Cater (2006) found that teenage mothers focused on disruptive home environments that may or may not have been caused by parental separation. Family forms which are not two parents (not including step-parents) are also becoming an increasingly more common family setting in which young people are growing up in. However, teenage conception rates continue to fall. An area of future research would be to consider whether the associations between family form and teenage conceptions have changed over time.

The decline in teenage fertility has coincided with the rise of social media and declines in risk-taking behaviours. Authors such as David Paton in *The Telegraph* (Bingham, 2016) have noted that teenage fertility declines have coincided with social media use, and surmise that young people may have replaced their face-to-face interactions with those on social media. The study in this chapter captures a cohort of young women who were growing up during a period of huge change in social media and technology, whereby household internet and mobile phones became commonplace during their childhood and teenage years. Due to the relative newness of these behaviours during the 2000s, the Next Steps study does not reliably capture social media use or whether this has replaced face-to-face contact. This chapter did find that face-to-face contact with friends outside of school on weekdays was associated with increased odds of experiencing a conception, but this analysis used this measure as a proxy for parental monitoring and opportunity to engage in sexual behaviours outside of the home. Most parents reported that they knew where their child was and so the specific measure could not be used. Nonetheless, the findings of the measure of seeing friends is consistent with the findings by Buston et al. (2007) and Roche et al. (2005) whereby young people of parents who monitored their behaviours were less likely to experience a conception and show how socialisation behaviours are very important predictors of teenage conception. Alongside supposed reductions in face-to-face contact, teenagers have indeed been found to be less likely to use substances than in the past (Inchley et al., 2018) and this study finds that ever regularly smoking predicts whether young women will go on to conceive. Substance use has been seen to cluster and represents a propensity for risk-taking (Meader et al., 2016), and so it is theorised that teenagers who engage in substance use may also be less careful to avoid pregnancy. Cigarette use, alongside other control variables, explains the associations between local area characteristics and experiencing a conception, and remains significant even after controlling for socioeconomic background. Alcohol use was less of a reliable measure due to more young women ever trying this behaviour and having difficulty to interpret measures of alcohol frequency. This research adds to the literature by finding that smoking may capture something beyond socioeconomic background and local characteristics and that, when it is a relatively rare event, risk-taking is a good predictor of conception as a teenager even after considering a number of control variables.

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The analysis considered the role of ethnic background at the local level through ethnic composition and at the personal level by ethnicity. The area measures of the prevalence of South Asian and Black persons was used over a grouped measure of non-White persons following Chapters 3 and 5. However, these ethnic composition variables were not significantly associated with experiencing a conception even before other area characteristics were controlled for. Due to the way that the survey oversampled ethnic minority teenagers, areas with low proportions of South Asian and Black persons had very small counts of young women in certain ethnic groups so an interaction effect between area and personal ethnicity could not be examined. The ethnicity of the young women was, however, a good predictor of university expectations and experiencing a pregnancy. This research finds that South Asian young women who were teenagers in the late 2000s are the only group that are significantly less likely to report experiencing a teenage conception than their White counterparts, whilst all non-White ethnic groups are significantly more likely to expect to attend university. This is consistent with past research as while most ethnic minority groups had higher teenage fertility in the past, they have become less likely or similarly likely to conceive than their White peers (Dubuc and Haskey, 2010). This analysis, however, was not able to account for the generation of these ethnic groups even though it has been found in past research that second generation (and third) immigrants are driving the fertility postponement in these ethnic groups (Berrington, 2020). This pattern may also reflect the fact that ethnic minority young women have also been found to have higher educational expectations in this research and past research (Strand, 2014; Berrington, 2016) and so are less likely to experience a teenage conception.

In conclusion, this chapter contributed to the literature by using a linked dataset of the Next Steps survey in England to examine the relationships between exosystem/area characteristics, personal educational expectations, and extensive microsystem/family and individual characteristics with experiencing a teenage conception. This research fills a gap in the literature by considering the role of area characteristics on experiencing a teenage conception in a sample of teenagers from the late 2000s and by investigating macro-micro relationships. While this research considered a range of area characteristics that measure deprivation, the only variable of significance

when controlling for multiple area measures was education, skills, and training deprivation. This research has found that area characteristics are related to both educational expectations and teenage conceptions but that the associations with the latter are explained by controlling for individual and family backgrounds. Therefore, in terms of this research, the narrative that teenage motherhood occurs through living in more deprived areas and having fewer expectations for education are usurped by the contextual factors of the young women and their families. This research provides evidence that background factors are more important than where young women live on experiencing a conception, although women living in certain areas may be more likely to have certain characteristics, and so this research highlights that the effect of living in certain areas is not universal.

6.7.1 Ongoing conclusions

The findings from the previous empirical chapters have included that area characteristics can predict teenage conception rates and abortion ratios across areas but that some of the variation remains unexplained by such characteristics. This last empirical chapter has been able to consider the role of area characteristics on the individual whilst controlling for the characteristics and behaviours of the young women. This analysis found that the relationships between area characteristics and the likelihood of young women experiencing a teenage conception were insignificant or were explained by family and individual characteristics. This finding, alongside the unexplained variation in area-level conception rates when using area characteristics as explanatory variables, suggest that predictions of teenage pregnancy is more complex than high rates only resulting from the presence of certain area characteristics. The main takeaway from this collection of findings is that researchers and policymakers need to be wary of assuming that area characteristics which predict reproductive trends for *areas* are as important in *individual-level* research, and vice versa. This research found that socioeconomic status predicted teenage conceptions and Chapter 3 also found that area-level aggregates of similar socioeconomic measures were also predictors of area-level teenage pregnancy. However, the finding that area deprivation was not a significant predictor of young women

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experiencing a conception highlights that, at least for this study, living in an area does not add any additional likelihood of conception beyond family socioeconomic status.

Teenagers who live in certain areas may be more likely to have a teenage conception than women in other areas because living in their area means that they are more likely to have lower family socioeconomic status. Areas being more likely to contain individuals with certain characteristics may be behind these relationships, rather than there being an effect of the areas themselves. Nonetheless, this research has shown that further work is still needed to understand the roles of area characteristics *and* more individual measures of characteristics and behaviours on teenage reproductive behaviours at the area *and* individual level.

Chapter 7 Discussion and conclusions

Reproductive behaviours have been found to be responsive to neighbourhood characteristics with young women in certain areas being more likely to experience teenage pregnancy and motherhood (Arai, 2007; Tabberer et al., 2000) or to opt for an abortion (Lee, 2013). This research investigated the exosystem/area-level factors associated with teenage fertility in England across the rapid fertility decline of the 2000s and 2010s. The conceptual framework adopted for this research presented a number of interconnecting variables relevant to teenage fertility that can be categorised into the macrosystem, exosystem/area-level, microsystem/family-level, individual-level, and proximate determinants. So, while this research primarily focused on the exosystem/area-level factors associated with teenage fertility, it is acknowledged that these relationships occur alongside factors operating at other levels in the conceptual framework. The mechanisms in how area characteristics are associated with teenage fertility may be direct if living in an area with a certain characteristic is associated with teenage reproductive behaviour, but indirect if teenagers in certain areas are more likely to have certain socioeconomic characteristics that are then, in turn, associated with different relevant behaviours.

This research had multiple overarching aims that went beyond the existing literature. First, it aimed to go beyond the existing research that largely focuses on local area variations in the under-18 conception rate. To do this, the research also investigated the proportion of these conceptions resulting in abortion (the abortion ratio); an under-utilised measure. Second, the research aimed to establish how the relationships between area characteristics and reproductive behaviours altered over time between 1998 and 2017. Although teenage fertility decline has been of interest due to the TPS in England, a limited amount of research has been conducted to explore if changes in area characteristics were associated with the changing local measures of teenage fertility; this research fills this gap by using conception rates and abortion ratios. Third, the research aimed to broaden the existing literature by widening the variables that measured exosystem/area-level characteristics. It used measures beyond the traditional measures of indexes of deprivation and included more nuanced variables that focused on teenage-

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specific measures of the local population by introducing measures of housing accessibility. Finally, this research aimed to investigate a macro-micro perspective, examining associations between individual and area-level factors and teenage pregnancy behaviour. Interaction effects investigated whether the role of local area characteristics differed according to the characteristics of the family context.

The findings from each of the empirical chapters in this thesis are summarised below, alongside a brief discussion of the insights when considering the findings across the chapters. This chapter then includes discussions around the contributions of the research to the existing literature, followed by examination of the implications of the findings for future research and policy, and in terms of using data linkage. Finally, the limitations of the research will be discussed alongside recommendations for future research.

7.1 Summary of the findings

Understanding the decline in under-18 conception rates throughout England's local authorities between 1998 and 2017 (Chapter 3)

The first empirical chapter added to the literature by investigating a wide range of area characteristics over nearly two decades and used data linkage to allocate a number of official statistics to the LAD under-18 conception rates. Area characteristics explain a much higher proportion of the variation in teenage conception rates across England by area rather than the rate of decline in teenage conceptions over time. In other words, the fixed effect models that just considered changes in area characteristics did not explain a large proportion of the variation in the teenage conception rates. The study found that urban areas had higher teenage conception rates than the more rural local authorities in England. However, this research found that local authorities in London, in particular Inner London, had significantly higher conception rates than even the most urban non-London areas. The differences between Inner London and the most urban non-London LADs were explained by controlling for area characteristics like deprivation, education, housing availability and ethnic composition. Yet the differences between Outer London and the

most urban non-London LADs were only reduced by controlling for area characteristics after 2006.

Higher under-18 conception rates were explained by area characteristics such as being urban, being in London, having higher youth unemployment, lower educational attainment, housing availability, and teenage ethnic composition. This research used interaction effects with the time period to consider whether associations between the area characteristics and under-18 conception rates varied over time. The effect of the positive association between under-18 conception rates and unemployment declined in 2006 to 2010. The effects for the relationship that under-18 conception rates had with housing affordability, the prevalence of social housing, and the prevalence of Black secondary school pupils were all smaller in the later years of the time period. This research also found through fixed effect models that growing youth unemployment was associated with rising conception rates. These models also found that growing educational attainment, housing becoming less affordable, declines in social housing, and rising proportions of Black or South Asian teenagers in LADs were associated with declines in under-18 conception rates.

Decomposing the teenage fertility decline: the contribution of the proportion of conceptions resulting in abortion to changes in fertility rates (Chapter 4)

The contribution of changes in teenage abortion ratios and conception rates to teenage fertility decline was quantified through decomposition analysis for the first time in England. This research showed that the relative contribution of conception rates and abortion ratios changed over the various periods of the decline in teenage fertility rates in the 2000s and 2010s. Across England, changes in abortion ratios contributed to a higher proportion of the decline in teenage fertility in the early 2000s than during the more rapid periods of fertility decline post-2007. Therefore, when fertility rate declines were the slowest (in the early 2000s), abortion ratios played a greater role compared to during the rapid fertility declines of the 2010s where the abortion ratio contributed to less of the change.

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When considering the regional trends, abortion ratio change contributed the most to fertility rate declines in LADs in the North West, Inner London, and Outer London. This research did not find a clear urban/rural trend as, while LADs in Inner and Outer London or the most non-London urban category had the highest proportion of teenage fertility change from abortion ratio changes, the LADs with the lowest contributions were the second most urban LADs and the second most rural LADs. Within the local authority areas that experienced the lowest levels of fertility decline, differences in abortion ratios over time played a larger role in the fertility decline compared to areas with the greatest teenage fertility decline.

Factors associated with teenage abortion ratios: the associations between local authority district characteristics and the proportions of teenage conceptions resulting in abortion in England, 1998 to 2017 (Chapter 5)

This research has provided new original insight into the area factors associated with teenage abortion ratios. The study also found that London had a distinct pattern of abortion ratios compared to the most urban areas outside of London from 1998 to 2017. The higher abortion ratios in local authorities in Inner and Outer London were not due to London having contrasting area characteristics as the differences persisted after controlling for area characteristics. The differences in abortion ratios in rural and the most urban non-London LADs were largely insignificant. The research found that area characteristics with positive associations with teenage conception rates often have negative associations with teenage abortion ratios. Under-18 abortion ratios were found to be higher in areas with lower youth unemployment, higher educational attainment, more unaffordable housing, less social housing, and larger proportions of Black teenagers. This analysis controlled for the TPS funding per head and did not find a significant association with abortion ratios during the strategy.

This research also used fixed effect models to consider the relationships between changes in area characteristics and changes in abortion ratios. However, the changes in area characteristics explained a small amount of the change in under-18 abortion ratios over time, and so rising abortion ratios must occur due to unmeasured changes in this

analysis. Nonetheless, rising youth unemployment, educational attainment, median house price to workplace earnings ratio, social housing per population, percentage of teenagers who were Black, and the percentage of teenagers who were South Asian in the LAD were associated with growing under-18 abortion ratios.

Neighbourhood characteristics, educational expectations, and teenage conceptions in England (Chapter 6)

The final empirical chapter of the thesis provided original insights into the micro and macro factors associated with teenage conceptions and, in particular, the role of educational expectations. This research considered the exosystem/area-level associations with teenage conceptions by linking individual-level data from the Next Steps survey to specifically chosen local exosystem/area-level characteristics. The data linkage required the use of a controlled version of the Next Steps dataset that identified the LSOA that the survey respondent was residing at age 14. Information about local areas, including the specific domains of the IMD official statistics such as income deprivation, educational deprivation, and barriers to housing and services, alongside specific measures that are used to calculate the ONS area classifications such as local employment sectors and ethnic composition, were collated and passed to the operators of the UK Data Service secure lab. The author then linked this data and undertook the analysis within the confines of the UK Data Service secure lab.

First, the research in this chapter investigated whether there are area-level differences in personal educational expectations (an assertion repeatedly made in the literature on geographical variations in teenage conceptions) and whether these area differences persist once the characteristics of teenagers are controlled. Second, the chapter examined whether personal educational expectations predicted experiencing a conception by the wave at age 19 before controlling for other factors. The chapter then examined whether the relationships between area characteristics and experiencing a conception by the wave at age 19 were explained by controlling for personal educational expectations and then family and individual characteristics. The research showed that young women who, at age 14, lived in the most income deprived quartile and the most

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educationally deprived quartile were the least likely to have expectations for university at age 14 and were the most likely to report experiencing a conception by the wave at age 19. However, local educational deprivation explained this relationship between living in an area with higher income deprivation and experiencing a conception. The relationships between all of the area characteristics and experiencing a teenage pregnancy were removed after controlling for ethnicity, ever smoking regularly, mother's highest qualification, occupational class, and family type. When predicting personal expectations, the only other area characteristic that was not explained by local educational deprivation was living in an area with high proportions of the population in mining, quarrying, or construction sectors. While young women in areas with higher proportions of the population in mining, quarrying, or construction sectors were significantly less likely to expect to attend university, this local measure of employment sectors did not significantly predict experiencing a conception.

Finally, this research investigated macro-micro interaction effects on experiencing a conception by the age 19 wave. Three of the four interaction effects were not significant at the 10% level which included LSOA educational deprivation with mother's education, LSOA educational deprivation with personal university expectations, and the LAD prevalence of the population working in mining, construction, and quarrying with family occupation. The only macro-micro interaction effect which was significant at the 10% level was between LSOA income deprivation and family occupation. This analysis had to only include young women with household representative that was employed due to low counts. Nonetheless, young women with a representative in routine and manual occupations had lower odds of experiencing a conception if they lived in an LSOA in the highest or second highest income deprived quartile than if they lived in the least deprived quartile of income deprivation. The association between having a household representative in an intermediate occupation and experiencing a conception did not vary by where the LSOA of income deprivation of where young women lived.

7.2 Synthesising the findings across the chapters

The empirical chapters used ecological and individual-level analyses to investigate the associations between area characteristics and teenage reproductive measures. While economic deprivation through youth unemployment rates were found to be predictive of higher under-18 conception rates and lower abortion ratios at the LAD level, the local measure of income deprivation from the IMD was not a significant predictor of individual experiences of teenage conception using the NS survey. Controlling for educational deprivation explained the relationship between income deprivation and experiencing a conception in the NS survey, whilst controlling for GCSE attainment did not explain the relationship between LAD youth unemployment and under-18 conception rates. The measures used were not identical, and so these differences may be due to using different measures, but this suggests that living in an area with more income deprivation acts as a proxy for limited educational attainment and opportunities in the area but that this is not the case when predicting local under-18 conception rates.

Ethnic composition was not a significant predictor across this research for under-18 conception rates, under-18 abortion ratios, and individual experiences of teenage conception in this research. The analyses in Chapter 3 found that areas with higher proportions of South Asian teenagers had lower under-18 conception rates whilst areas with higher proportions of Black teenagers had higher under-18 conception rates between 1998 and 2005. Chapter 5 found that areas with higher proportions of Black teenagers also had higher abortion ratios even after controlling for the other area characteristics. However, in Chapter 6, the Black and South Asian ethnic composition neighbourhood measures were not significantly associated with experiencing a conception in the individual-level analysis.

Whether a LAD was in an urban or rural area was highly predictive of under-18 conception rates but was less predictive of abortion ratios beyond abortion ratios being higher in London. Whether a young woman lived in an urban or rural area did not have a clear relationship with experiencing a conception in the NS survey even before controlling for other characteristics, with the only distinct category being young women living in hamlet isolated dwellings being much less likely to report a conception. Rurality can also

be measured by distance to services. This analysis of individual-level experiences of conceptions also did not find that the barriers to housing and services significantly predicted experiencing a conception as a teenager. These findings provide evidence that the urban and rural differences in conception rates are largely due to the areas having certain characteristics, or that the characteristics of the teenagers living in the areas are more important in predicting pregnancies.

7.3 The contributions and implications for research

The first aim of the research was to contribute to the literature by examining more than under-18 conception rates and so these studies also considered abortion ratios. This research used decomposition analysis to quantify the role of abortion ratio change in the decline in teenage fertility throughout three periods (1998-00 to 2004-6, 2004-6 to 2009-11, and 2009-11 to 2015-17) and found justification for abortion ratios to be included in the narratives of England's teenage fertility decline. These findings highlight that abortion ratios should play more of a role in the discussions around England's decline in teenage fertility and justified the inclusion of research that considers the role of area specifically on these abortion ratios. Little to no research has been published on the role of area characteristics on abortion ratios; those that have done so have used a lens of evolutionary demography (Virgo and Sear, 2016) or have conducted separate analyses for each area measure (Lee et al., 2004). Instead, this research examined these relationships over a longer time period and with a wider variety of area characteristics. This research also explored the meaning behind abortion ratio changes as they are more complicated than interpreting conception rate changes, and this is discussed further in the section around policy implications.

This research found that area characteristics explained more of the geographical trends in teenage conception rates and abortion ratios across England but little of the change over time. This highlights that while differences between areas continue to be explained by certain characteristics, these area changes are not the only aspects that have contributed to teenage fertility decline within LADs. Nonetheless, this research does

show that policy and research need to take into account the changes in areas that did indeed affect teenage fertility rates. The findings highlight, however, that research and policy also need to continue to recognise there are other mechanisms at play beyond area characteristics, and that we need better and broader measures of these factors.

This analysis included interaction effects in Chapter 3 to investigate whether the associations between area characteristics and LAD conception rates altered over time. The results found that the effect of the association between youth unemployment in the local area on teenage conception rates declined for 2006 to 2010, which is consistent with findings reported by Wellings et al. (2016) that compared a sample of women in the 2010-12 Natsal survey to the 1999-01 survey. This current research contributes to this literature by finding this weakening when using more complex methods, such as examining every year between 1998 and 2017 using random-effect models rather than two distinct cohorts. However, as the research in Chapter 3 also included the 2010s, this research also found that the effect of the associations between youth unemployment and under-18 conception rates returned to the pre-2006 to 2010 levels, and this suggests that this weakening may have been temporary due to the global recession. Nonetheless, the housing to workplace earnings ratios, the prevalence of social housing, and the percentage of Black teenagers in the LAD did have weakened effects of their associations with under-18 conception rates. This means that the effects of the associations between certain area characteristics and conception rates have weakened alongside the reductions in teenage pregnancies.

The research found that the characteristics of areas *did explain* a large amount of the London/urban/rural variation in teenage conception rates. While the variation according to whether a LAD was in London, or was urban or rural, were largely explained by area characteristics (including youth unemployment, educational attainment, teenage ethnic composition, social housing, and housing affordability) some differences remained. The studies provide contemporary evidence that controlling for whether areas were urban or rural continues to be important when considering the role of area characteristics on teenage fertility measures (Bradshaw et al., 2005; Diamond et al., 1999). The studies also add new evidence that London should be separated from the other urban areas of England as characteristics do not explain all of these differences (particularly for abortion

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ratios that continued to be much higher in London). Better measures of teenage sexual behaviour, contraception use, and service use would aid researchers and policymakers to observe what it is about London that causes these distinct trends in conception rates and abortion ratios, and such measures are discussed further in the policy implications in section 7.4.

This research also used individual-level data to consider the role of urban and rural areas but did not find that the likelihood of experiencing a conception as a teenager was different whether they lived in an urban or rural area at age 14 when using the Next Steps survey. This also did not change after removing London-based respondents. The reason for this is not clear and may be because the rural measure in the NS survey was very localised at the OA-level rather than representing a general area. However, it may also be because localised area measures of whether young women live in rural or urban areas can capture very different groups of young women. On the one hand, some rural areas in England are affluent and, even if they were more remote, are characterised by lower teenage conceptions. On the other hand, qualitative accounts of young women from remote rural locations with physical barriers to services and opportunities stated that they had limited life options due to these restrictive or limited opportunities and so went on to teenage motherhood, as reported in Coleman and Cater (2006). This research also considered the IMD domain of local barriers to housing and services, but this was also not predictive of conceiving as a teenager. Rural isolation may, therefore, be a specific intersection of these two measures that could not be explored further in this research study and would benefit from further investigation.

The research reported in this thesis included teenage-specific measures of ethnic composition where possible and distinguished between ethnic groups over and beyond just non-White versus White (Girma and Paton, 2015). The analyses found that the ethnic composition measure for Black teenagers was predictive of under-18 conception rates and abortion ratios, but that the measure for South Asian teenagers only slightly predicted under-18 conception rates. Area associations do not mean individual behaviours changing, although the literature has shown evidence of the postponement of teenage childbearing in South Asian and Black women in England, particularly second-generation migrants in such groups (Berrington, 2020). The findings from the current

research highlight that teenage-specific ethnic compositions should be used when possible in this area of research compared to measures of overall ethnic composition with groups of all ages and non-White ethnicities grouped together; findings that use more simplistic measures of ethnic composition should be interpreted with caution. This is particularly the case as the prevalence of Black and South Asian measures did not have identical relationships with these reproductive measures and the body of research would benefit from ecological studies that break down Black and South Asian ethnic groups even further. Although the analysis of the NS study found that South Asian women were significantly less likely to report experiencing a conception than their White counterparts, this analysis would have also been improved by using measures of whether young women were immigrants or were a second or higher generation of immigration. Including the second generation of ethnic minority women would have been interesting for the analyses as the second-generation ethnic minority young women have been found to have older ideal ages of first birth (Berrington, 2020).

As the focus of this PhD was on exosystem/area-level characteristics and their associations with reproductive behaviour, many of the individual or family characteristics were treated as control variables rather than variables of interest. Nonetheless, this research found that one of the most significant variables for experiencing a conception by the age 19 survey was family form. The family structure remained a significant predictor of teenage pregnancy even after controlling for many area, family, and individual factors. The young women in the NS survey were teenagers in the late 2000s and so it appears family form was very predictive of experiencing a conception at this time. These alternative family forms that do not include two natural (or adoptive) parents are increasingly common in England and investigating these relationships with more contemporary cohorts may find fewer striking differences if heterogeneous family forms are normalised. However, Wellings et al. (2016) found that living with two natural parents until age 14 did not significantly predict experiencing a pregnancy in the 1990-01 cohort but that living with two natural parents until age 16 was a significant predictor of experiencing a conception in the 2010-12 cohort. The different ages at the time of asking about family form may be important in predicting experiencing teenage conception, as the timing of parental divorce or separation may be important. The NS was not able to

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measure certain aspects of family form but research for the future can use the MCS, which is a birth cohort and so more accurately measures mother's age at first birth and greater detail on family change and formation such as the timing of divorce/separation that would have improved the analysis in this research.

7.3.1 The contributions and implications from using data linkage

The studies in this research used two forms of data linkage. Firstly, for chapters 3 to 5, the author linked a number of handpicked area characteristics for each LAD to under-18 conception rates, fertility rates, and abortion ratios. One of the challenges of creating this dataset was finding the variables for the extensive time period of 1998 to 2017. The author initially wanted to use ward-level conceptions data and gained access to this dataset. However, the ward-level conceptions data had a high level of suppressed values due to low counts and area characteristics that are available at the ward-level for each year between 1998 and 2017 are even less common. The author combed through many archived web pages for these LAD measures and many of them had obsolete links to the data that meant that the author had to complete numerous Freedom of Information Requests to access older data. Even then, certain years or measures were not available and measures that could not be found are discussed below in the limitations and recommendations section. These experiences highlight that there are large obstacles to researchers who want to consider changes over time in England and these are even greater for those who want to measure teenage-specific LAD characteristics.

Secondly, the author used data linkage to add handpicked local neighbourhood characteristics to the Next Steps dataset to produce a novel study that could consider the macro-micro factors associated with teenage conceptions. The use of the Next Steps dataset that included the LSOA locations of where young women lived at age 14 meant that the author had to complete the data linkage and the subsequent analyses in the UK Data Service's remote secure lab environment. This presented many practical challenges that were heightened by the pandemic. The application for secure lab data is lengthy and provides hefty barriers to many researchers. Before the pandemic, the UK Data Service requested that the desktop computer of the data user was not overlooked, which is a

challenge for postgraduate students in shared offices. The pandemic meant that this became unnecessary as it allowed a remote connection to the desktop to be made from home. However, this meant that the author had to use their personal computer at home to connect to the university-provided computer in the office. The reasons for the detailed applications for secure lab data are valid as they are in place to protect the members of the public; however, they make the research process very difficult.

Related to this latter point, the author only used the geographical identifiers to link the two datasets and area characteristics that were in quartiles. Creating the quartiles for the area characteristics were completed to represent the quartiles for the whole of England and so were completed before needing to access the geographical identifiers. Therefore, the author did not need to access the geographical identifiers beyond linking these aggregated area measures. Instead, having access to this linked dataset at home (through the data archive or the author completing this quick data linkage and removing the in-depth geographical identifiers before home access) could have removed workload for the secure lab through checking multiple written outputs with tables and extensive delays to the author. These delays are important considerations for researchers, and it may be useful for the secure lab to consider the specific requirements of research projects.

7.3.2 The strengths and weaknesses of the data

The first three empirical chapters in this thesis used routine data about teenage conceptions and abortions to women under the age of 18 as the outcome variables. The conceptions dataset includes conception rates, birth rates, abortion rates, and abortion ratios for each Local Authority District in England. The quality of the conceptions dataset is high in England as births and abortions are notifiable by law through the Births and Deaths Registration Act of 1953 and the Abortion Act of 1967. While this data does not include miscarriage, the routine conceptions dataset largely represents a complete record of births and abortions across England during 1998 to 2017. The main limitation of using the under-18 conception rates and abortion ratios at the Local Authority District is that some of the data is said to have 'low reliability' by the Office for National Statistics. This

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low reliability occurs when there are low counts of these pregnancy outcomes or when there are low numbers of conceptions in the area. Therefore, this categorisation of 'low reliability' has increased between 1998 and 2017 as more areas are having these very low numbers of conceptions. The impact of this low reliability for values which are based on low numbers of conceptions may be that the models are not as precise at predicting these low conception rates or abortion ratios in such areas.

The final empirical chapter in this thesis used a longitudinal survey to measure teenage conceptions in individuals. The nature of survey data, particularly longitudinal survey data, means that this data source is subject to the quality of the sampling and the levels of non-response. The analysis of Next Steps survey for this project included waves one and six. Wave six was collected five years after the initial wave and so a limitation of this data is that it is subject to attrition over time. The sixth wave, however, sampled all of those reached in the previous wave. The previous wave, wave five, had attempted to reengage some of those who had not taken part in either some or all of waves two, three, and four and so efforts were made to reduce attrition by the Next Steps team. The survey weighting used in the analyses also accounts for the survey sampling and the attrition for wave six to adjust the sample to be representative of England.

While attrition is an issue for longitudinal survey data, such data also benefits from less recall bias because teenagers can more accurately report their recent behaviour than adults who may be recalling information from their teenage years which occurred many years or even decades ago. The response-rate of individual questions in the survey also mean that the quality of the dataset can vary by topic, particularly if the survey includes sensitive topics. Of the 4467 women in the sample, 4066 women responded to the question of ever being pregnant (or had reported that they had not had sex). Questions about sexual behaviour and reproductive behaviour can be considered to be sensitive and 355 women did not report whether they had ever had sex. A further 16 women reported that they had had sex but did not answer whether they had ever been pregnant. The estimates for the analyses may therefore slightly underrepresent women who experienced a conception as a teenager if women who had conceived were more likely to not respond, or overrepresent women who experience a conception if women who had not conceived were more likely to not respond. Nonetheless, the response-rate

of the conception status was just over 90 per cent which is high for such a sensitive question. The nature of using surveys to ask about behaviour means that this source has more weaknesses than the routine data in terms of capturing ever being pregnant, although it benefits from a larger range of explanatory variables and insight into individuals rather than aggregated areas.

The other main variable of interest in this analysis was the university expectations at age 14 which used the responses to whether young women believed they would apply to university and then how likely they thought it was that they would get into university. The new variable which recoded both questions into one about overall university expectations had a lower response-rate at 3956 out of 4467, largely due to 274 women responding 'don't know' to their likelihood of getting into university. This variable may therefore overrepresent women who are more certain about their views on university and may require women to understand, many years before even applying, their own likelihood of university acceptance at age 14. Of the explanatory variables from the Next Steps survey, the question about household occupation had a lower response-rate than the question about ever being pregnant with 4029 responses out of 4467. All other explanatory variables had a response-rate of over 90 per cent which is high for a survey, particularly as these questions included 'risky' topics like truancy and smoking.

7.4 The contributions and implications for policy

The findings suggest that area characteristics do play a role in predicting both area and individual teenage reproductive behaviour. Area characteristics were found to explain some of the differences in conception rates and abortion ratios across England, and particularly explained the trend of very high conception rates in London over time compared to non-London urban areas at the start of 1998 to 2017. This research informs policymakers that areas in London can act as examples of places that, in recent years, allow teenagers to avoid conceptions and access abortion due to the distinct patterns of lower conception rates alongside much higher abortion ratios in Inner and Outer London. The higher initial conception rates in the late 1990s was also explained by area

characteristics but the lower rates in the 2010s were not explained by area characteristics. This means that the reproductive pattern in London is likely to have more recently occurred due to other unmeasured differences in behaviour compared to non-London teenagers, whether it be, for example, sexual behaviour or service use. However, policymakers should keep in mind that this research could not statistically test how these teenage sexual and behaviours differ by area and whether such differences can explain this distinctive reproductive pattern in London.

While area characteristics explained the differences in teenage conceptions and abortions across the country, changing area characteristics did not explain very much of the *changes* in rates or ratios themselves. This finding suggests that other mechanisms outside of changing area characteristics are behind the trends in teenage conceptions and abortions. As mentioned above, this research can be used to inform policy through its findings on differences in teenage reproductive behaviour across England, but it has also shone a light on the fact that researchers and policymakers need better sources of information about teenage reproductive and sexual behaviours to improve the understanding of what is behind the consistent year-on-year declines in teenage conceptions. The funding and organisation of the ten-year Teenage Pregnancy Strategy was focused on differences between local authorities. The original research in this thesis focused on the role of differences in area characteristics on teenage conceptions and abortions but the author would have liked to also consider the role of teenage sexual behaviours on teenage conception and abortion measures between areas. However, there is a lack on data on teenage sexual behaviours in England. It is very difficult to empirically measure the importance of changing areas or whether changing behaviours of teenagers are behind teenage fertility decline due to a lack of data at the local authority level (or smaller) and limited representative surveys which include recent cohorts of teenagers. Data around teenage sexual behaviours, such as contraceptive use, the use of emergency contraceptives, the use of sexual health services, and the sexual knowledge held by teenagers, are not routinely available by local areas. This lack of data has led to sometimes contrasting theories as to what drove the teenage fertility decline. Future policy, particularly such large strategies like the TPS, must therefore include the roll-out (or continuation) of high-quality measures that can be used to track related behaviour

changes. These measures are vital to allow informed reflections about the changes brought about by policy by both the policymakers themselves and researchers.

This research was able to consider the relationships between area characteristics and local authority level teenage conception rates, but also the relationships between area characteristics and individual young women's likelihoods of experiencing a conception as a teenager in the Next Steps survey. This research has shown that considerations need to be made when examining research and other findings as to whether such relationships with area characteristics are acting as proxies for individual and microsystem/family determinants. In other words, policymakers need to keep in mind that areas may have higher conception rates as the young women living there are more likely to individually experience a teenage conception as they have certain family or individual characteristics rather than just because of the influence of where they live. In particular, chapter 6 examined the popular narrative that young women in deprived areas have lower educational and career aspirations that are linked to higher teenage fertility (Arai, 2007, 2003; Social Exclusion Unit, 1999). The analysis in this current research project provided some statistical support for the association between measures of local deprivation and individual educational expectations. It also found, however, that while local educational deprivation and individual educational expectations separately contribute to the likelihood of experiencing a conception as a teenager, both measures were explained by controlling for family and individual characteristics (ethnicity, regularly smoking, family occupation, mother's highest qualification, and family form). These findings suggest that family and individual characteristics may represent something more than being more likely to live in a deprived area or having educational expectations. The findings from this research can inform policymakers about the importance of considering both area and family contexts, and that research which does not control for individual and family characteristics can include misleading area-level findings. Furthermore, the findings from this research do not support the simplistic narrative that teenage conceptions occur in certain areas due to lower educational expectations and highlight that policy would benefit from targeted interventions rather than relying on widespread improvements in educational expectations.

Finally, this research also examined the meaning behind abortion ratios and their changes in the context of teenage fertility decline. On one hand, this research noted that abortion ratios may represent the fact that higher proportions of these pregnancies are likely to be unplanned, which is an important indicator of unmet need. Therefore, policymakers can use abortion ratios to identify the need to support young women to access contraception if these women want to engage in vaginal-penile sexual intercourse and avoid pregnancy. On the other hand, in the context of the declining conception rates, growing proportions of abortion ratios can represent the fact that young women have increasingly avoided teenage motherhood through evading pregnancy but then opting for abortion if a conception did occur. So, this presents a different picture whereby the needs of teenagers have been met because fewer are falling pregnant and the women who do have an unwanted pregnancy can access abortion. Regardless, this research has broadened the knowledge around the fertility decline by introducing abortion ratios; policy should replicate this by including abortion in discussions and targets around teenagers being able to achieve their fertility desires.

7.5 Limitations and recommendations

This research has considered a variety of exosystem/area-level factors associated with teenage fertility and has used different levels of geography to do so. The analyses used the lowest geographies available for each variable of interest to consider the role of the neighbourhood, but further research could be done to consider the level of geography that best explains the variation. Lupton and Kneale (2010) noted that the literature is also unclear about the scale of area characteristics which best explain teenage parenthood. For example, future research could test whether the LSOA-level deprivation is a better explanatory variable for individuals experiencing a teenage conception than LAD-level or regional deprivation. The individual-level and family-level control variables could be used to consider whether such measures explain all of the associations between area and experiencing a conception at both localised and larger geographies.

This research is, to the author's knowledge, the first that considers the varying role of abortion ratios using decomposition analysis across the various periods of decline

in under-18 fertility rates in England and the Western world. Whilst this was beyond the scope of this project, decomposition of the roles of conception rate and abortion ratio change to fertility rates for the other countries of Great Britain, across Europe, and other high-income countries would provide easily digestible contrasts in the trends. A comparison of the role of abortion across different countries may aid researchers to predict the future of teenage reproductive behaviour by being able to compare current trends in English rates with past trends of countries like Denmark, the Netherlands, and Sweden, that have very low rates of teenage fertility, but vastly different abortion ratios.

While the first three empirical chapters were able to consider the associations with both the LAD under-18 conception rates and abortion ratios, Chapter 6 only considered ever experiencing a conception. This research has highlighted that the national and local trends in teenage fertility are that teenagers are increasingly avoiding pregnancy and are now more likely to opt for an abortion if they do indeed become pregnant. Following this avoidance of motherhood through pregnancy and opting for an abortion, the author would have liked to consider whether young women who opt for abortion have more similar characteristics to teenage women who never became pregnant than women who experienced at least one birth. However, the NS sample of women reporting each pregnancy outcome was insufficient for this analysis.

The research focused on teenage reproductive behaviour and this is traditionally measured before the age of 18 in England. While the first three empirical chapters used the under-18 measures of reproductive behaviour, the final empirical chapter that used the Next Steps study could not use this age range. The NS survey did not ask about whether respondents had ever conceived until the wave at age 19 rather than asking the date of this conception. Therefore, one of the limitations of this latter empirical chapter is that it may also capture conceptions at age 18 or 19. Teenagers who are 18 or 19 are at an age where they may leave home for university and enter the workforce after further education, and so such conceptions may have occurred in a very different context to those under the age of 18. The relationships between the variables of interest and the outcome of experiencing a conception may be weaker than if the measure of conception was before the age of 18. Being able to observe the age at which conceptions had

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occurred would have also been useful to be able to distinguish between younger teenage pregnancy (before the age of 16) and those at 16 to 17.

One of the initial plans for the use of the Next Steps survey in this research was to compare the sexual, risk, and other relevant behaviours of the NS teenagers (aged 17 in 2007) to those around this age in Natsal 3 in 2010-12 and the Millennium Cohort Study in 2017. The NS survey did not ask about sexual behaviour until the wave at age 19 and so the sexual behaviours that would lead to under-18 conceptions could not be measured using this survey. Due to this, the author decided to focus on the Next Steps study to consider reproductive behaviour through whether young women conceived by the wave at age 19 rather than comparing multiple surveys. Nonetheless, depending on whether the age at first conception is asked in the MCS age 22 questionnaire, the analysis in Chapter 6 that considers the exosystem/area-level associations with educational expectations and experiencing a conception could be replicated for a cohort of women who have compulsory educational participation until age 18, higher educational attainment, higher post-compulsory educational participation (Crawford and Greaves, 2015; Universities UK, 2018), higher university fees, and are less likely to conceive.

Another limitation of the individual-level analyses in Chapter 6 is that educational attainment is not controlled for alongside educational expectations. The author was inspired by the work by Crawford, Cribb, and Kelly (2013) that considered extensive measures of educational attainment at the end of Key Stage 2 and 3 (around ages 11 and 14) and looked into adding to the literature by controlling for educational attainment research in the analyses using the NS survey. Unfortunately, the NS survey did not collect test scores or measures of educational ability that would have been interesting to consider alongside LSOA educational deprivation and individual educational expectations. The NS survey started when teenagers were age 14 but the National Pupil Database (NPD) was not linked to the survey until GCSEs (at age 16). The NS survey that was linked to the NPD for GCSE attainment was another dataset that would have needed to be accessed through the secure lab. Future work using studies like the MCS could build on this research by replicating the analyses whilst also controlling for attainment and cognitive measures.

The measure of personal educational expectations in this research has limitations in that it only measures university expectations. University attendance is not the only way young people can obtain education and present career motivation, and women who want to be young mothers have been found – in qualitative research – to still have educational and career aspirations (Greene, 2006) but these can be postponed until after childbearing. Therefore, the measure of educational expectations used in this research may focus on a narrow view of educational expectations, both in terms of timing and in terms of coverage. In England, a level 5 NVQ is equivalent to a higher education diploma or foundation degree and a level 6 NVQ is equivalent to an undergraduate degree or degree apprenticeship. Unfortunately, however, while the MCS was conducted 10 years after the NS, it has similar questions about general post-16 education and university attendance and does not ask about more vocational aspirations. Surveys should use more inclusive measures of educational expectations.

This research did not intend to evaluate the role of the TPS but it is clear from other recent studies that the TPS introduced improvements in sexual health services, access to contraception, and encouraged localities to deliver higher quality sex and relationships education (Hadley, Ingham and Chandra-Mouli, 2017). The research did control for the TPS funding when investigating the determinants of under-18 conception rates in Chapter 3 and abortion ratios in Chapter 5 but it is difficult to interpret what such relationships mean. This is because areas that had higher initial rates of teenage conceptions at the start of the strategy received greater TPS funding and there is little to no data on how much LADs prioritised teenage pregnancy reduction after the TPS (Hadley, Ingham and Chandra-Mouli, 2017). As noted in the contributions and implications for policy section, future governmental policy needs to be accompanied by more detailed measures of successes, as studies like Baxter et al. (2021) compared the conception rate change in England to other countries and dismissed the role of the TPS without taking into account the continuation of local teenage pregnancy reduction efforts after the TPS, nor the efforts in other countries that did not have a formal strategy (for example, Scotland mirrored much of their policy initiatives on the England initiatives).

Improvements in measures about sexual behaviours, sexual knowledge and LAD-level contraceptive use would also be very useful to evaluate why certain areas vary in

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fertility trends even though their characteristics are similar (i.e. the London effect) as researchers have to rely on measures that are not across all settings (Girma and Paton, 2015), not teenage-specific (Girma and Paton, 2015), survey data (Scott et al., 2020), or national measures in the US (Lindberg et al., 2018). England does not have data that captures how teenage sexual behaviour may vary by local area beyond the LAD conception rate data or heavily suppressed ward-level conceptions data. Therefore, research has not been able to ascertain whether varying sexual frequency or age at first sex by area causes the contrasting rates of teenage conceptions across the country. While data about chlamydia and new STIs are available for under 25s, these measures are not teenage specific. The measures of chlamydia and new STIs are not publicly available for those aged 15 to 19 and are often only provided directly to local councils at higher geographies than LAD-level and so are difficult for researchers to obtain. Data about LARC use by local areas is currently only available for the whole adult population or under 25s rather than just teenagers, and a study by Connolly and colleagues (2014) had to use a variety of data sources like the IMS British Pharmaceutical Index or the IMS Hospital Pharmacy Audit to more accurately measure national LARC use in England over time. Teenage contraceptive pill and condom use in England is not measured outside of a limited number of surveys like Natsal or the MCS that include respondents that are teenagers. Therefore, it is not known how the contraceptive pill and condom use varies by local area. The access to local data about the use of emergency contraception by teenagers is also limited as access through community settings, i.e. pharmacies, are not included in rates. The author has received numerous questions about the role of emergency contraception in teenage fertility decline when presenting parts of this research, but these questions cannot be answered at the local level. There is also no information on how sexual knowledge varies from area to area across England, although such knowledge may be important in enabling young people to make informed decisions about their sexual and reproductive behaviours. Due to the introduction of mandatory Relationships and Sex Education (RSE) in England in 2020, this is also a prime time to introduce a measure of the quality of relationships and sex education through Ofsted quality assessments or employing widespread tests (like in French et al. (2007)) about sexual knowledge.

7.6 Final thoughts

This research provides insight into the relationships that area characteristics have with local teenage reproductive behaviour and the likelihood of individuals conceiving as teenagers. The research illustrates that area characteristics continue to explain under-18 conception rates, but that some of these relationships have weakened over time as fertility rates have declined. The research also provides evidence that abortion ratios deserve more attention when discussing under-18 fertility change and that area characteristics such as youth unemployment, educational attainment, housing availability and the proportion of Black teenagers also explain variations in abortion ratios. While exosystem/area-level measures of economic deprivation, rurality, ethnic composition, and barriers to housing were found to be associated with local rates of conceptions or abortion ratios, such variables were not predictive of young women's individual experiences of teenage pregnancy. This research goes beyond the limited literature considering the macro-micro area-level associations with experiencing a teenage conception using an individual-level dataset by testing the narrative of whether area deprivation is associated with conceptions through varying personal educational expectations. This research found that ethnicity, smoking, family occupation, mother's education and family form explained the relationships area characteristics and personal educational expectations had with experiencing a conception, which highlights how the ongoing narrative of educational expectations misses important factors for young women.

The research in this thesis has contributed to the teenage fertility literature in a variety of ways, particularly by conducting ecological *and* individual-level analyses. The research updates the literature with contemporary findings for teenage conception rates, provides a foundation so that further research can examine the contribution of abortion ratios, expands the knowledge around the determinants of under-18 abortion ratios across the 2000s and 2010s, and adds to the limited literature that has focused on the associations between area characteristics and experiencing a teenage conception in individual-level datasets.

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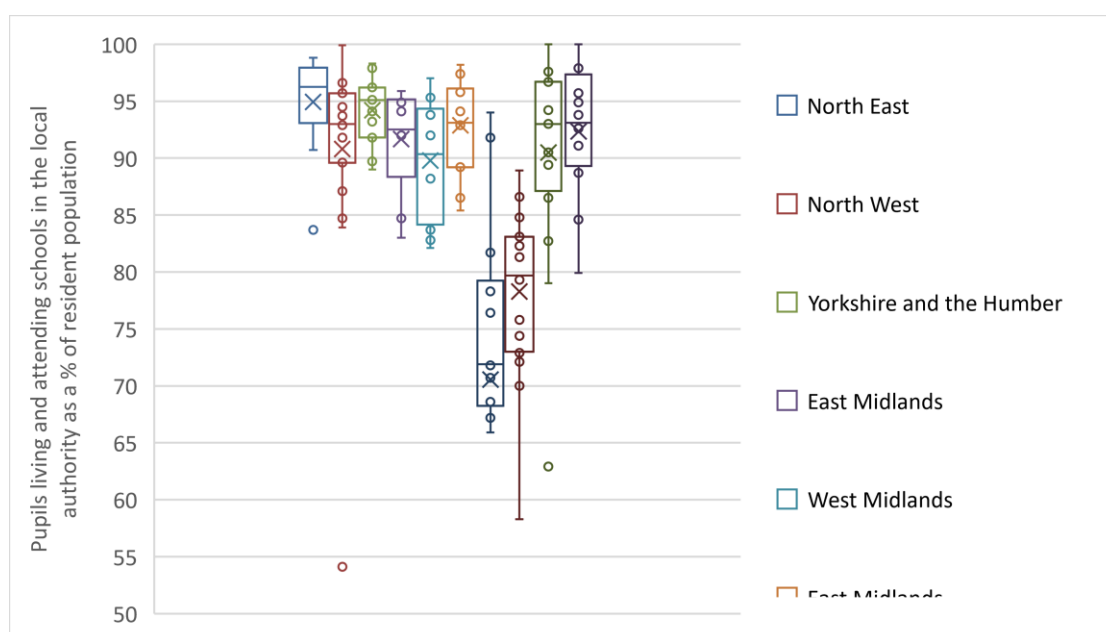
Appendix A. Supplementary material about the research decisions in Chapters 3 to 5

Chapters 3 to 5 use a dataset that has been created by the author by collating a range of LAD-level characteristics and linking them to the LAD-level conceptions, fertility, and abortions data from the Office for National Statistics. Therefore, decisions behind why certain variables have been used in the analyses are shared between these chapters and so will be discussed together. Supplementary materials which are specific to each chapter are included in the following appendices, such as descriptive analyses and sensitivity analyses.

Using data from the School Census for LAD-level analyses

One of the potential limitations of the data used in Chapters 3 and 5 is that LEA school-based measures only include state-funded secondary school pupils (and exclude those in private schools and those who commute outside of the LEA to school). Figure A.1 presents the cross-border movement of secondary school pupils to school for 2017 and shows that London has a distinctive pattern of young people being less likely to attend and reside in the same LEA. The percentage of pupils attending and residing in the same LEA varies within regions, but, on average, only ten per cent of pupils in England (excluding London) migrate across borders for their schooling.

Figure A.1 The percentage of secondary school pupils who attend schools in the same local authority as their residential local authority, in 2017 (source: Department for Education, 2017)



The cross-border movement may suggest that the school-level measures of the LADs are not representative of teenagers in the area. However, as presented in Figure A.2, the correlation between the 2011 school-based measures of ethnic composition are highly correlated with the ethnic composition of teenagers residing in the area from the 2011 census at over 0.9. The measure of ethnic composition from the school-census of state-funded secondary-school pupils is a more accurate measure of overall LAD composition for London compared to the rest of England. This is the case even though these teenagers are more likely to move across boundaries for school. Black and South Asian populations (as shown in Figure A.3) are slightly overrepresented in the School Census, which may be because private school pupils are more likely to be White. The analyses in Chapters 3 and 5 therefore use a measure of ethnic composition which slightly overrepresents these ethnic minority groups. The average educational attainment at GCSE is also measured at the LEA level, and so the average results may be lower than if local private school students are included. Nonetheless, from these sensitivity analyses, the LEA measures do appear to represent the general teenage population who live in these areas.

Appendix A

Figure A.2 The correlations between the two sources of ethnic composition measures; the school-census of state-funded secondary-school pupils and the 2011 census measuring residential teenagers (sources: the 2011 Census and the 2011 School Census)

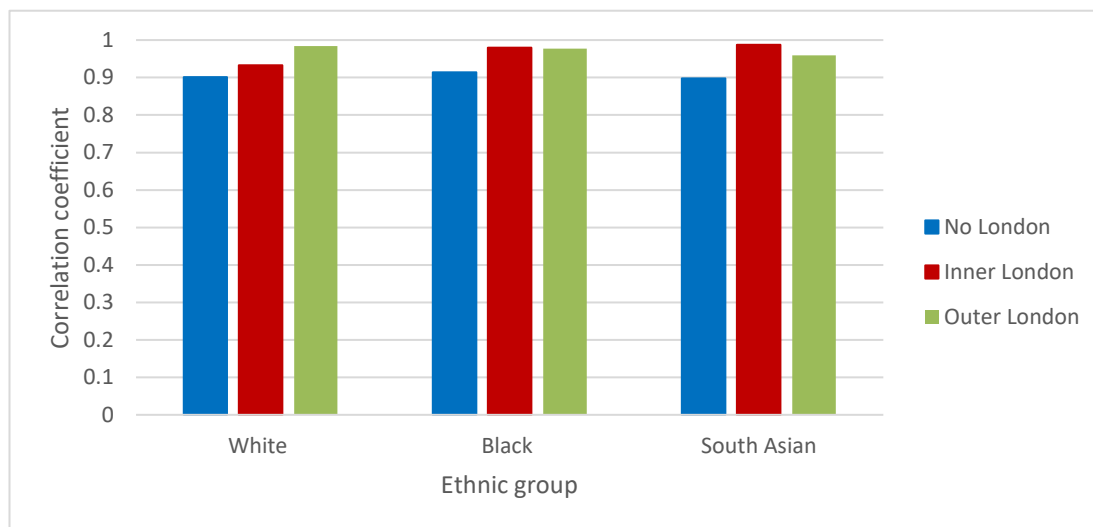
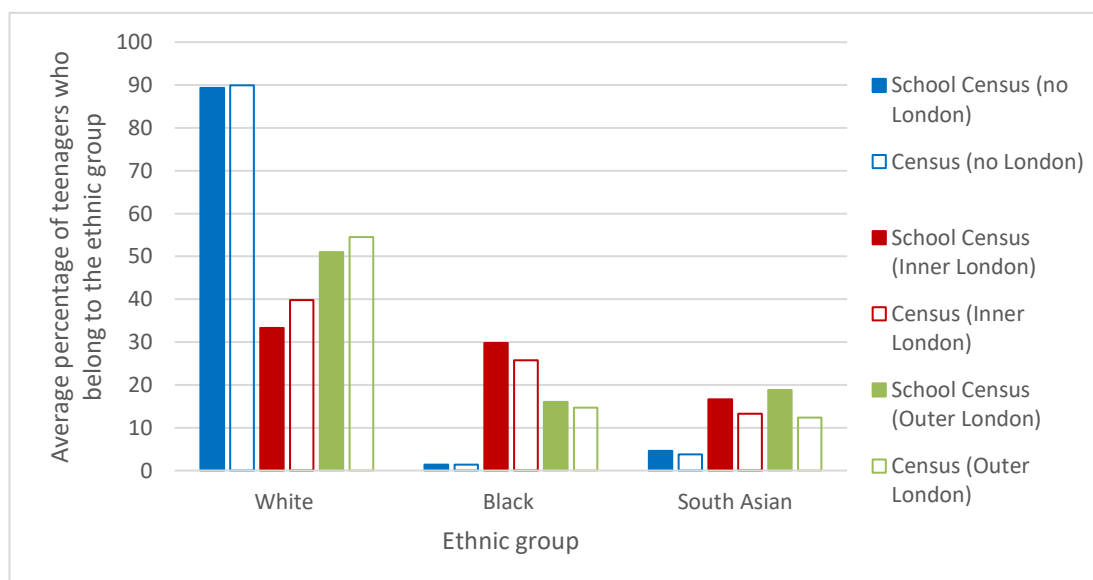


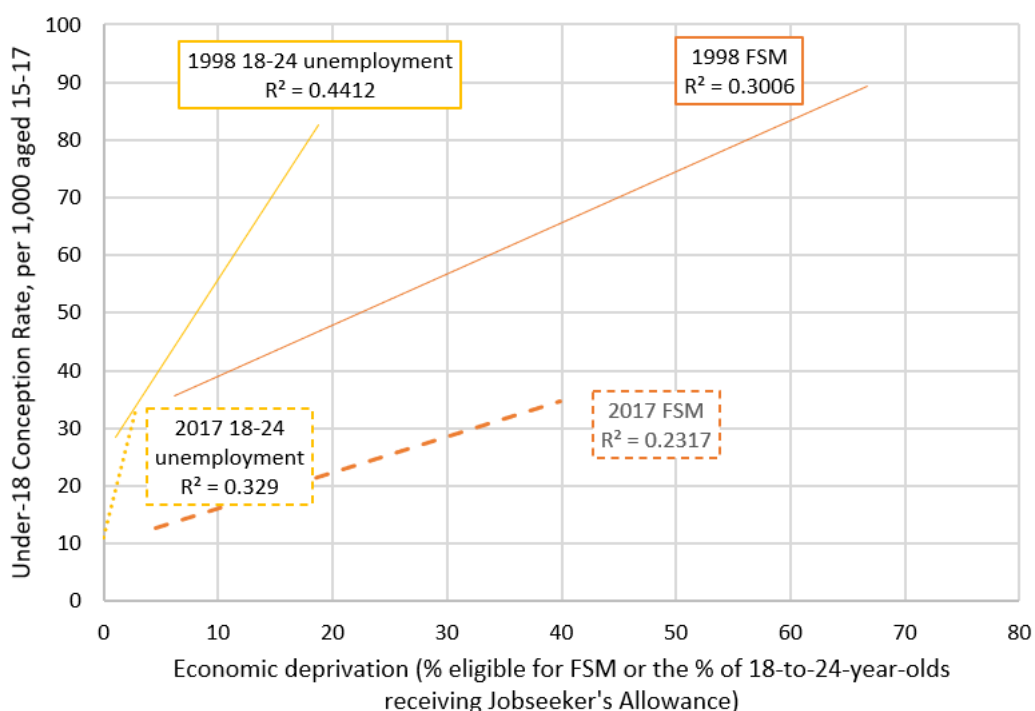
Figure A.3 The average percentage of teenagers who belong to a White, Black, or South Asian ethnic group for each of the data sources and by whether the LADs are in London (sources: the 2011 Census and the 2011 School Census)



Choosing the economic deprivation measure

Economic deprivation in the LAD could have been measured in multiple ways. As the author wanted to capture economic deprivation in an area which would be related to young people, the prevalence of FSM eligible pupils and youth unemployment were considered. Figure A.4 presents the relationships the two measures of youth deprivation have with under-18 conception rates; the proportion of variation in under-18 conception rates explained by the prevalence of 18-to-24-year-olds receiving Jobseeker's Allowance is consistently higher (44% in 1998 and 33% in 2017) than the prevalence of teenagers eligible for Free School Meals (30% in 1998 and 23% in 2017). Chapters 3 to 5 therefore use youth unemployment to capture the economic deprivation in LADs.

Figure A.4 The trend lines of the relationships between under-18 conception rates and the two youth educational deprivation measures (Free School Meal eligibility and the prevalence of 18-24-year-olds receiving Jobseeker's Allowance) in 1998 and 2017

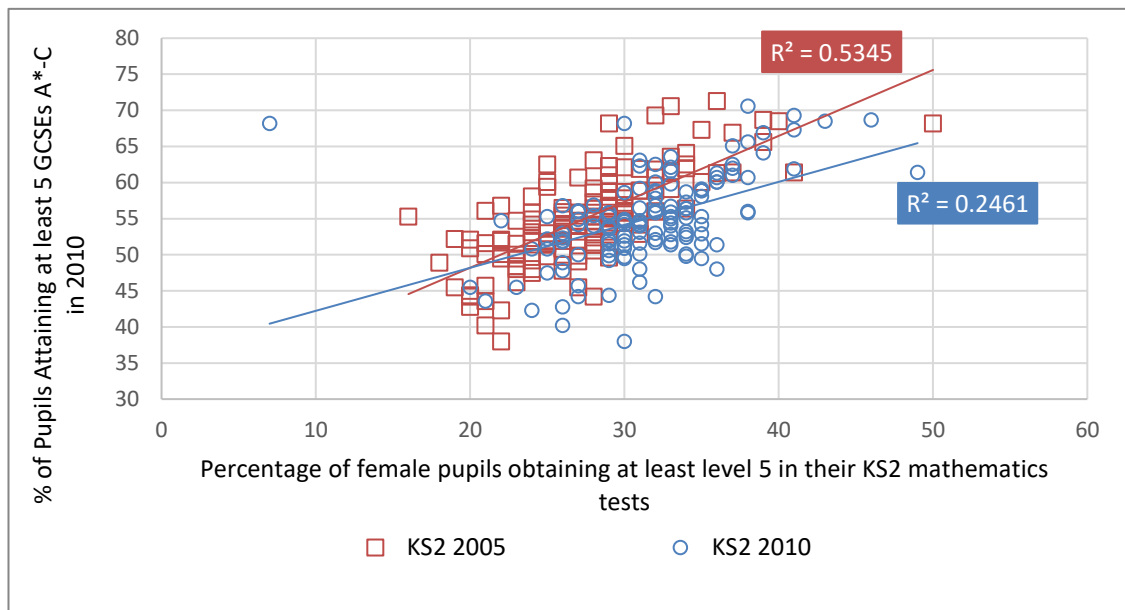


Choosing the educational attainment measure

Appendix A

As mentioned in Section 2.3.4, the compulsory national tests at the end of KS3 (around age 14) were discontinued from 2011. Therefore, as Chapters 3 and 5 considered 1998 to 2017, other measures of educational attainment were needed. KS2 measures of educational attainment were initially sought out as the author had concerns that, if teenage pregnancy had a negative effect on GCSE attainment, a measure of educational attainment during the teenage years where conceptions occur may unearth an unclear relationship. The author tested whether KS2 results of teenagers from around the time the cohort of teenagers were taking KS2 tests (i.e. teenagers in 2010 and KS2 results from 2005) have a stronger relationship with GCSE results in 2010 than comparing KS2 results and GCSE results in the same year (2010). In other words, teenagers around the age of 16 (GCSE age) in 2010 were also given the values of their KS2 results (which are taken around age 11), compared to both KS2 and GCSE results being from the same year and featuring different cohorts of women. Figure A.5 shows that the percentage of GCSE attainment in 2010 explained by KS2 results is higher for the results that follow the cohort (2005) rather than those in the same year (2010). The author, therefore, decided that KS2 results which are shifted by 5 years is the better KS2 attainment measure for these chapters. However, due to using the value from 5 years before, the 1998 to 2005 values (data from 1993 to 2000) were not available and so the KS2 variable would have a large gap. The author then investigated using GCSE attainment and this is the measure used in Chapters 3 and 5 for educational attainment.

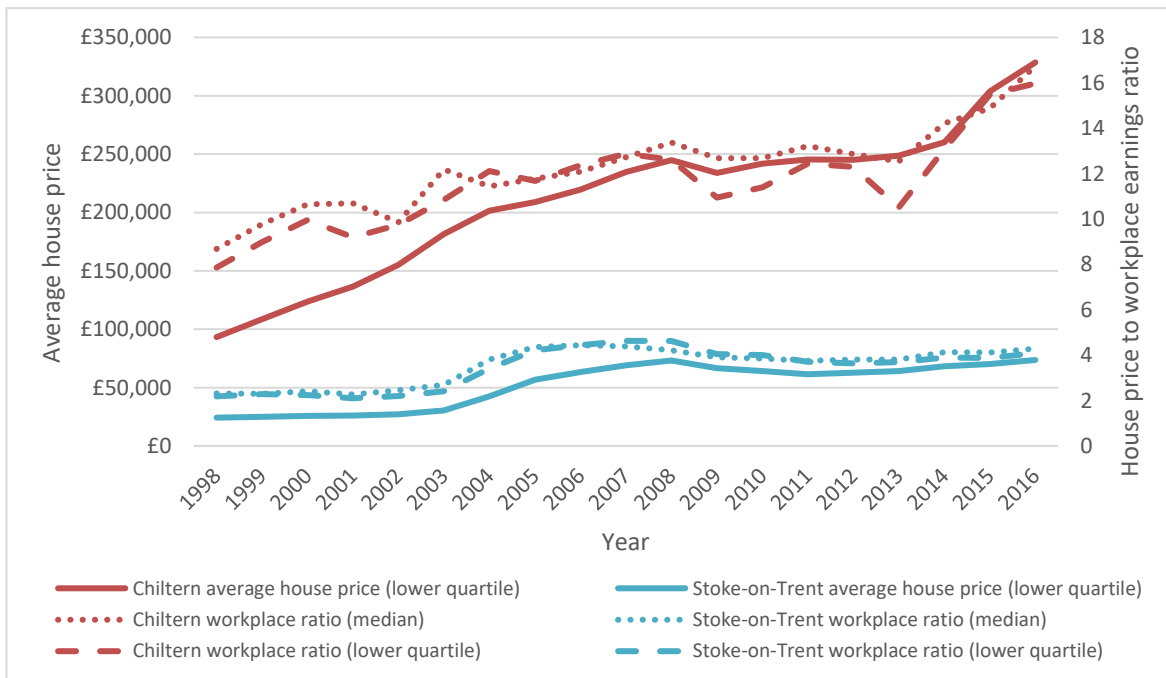
Figure A.5 The association between Key Stage 2 results in 2005 and 2010 with the GCSE results in 2010 (source: ONS)



Choosing the housing affordability measure

Chapters 3 and 5 included measures to represent the availability of affordable housing. Firstly, the author adjusted the house prices for inflation. However, house prices, and then adjusted house prices for inflation, continued to be found to act as proxies for the year rather than change in accessibility. Instead, these analyses used the house price to workplace earnings ratio which are calculated by the ONS. A higher value of this ratio represents LADs as less affordable. The house price to workplace earnings ratio has a similar trend to the average house price in the area with lower house prices (i.e., Stoke-on-Trent) in Figure A.6, and so this measure is not as necessary for such areas. However, certain areas like Chiltern which had high house prices in the 1990s and the early 2000s also had higher workplace earnings and so the house price to workplace earnings ratios better represent of the affordability across all areas.

Figure A.6 A comparison of the average house price at the lower quartile to the median house price to workplace earnings ratio of an example of an area with one of the most expensive housing markets (Chiltern) to an area with one of the lowest (Stoke-on-Trent)



1 **Appendix B. Supplementary analyses for the under-18** 2 **conception rates (Chapter 3)**

3 Descriptive analyses were undertaken to view the individual relationships between
4 the area characteristics and the under-18 conception rates before undertaking multiple
5 regression analyses. The descriptive analyses include graphs of the relationship (the line of
6 best fit for the LADs) in the earliest year that data was available for the variable and the
7 latest year the conception and abortion are available (2015 as of the creation of these
8 figures, but the analysis in the chapters have since included 2016 and 2017). These graphs
9 show the relationships in Inner London, Outer London, and the rest of England (which
10 excludes London) to consider if these relationships differ between these areas and to
11 prevent London's distinctive characteristics influencing the relationships in the rest of
12 England. London was found to have distinctive area characteristics such as ethnic
13 composition in Table 3.1, therefore the descriptive analyses separated London to the rest of
14 England. The analysis was repeated for abortion ratios in Appendix C.

15

16 Economic Deprivation

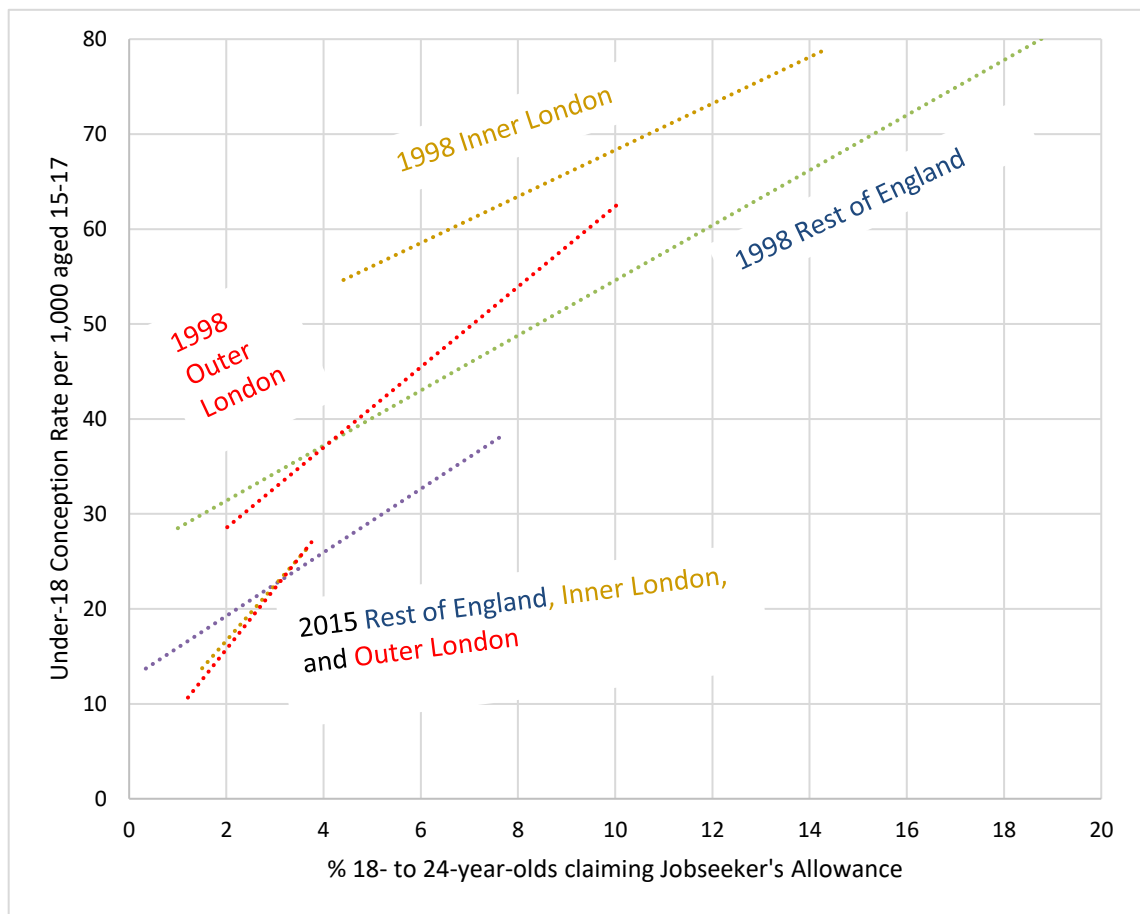
17 The first measure of economic deprivation is the percentage of 18-to-24-year-olds
18 claiming Jobseeker's Allowance and the trend lines with under-18 conception rates are
19 presented in Figure B.1. LADs with more youth unemployment consistently have higher
20 under-18 conception rates in 1998 and 2015. This graph shows how there has been a shift
21 towards less youth unemployment between 1998 and 2015, and a reduction in under-18
22 conception rates as the trend lines are closer to the origin in 2015. The relationship between
23 youth unemployment and under-18 conception rates are steeper in Outer London in 1998
24 and 2015 compared to the rest of England, which suggests that a unit increase in youth
25 unemployment predicts a higher under-18 conception rate in Outer London than the rest of
26 England. Youth unemployment in Inner London has a similar relationship with conception

Appendix B

1 rates to the rest of England in 1998, but this relationship becomes much more similar to the
2 steeper association for Outer London in 2015.

3

4 Figure B.1 The trend lines of the relationship between under-18 conception rates and the
5 percentage of 18- to 24-year-olds claiming Jobseeker's Allowance in 1998 and 2015, by
6 whether the LADs are in London



7

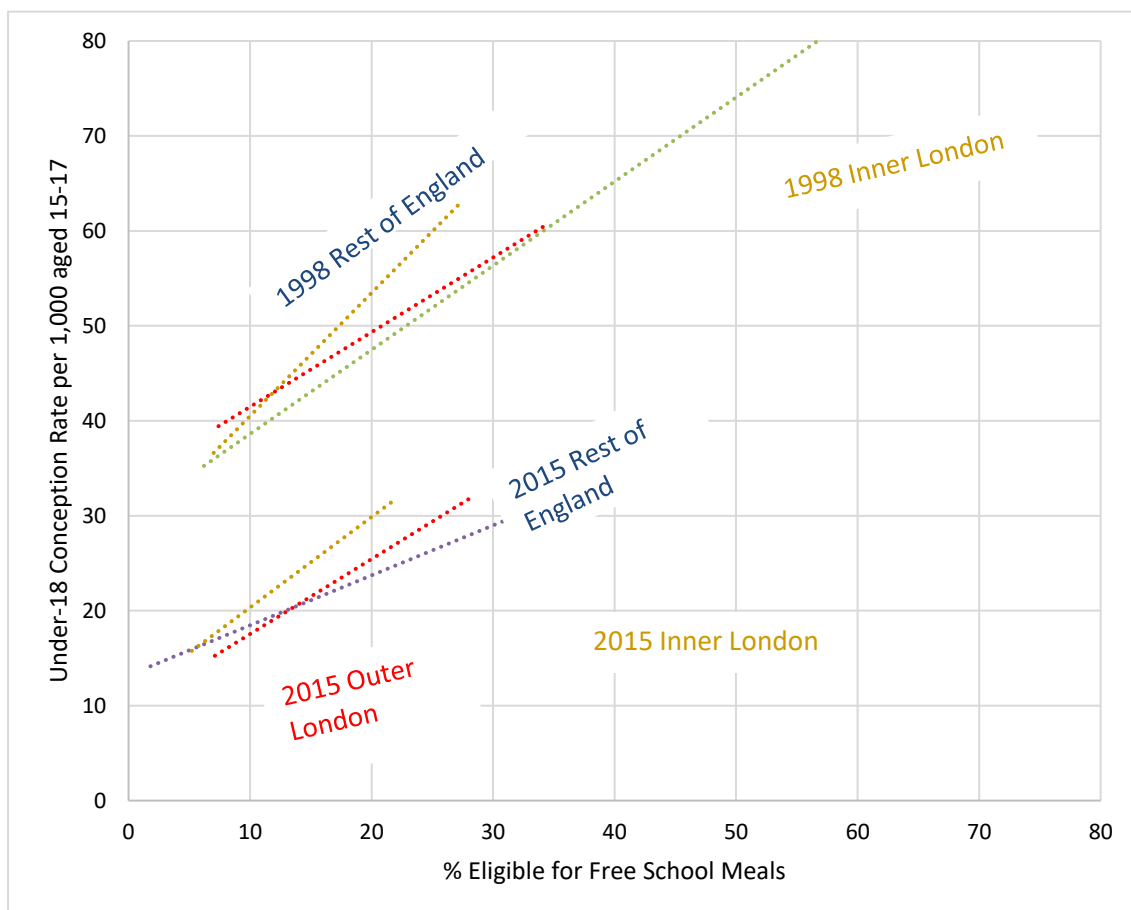
8

9 The second measure of economic deprivation which is considered during the
10 descriptive analyses is the percentage of state-funded secondary school pupils eligible for
11 Free School Meals. Figure B.2 presents that the higher the prevalence of teenagers eligible
12 for FSM, the higher the under-18 conception rate. Inner London's LAD-level deprivation has
13 a weak association with teenage conceptions in 2015, meaning that a more deprived Inner

1 London borough does not necessarily have higher conceptions. For Outer London and the
 2 Rest of England, the steepness of the trend lines are slightly smaller 2015 than 1998 and
 3 have shifted downwards to represent the widespread decline in conception rates for 2015.
 4 This means that each percentage of pupils eligible for FSM is associated with a higher
 5 increase in under-18 conception rates in 1998 than 2015.

6

7 Figure B.2 The trend lines of the relationship between under-18 conception rates and the
 8 percentage of pupils eligible for Free School Meals in 2004 and 2015, by whether the LADs
 9 are in London



10

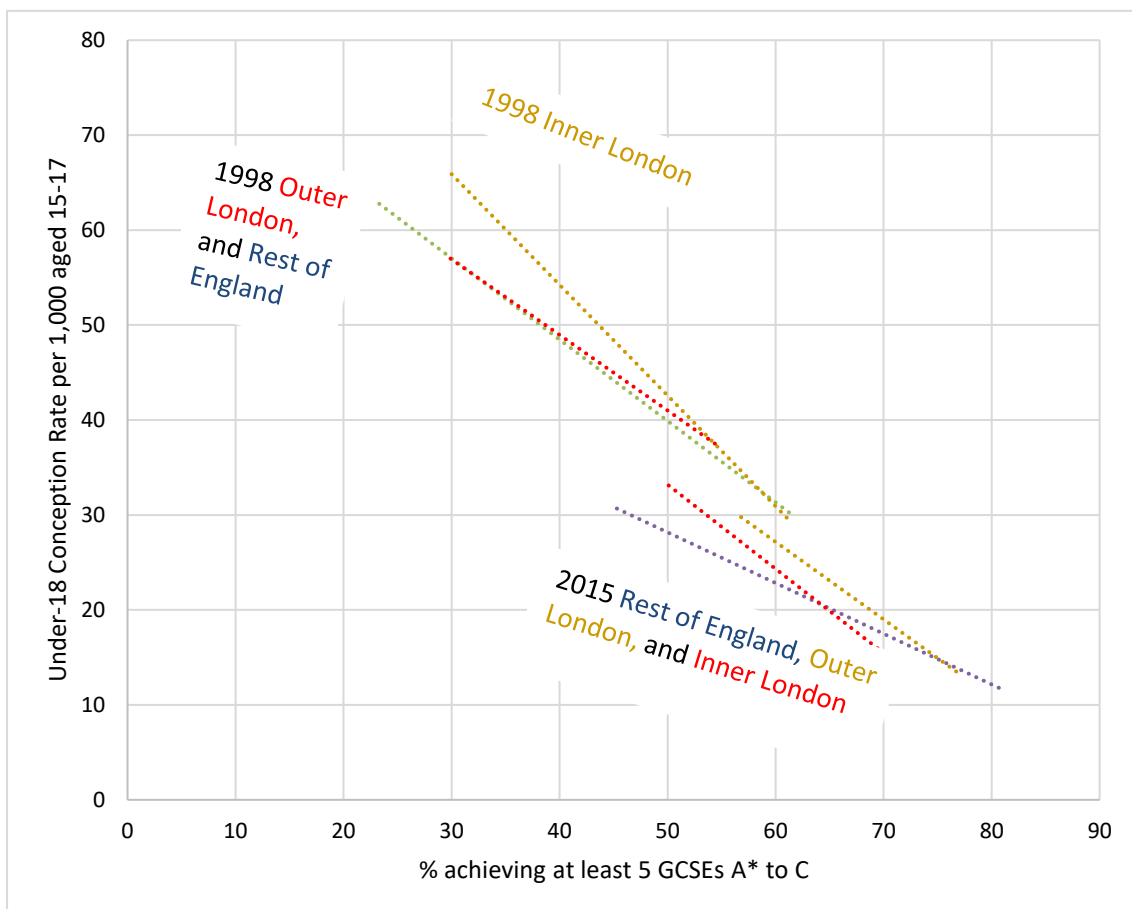
Appendix B

1 Education

2 There has been a rising educational attainment in London and the rest of England
3 which is evident in Figure B.3. The average GCSE attainment is much higher for 2015 than
4 1998 and so the trend lines have shifted to the right for 2015. LADs with higher GCSE
5 attainment have lower under-18 conception rates across London and the rest of England
6 and the trends are similar across these groups of areas. Each unit of GCSE attainment
7 predicts a larger negative effect on conception rates in 1998 compared to 2015 as the
8 relationship has become slightly less steep.

9

10 Figure B.3 The trend lines of the relationship between under-18 conception rates and the
11 percentage of pupils achieving at least 5 GCSEs at level A* to C in 1998 and 2015, by
12 whether the LADs are in London

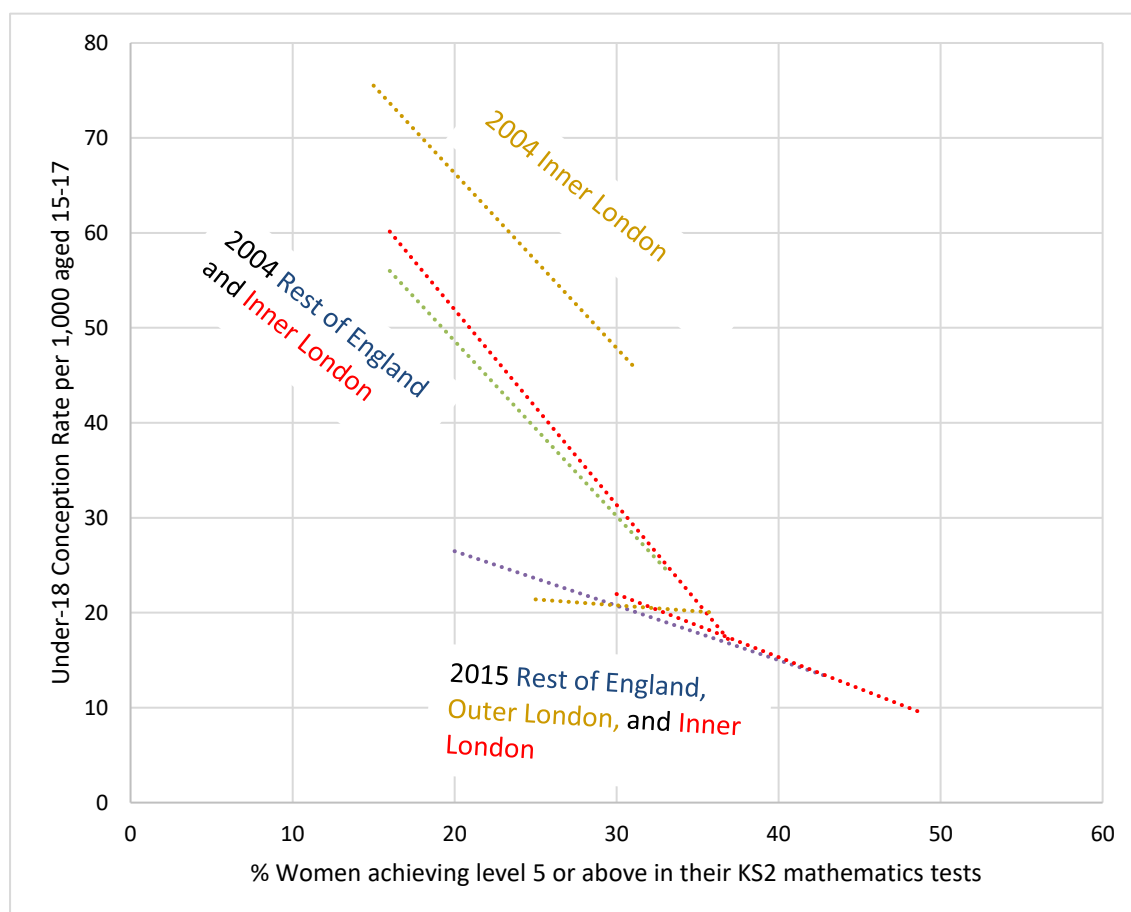


13

1 As presented in Figure B.4, in both 2004 and 2015, the level of KS2 educational
 2 attainment (from the percentage of girls achieving level 5 or above in their KS2 mathematics
 3 tests) is associated with lower under-18 conception rates. Each percentage of KS2
 4 attainment predicts a larger negative effect on conception rates in 2004 compared to 2015
 5 where the trend lines are much flatter.

6

7 Figure B.4 The trend lines of the relationship between under-18 conception rates and the
 8 percentage of women achieving level 5 or above in their Key Stage 2 mathematics tests
 9 (above the national standard) in 2004 and 2015, by whether the LADs are in London



10

11

12

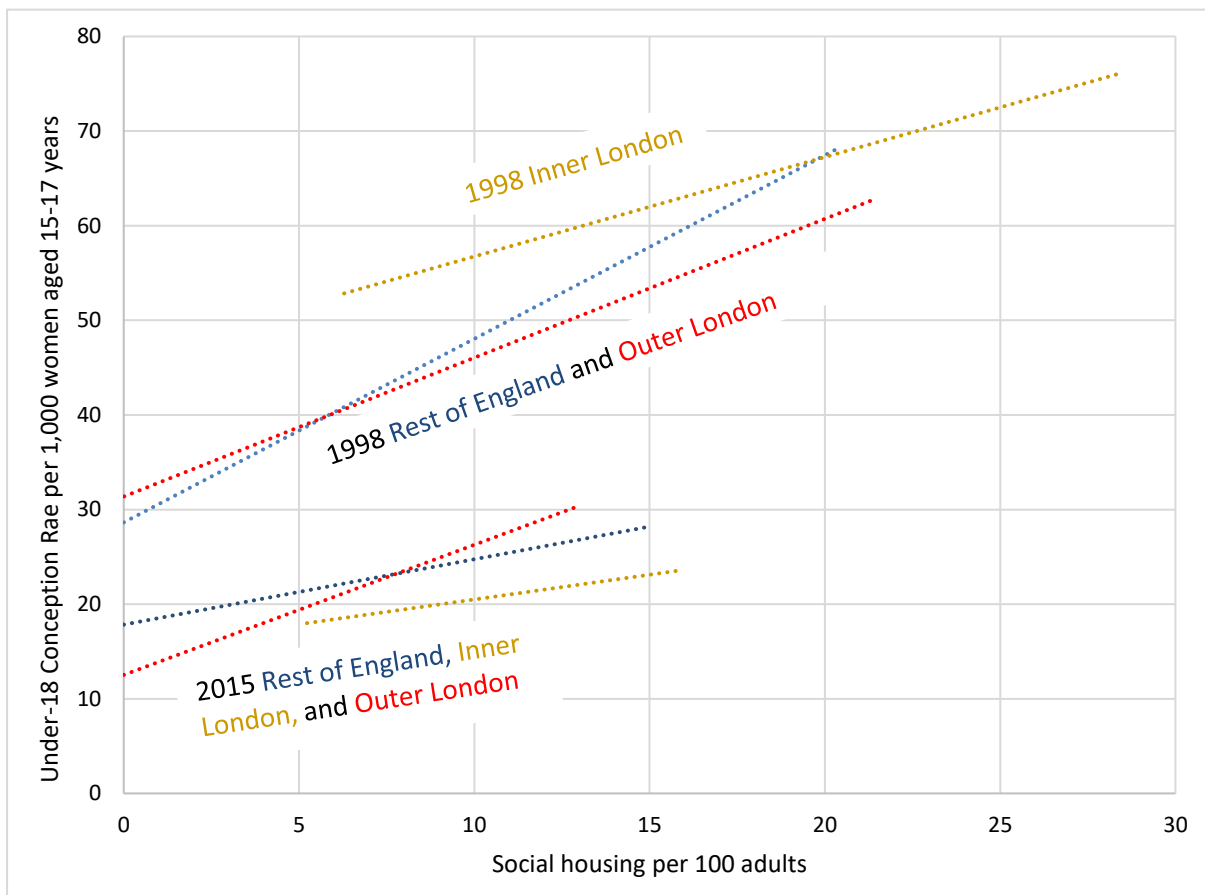
13 Housing

Appendix B

1 Two measures of the accessibility to 'affordable' housing are included in these
2 descriptive analyses: the stock of social housing per 100 adults, and the average house price
3 to workplace earnings ratio. It is evident in Figure B.5 that the higher the stocks of social
4 housing per 100 adults in each LAD, the higher the under-18 conception rate is in the LAD in
5 1998 and 2015. The shift of the trend lines toward the origin for 2015 compared to 1998
6 represents the reduction in social housing stocks across England.

7

8 Figure B.5 The trend line for the relationship between under-18 conception rates and social
9 housing per 100 adults in 1998 and 2015, by whether the LADs are in London



10

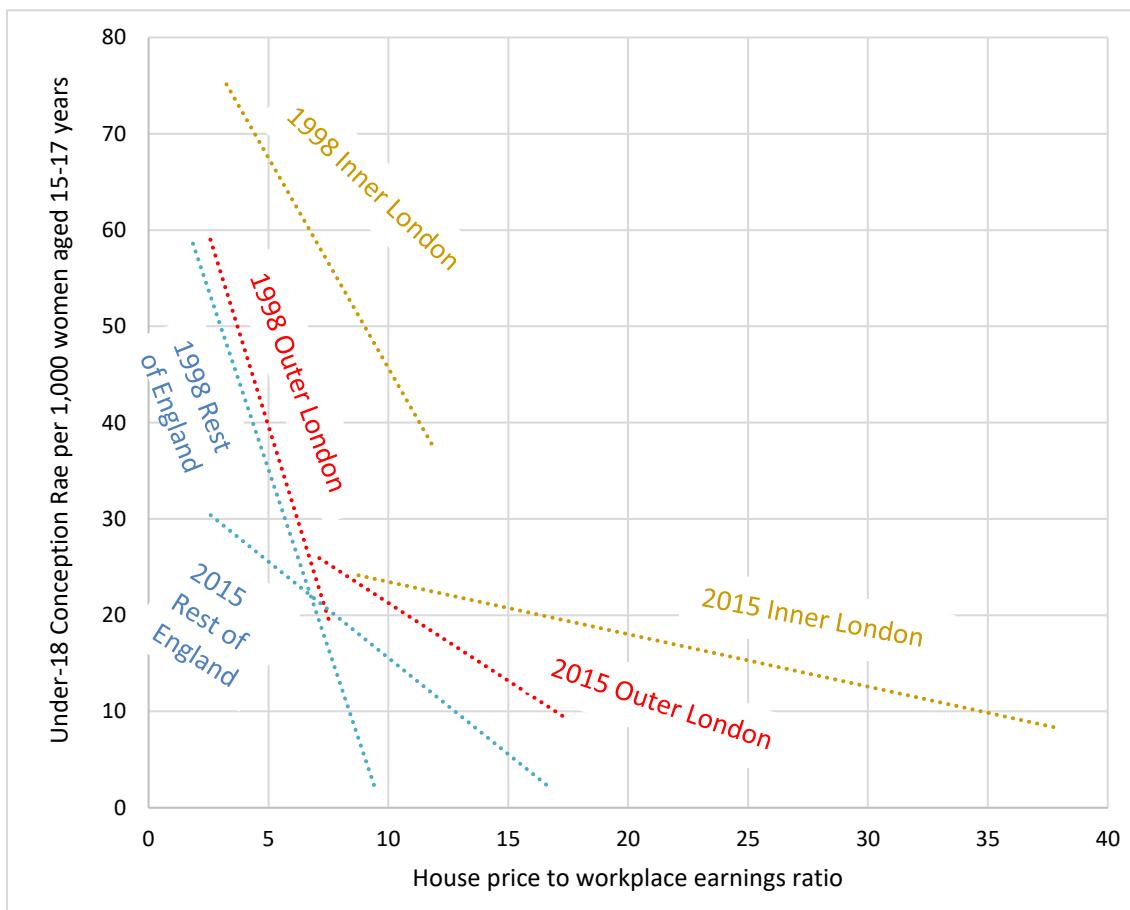
11

12 House prices have risen across England and the average house price to workplace
13 earnings represent how unaffordable housing is compared to the earnings of the working
14 population in that area. LADs with a higher house price to workplace earnings ratio (more

1 unaffordable) have lower under-18 conception rates, as presented in Figure B.6. There is a
 2 larger range of under-18 conception rates and house price to workplace earnings ratios in
 3 1998 compared to 2015, resulting in very steep trend lines for 1998. The relationships
 4 between the house price to workplace earnings ratio and conception rate are much less
 5 steep in 2015 compared to 1998, meaning, each unit of the house price ratio predicts a
 6 larger negative effect in 1998 compared to 2015.

7

8 Figure B.6 The trend line for the relationship between under-18 conception rates and the
 9 median house price to workplace earnings ratio in 1998 and 2015, by whether the LADs are
 10 in London



11

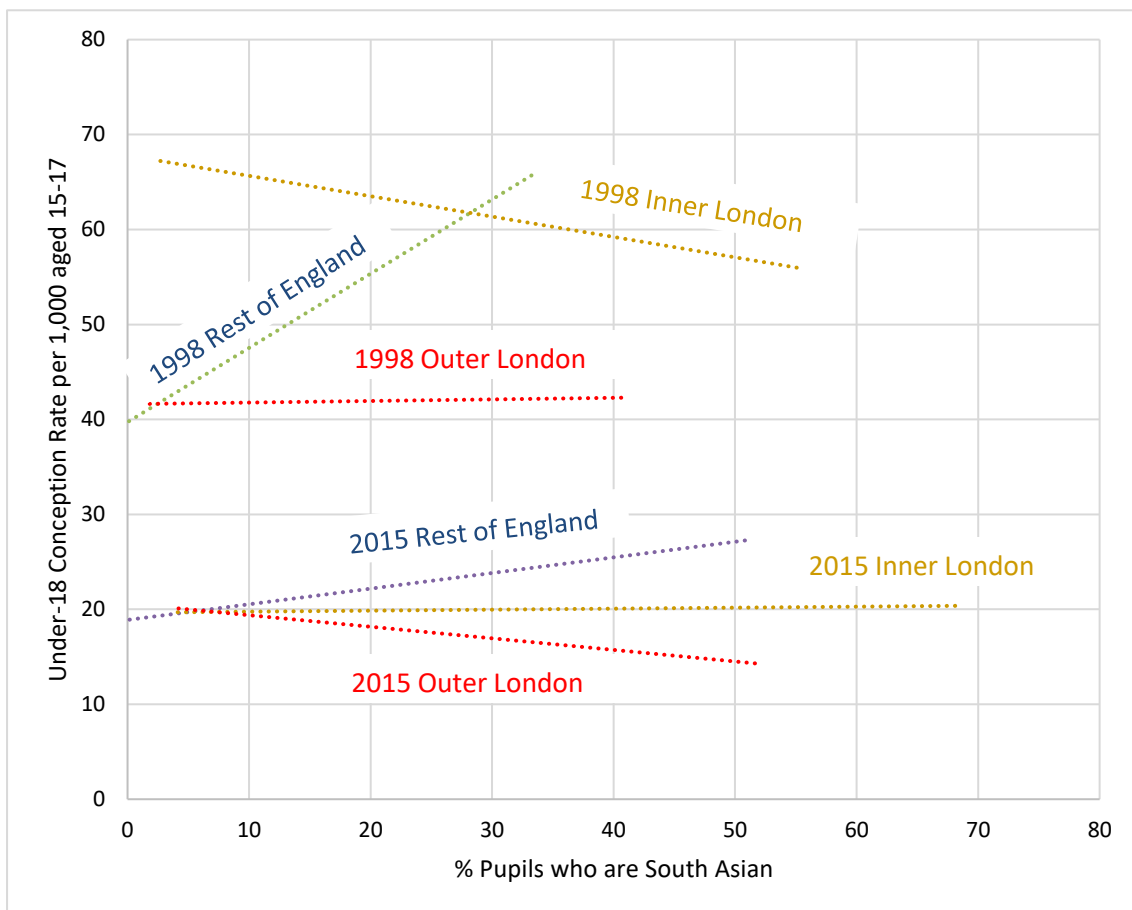
12 Ethnic Composition

Appendix B

1 Two measures of ethnic composition are included in these descriptive analyses, the
2 percentage of pupils registered as South Asian (Figure B.7), and Black (Figure B.8) in state-
3 funded secondary schools. The relationships between the percentage of pupils registered as
4 South Asian and under-18 conception rates across London and the rest of England are
5 inconsistent in direction. The associations are positive for 1998 and 2015 in the rest of
6 England but are negative or very weak for Inner and Outer London in 1998 and 2015.

7

8 Figure B.7 The trend lines of the relationship between under-18 conception rates and the
9 percentage of pupils registered as South Asian in 1998 and 2015, by whether the LADs are in
10 London



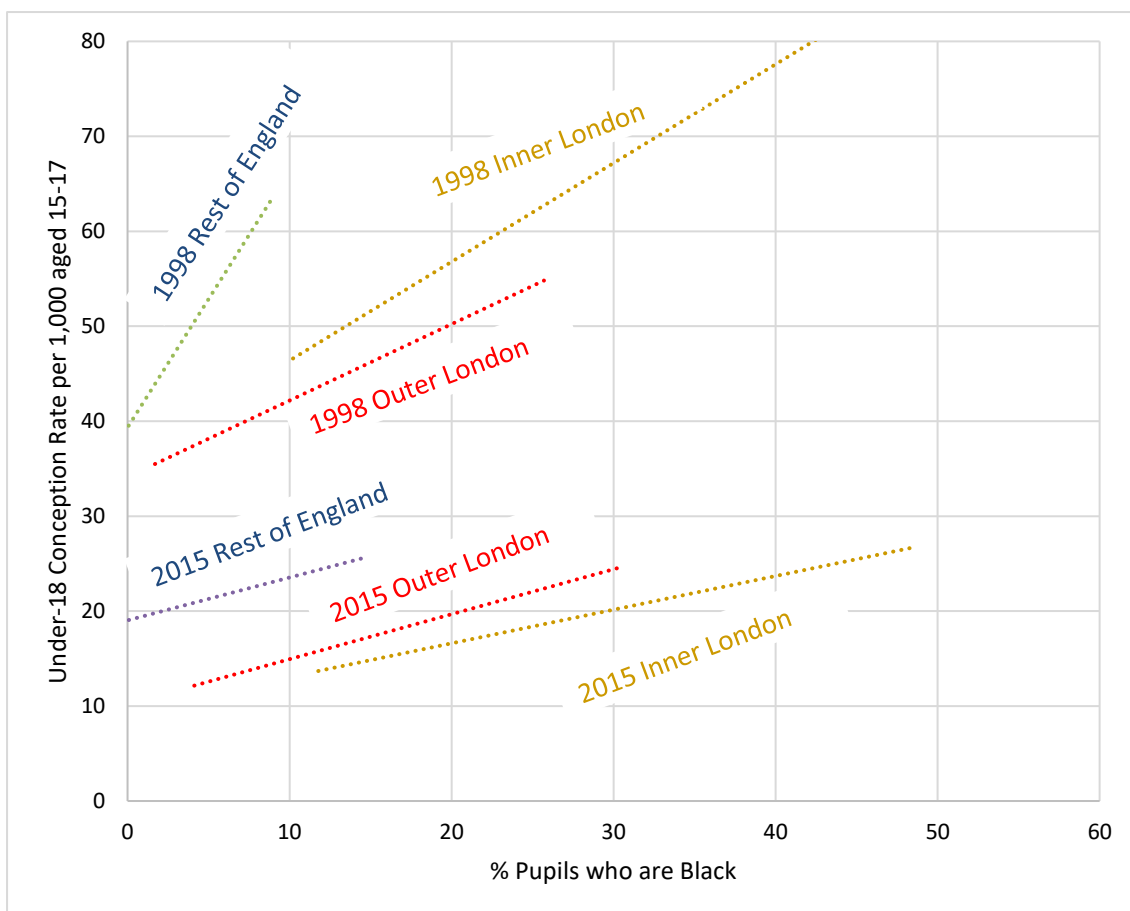
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12

1 LADs with higher proportions of pupils registered as Black have higher under-18
2 conception rates across London and the rest of England in Figure B.8. The effect of each unit
3 increase in the percentage of Black pupils is smaller in 2015 compared to 1998 across
4 London and the rest of England.

5

6 Figure B.8 The trend lines of the relationship between under-18 conception rates and the
7 percentage of pupils registered as Black in 1998 and 2015, by whether the LADs are in
8 London



9

10

Appendix B

1 Table B.1 Summary statistics of the time-varying variables by whether the LADs are urban/rural, 1998 and 2017

Variable name	Mean value across LADs															
	1998								2017*							
	Major	Large	Other	Significant	Rural 50%	Rural 80%	Inner	Outer	Major	Large	Other	Significant	Rural 50%	Rural 80%	Inner	Outer
Under-18 conception rate per 1,000 15-17-year-old women	50.1	49.6	53.1	38.6	35.7	31.1	64.6	41.9	19.7	19.7	19.7	15.3	14.7	12.6	16.3	15.6
% claiming Jobseekers Allowance among the 18-24-year-old population	7.7	6.1	6.9	5.2	5.1	4.7	8.5	5.2	1.1	0.8	1.2	0.6	0.7	0.4	0.8	0.8
% of Pupils Attaining at least 5 GCSEs A-C*	44.0	45.0	45.9	49.0	48.3	47.4	35.1	43.2	65.7	65.4	59.7	66.7	65.6	65.5	69.5	70.8
Median House Price to Workplace Earnings Ratio	3.5	3.5	3.4	4.2	4.8	4.5	5.7	4.7	7.7	8.2	5.3	9.3	9.2	9.3	18.3	14.1
Total Number of Social Housing Units for each LAD per 100 people (18 and over)	11.5	7.6	9.1	6.0	5.9	4.1	17.5	7.1	3.9	3.7	5.7	2.0	1.8	0.9	8.4	3.9
% Pupils in Secondary Schools which were Black	1.9	1.1	0.9	0.7	0.7	0.5	27.5	9.6	3.5	2.3	2.5	1.6	1.2	0.9	28.3	16.8

Variable name	Mean value across LADs															
	1998								2017*							
	Major	Large	Other	Significant	Rural 50%	Rural 80%	Inner	Outer	Major	Large	Other	Significant	Rural 50%	Rural 80%	Inner	Outer
Pupils in Secondary Schools which were South Asian	7.2	4.5	3.2	2.7	1.7	1.3	14.9	15.0	11.7	7.3	7.3	4.5	3.3	2.5	17.5	21.1

*In this table, the 2015 values for the GCSE variable are presented due to the 2016 and 2017 grading changes.

Table B.2 Sensitivity analyses for the random effect models of the relationships between Local Authority District characteristics with under-18 conception rates in England, 1998-2017

VARIABLES	Model 1 Urban/ rural & time period only	Model 2 All covariates, 1998- 2017, Whole of England	Model 3 All covariates, 1998- 2017, excluding London	Model 4 All covariates, 1998- 2015, Whole of England	Model 5 All covariates, 1998- 2015, excluding London	Model 6 FSM (instead of JSA), 1998- 2017, Whole of England	Model 7 FSM (instead of JSA), 1998- 2017, excluding London
Time Period (Ref. = 1998)							
1999-2005	-4.21***	2.13	3.19	2.14	3.19	-5.26	-6.70
2006-2010	-8.20***	26.07***	29.80***	25.22***	28.65***	14.54***	13.74***
2011-2017	-24.17***	-23.01***	-19.60***	-22.52***	-19.46***	-42.03***	-41.56***
Urban/ Rural Measure (Ref. = Major Urban)							
Large Urban	-1.33	2.12	2.74*	2.30	2.90*	1.98	2.26
Other Urban	1.08	2.93**	3.47**	2.83**	3.37**	2.93**	3.21**
Significant Rural	-8.48***	-4.11***	-3.37**	-4.18***	-3.46**	-4.00***	-3.51**
Rural-50%	-10.99***	-5.90***	-4.80***	-5.97***	-4.87***	-5.48***	-4.69***
Rural-80%	-14.83***	-10.00***	-8.81***	-10.38***	-9.21***	-10.04***	-9.26***

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	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7
Inner London	15.90***	3.06		2.81		1.12	
Outer London	-6.85**	-5.44**		-5.73***		-5.94***	
Urban/Rural Interactions with Time Period							
Large Urban * 1999-2005	-0.60	-1.22	-1.71	-1.27	-1.73	-1.07	-1.22
Large Urban * 2006-2010	0.55	-2.66*	-3.12**	-2.63*	-3.06**	-2.11	-2.10
Large Urban * 2011-2017	0.59	-2.41*	-3.04**	-2.60*	-3.18**	-2.13	-2.41*
Other Urban * 1999-2005	-1.64	-0.93	-1.52	-0.92	-1.52	-0.60	-0.89
Other Urban * 2006-2010	-1.88	-2.86**	-3.43***	-2.78**	-3.34**	-2.44*	-2.47*
Other Urban * 2011-2017	-5.51***	-3.82**	-4.49***	-4.12***	-4.79***	-2.64*	-3.18**
Significant Rural * 1999-2005	1.07	0.56	-0.30	0.58	-0.26	1.06	0.57
Significant Rural * 2006-2010	2.81**	-0.19	-0.84	-0.14	-0.78	0.46	0.35
Significant Rural * 2011-2017	5.55***	0.60	-0.22	0.24	-0.58	0.89	0.39
Rural-50% * 1999-2005	-0.45	-1.34	-2.46*	-1.27	-2.38*	-1.02	-1.74
Rural-50% * 2006-2010	2.56*	-0.95	-1.96	-0.87	-1.88	-0.65	-1.14
Rural-50% * 2011-2017	7.29***	1.57	0.39	1.37	0.16	1.68	0.83
Rural-80% * 1999-2005	0.05	-0.22	-1.47	-0.16	-1.40	0.40	-0.34

	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7
Rural-80% * 2006-2010	3.22**	0.02	-1.06	0.08	-1.00	0.63	0.18
Rural-80% * 2011-2017	9.82***	4.04***	2.74*	3.67***	2.35	4.45***	3.63**
Inner London * 1999-2005	-0.04	-4.22		-4.06		-7.06**	
Inner London * 2006-2010	-11.15***	1.87		1.66		-2.35	
Inner London * 2011-2017	-18.21***	-2.35		-3.19		-6.37*	
Outer London * 1999-2005	3.84**	1.94		2.05		2.19	
Outer London * 2006-2010	1.57	4.89**		4.93**		4.37**	
Outer London * 2011-2017	2.86	3.77**		3.22		2.82	
% of 18-24-year-olds claiming Jobseekers Allowance		0.89***	0.98***	0.84***	0.92***		
1999-2005 * Youth Jobseekers Allowance		0.14	0.13	0.12	0.10		
2006-2010 * Youth Jobseekers Allowance		-0.30*	-0.39**	-0.29*	-0.37**		
2011-2017 * Youth Jobseekers Allowance		0.03	-0.05	-0.10	-0.15		
% of Pupils Eligible for Free School Meals						0.19**	0.24***
1999-2005 * Free School Meals						0.14*	0.17*
2006-2010 * Free School Meals						0.15*	0.21**
2011-2017 * Free School Meals						0.13	0.14

Appendix B

	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7
% of Pupils Attaining at least 5 GCSEs A-C		0.08	0.14**	0.08	0.14**	0.04	0.06
1999-2005 * GCSE		-0.20***	-0.19***	-0.19***	-0.19***	-0.11*	-0.07
2006-2010 * GCSE		-0.48***	-0.53***	-0.47***	-0.52***	-0.35***	-0.34***
2011-2017 * GCSE		0.00	-0.05	0.00	-0.05	0.24***	0.23***
Median House Price to Workplace Earnings Ratio		-1.78***	-1.81***	-1.66***	-1.69***	-2.09***	-2.16***
1999-2005 * Housing Unaffordability		1.24***	1.27***	1.18***	1.20***	1.43***	1.48***
2006-2010 * Housing Unaffordability		0.99***	1.02***	0.97***	1.02***	1.29***	1.41***
2011-2017 * Housing Unaffordability		1.58***	1.70***	1.56***	1.73***	1.82***	1.93***
Total Number of Social Housing Units for each LAD per 100 people (18 and over)		0.43***	0.46***	0.43***	0.46***	0.50***	0.54***
1999-2005 * Social Housing		-0.12	-0.20**	-0.12	-0.20**	-0.18**	-0.25**
2006-2010 * Social Housing		-0.30***	-0.32***	-0.31***	-0.33***	-0.38***	-0.41***
2011-2017 * Social Housing		-0.47***	-0.52***	-0.44***	-0.48***	-0.53***	-0.59***
% Pupils in Secondary Schools who are Black		0.51***	-0.29	0.51***	-0.30	0.45***	-0.62
1999-2005 * % Black		-0.02	0.74*	-0.03	0.70*	0.00	0.70*
2006-2010 * % Black		-0.49***	-0.10	-0.50***	-0.12	-0.43***	0.14
2011-2017 * % Black		-0.54***	0.15	-0.54***	0.16	-0.47***	0.43

	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7
% Pupils in Secondary Schools who are South Asian		-0.01	0.28***	-0.00	0.30***	-0.06	0.18*
1999-2005 * % South Asian		-0.12**	-0.35***	-0.12**	-0.35***	-0.15***	-0.34***
2006-2010 * % South Asian		-0.15***	-0.34***	-0.15***	-0.34***	-0.18***	-0.34***
2011-2017 * % South Asian		-0.07	-0.34***	-0.08	-0.34***	-0.08	-0.30***
TPS Funding per each Female aged 13-17		0.23***	0.22***	0.24***	0.23***	0.28***	0.28***
2006-2010 * TPS Funding (REF. = 1999-2005)		-0.00	-0.00	0.00	0.00	-0.07**	-0.09***
Constant	48.70***	39.78***	35.35***	39.64***	35.26***	44.99***	43.28***
<u>Random Effects</u>							
σ_u Between LAD variation	8.43	4.28	4.26	4.53	4.52	4.77	4.72
σ_e Within LAD variation	5.82	4.83	4.81	4.87	4.83	4.91	4.89
Rho	0.68	0.44	0.44	0.46	0.47	0.49	0.48
*** p<0.01, ** p<0.05, * p<0.1							

Table B.3 The fixed effect models of under-18 conception rates including the varying sensitivity analyses

VARIABLES	Model 1 Urban/ rural & time period only	Model 2 All covariates, 1998-2017, Whole of England	Model 3 All covariates, 1998-2017, excluding London	Model 4 All covariates, 1998-2015, Whole of England	Model 5 All covariates, 1998-2015, excluding London	Model 6 FSM (instead of JSA), 1998- 2017, Whole of England	Model 7 FSM (instead of JSA), 1998- 2017, excluding London
Time Period (Ref. = 1998-2005)							
2006-2010	-3.73***	-0.64**	-1.69***	-0.44	-1.12***	-0.60**	-1.42***
2011-2017	-17.59***	-10.03***	-11.02***	-9.31***	-9.93***	-13.91***	-13.77***
% of 18-24-year-olds claiming Jobseekers Allowance		1.37***	1.18***	1.12***	0.87***		
% of Pupils eligible for Free School Meal						0.69***	0.29***
% of Pupils Attaining at least 5 GCSEs A-C		-0.18***	-0.11***	-0.19***	-0.11***	0.05***	0.10***
Median House Price to Workplace Earnings Ratio		-0.19***	0.34***	-0.08	0.27***	-0.38***	-0.10
Total Number of Social Housing Units for each LAD per 100 people (18 and over)		0.41***	0.34***	0.40***	0.35***	0.55***	0.53***
% Pupils in Secondary Schools who are Black		-0.31***	-1.21***	-0.33***	-1.12***	-0.38***	-1.23***
% Pupils in Secondary Schools who are South Asian		-0.44***	-0.70***	-0.44***	-0.73***	-0.52***	-0.83***
Constant	39.73***	44.42***	38.59***	45.54***	40.38***	30.07***	31.37***
<u>Random Effects</u>							

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	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7
σ_u Between LAD variation	10.54	9.63	11.18	10.42	11.67	8.66	11.64
σ_e Within LAD variation	6.44	5.72	5.40	5.71	5.40	5.94	5.64
Rho	0.73	0.74	0.81	0.77	0.82	0.68	0.81
*** p<0.01, ** p<0.05, * p<0.1							

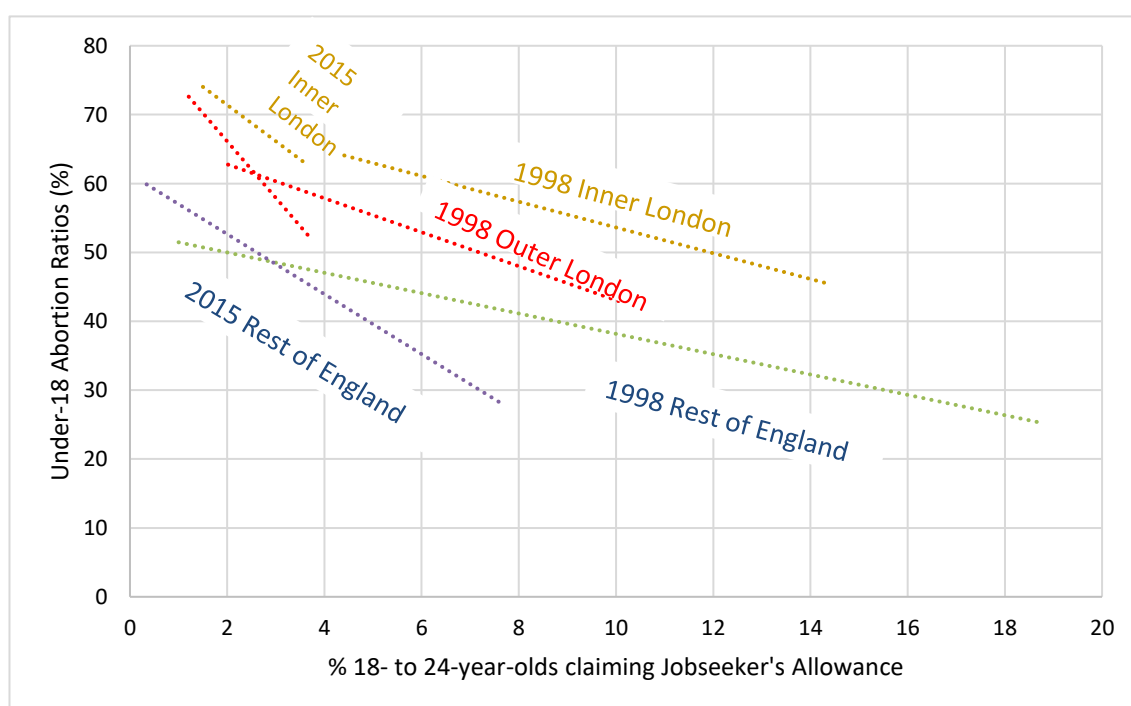
Appendix C. Supplementary analyses for under-18 abortion ratios (Chapter 5)

The descriptive analyses in Appendix B have been replicated for under-18 abortion ratios and this section also includes additional regression analyses for Chapter 5.

Economic Deprivation

LADs with higher proportions of young people claiming Jobseeker's Allowance have lower proportions of under-18 conceptions resulting in abortion throughout England and for 1998 and 2015. Each percentage of youth unemployment has a larger negative effect on under-18 abortion ratios in 2015 compared to 1998 across London and the rest of England.

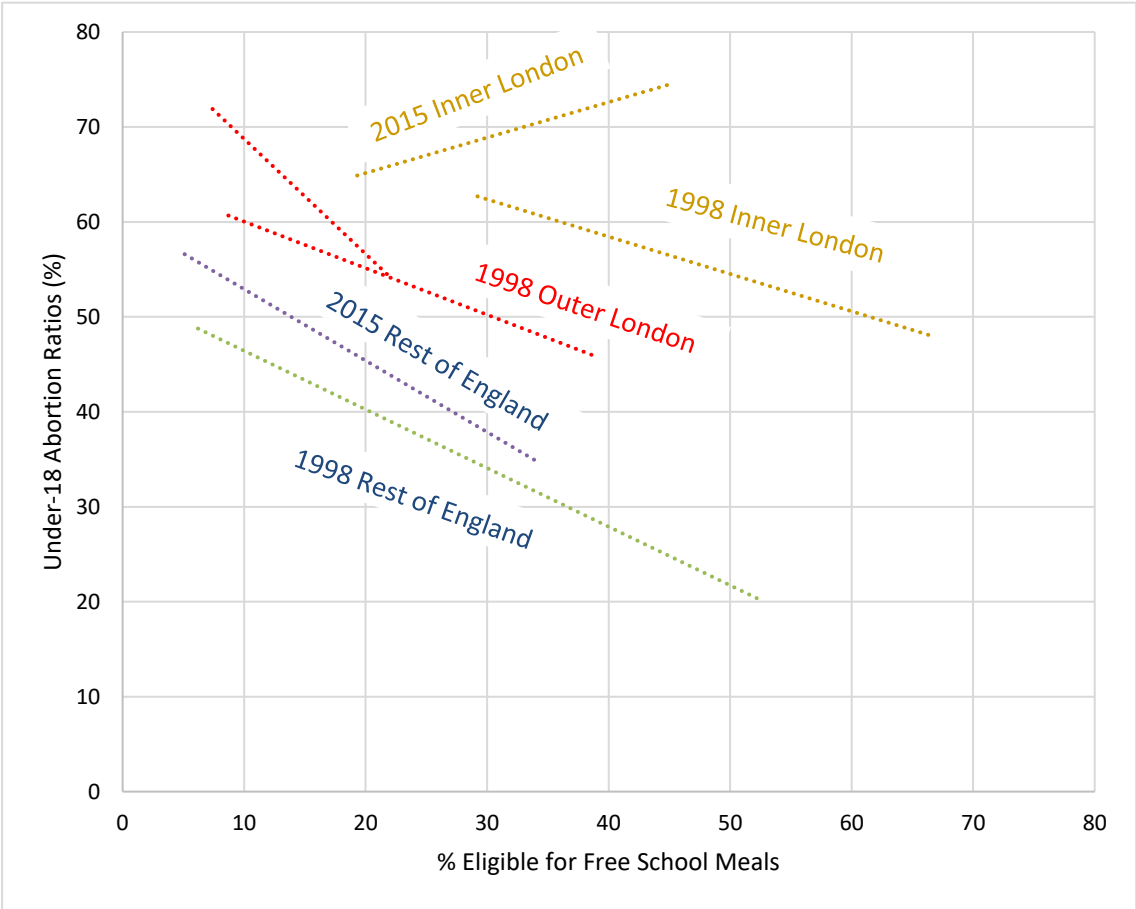
Figure C.1 The trend lines for the relationship between under-18 abortion ratios and the percentage of 18- to 24-year-olds claiming Jobseeker's Allowance in 1998 and 2015, by whether the LADs are in London



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Figure C.2 shows the relationships between the percentage of state-funded secondary school pupils eligible for Free School Meals and under-18 abortion ratios. The association between FSM and under-18 abortion ratios are largely negative, with more FSM being associated with lower proportions of conceptions resulting in abortion, but the trend in Inner London in 2015 is positive (although this may be due to a combination of a weak relationship as the R^2 is around 10% and Inner London having a small sample size of LADs).

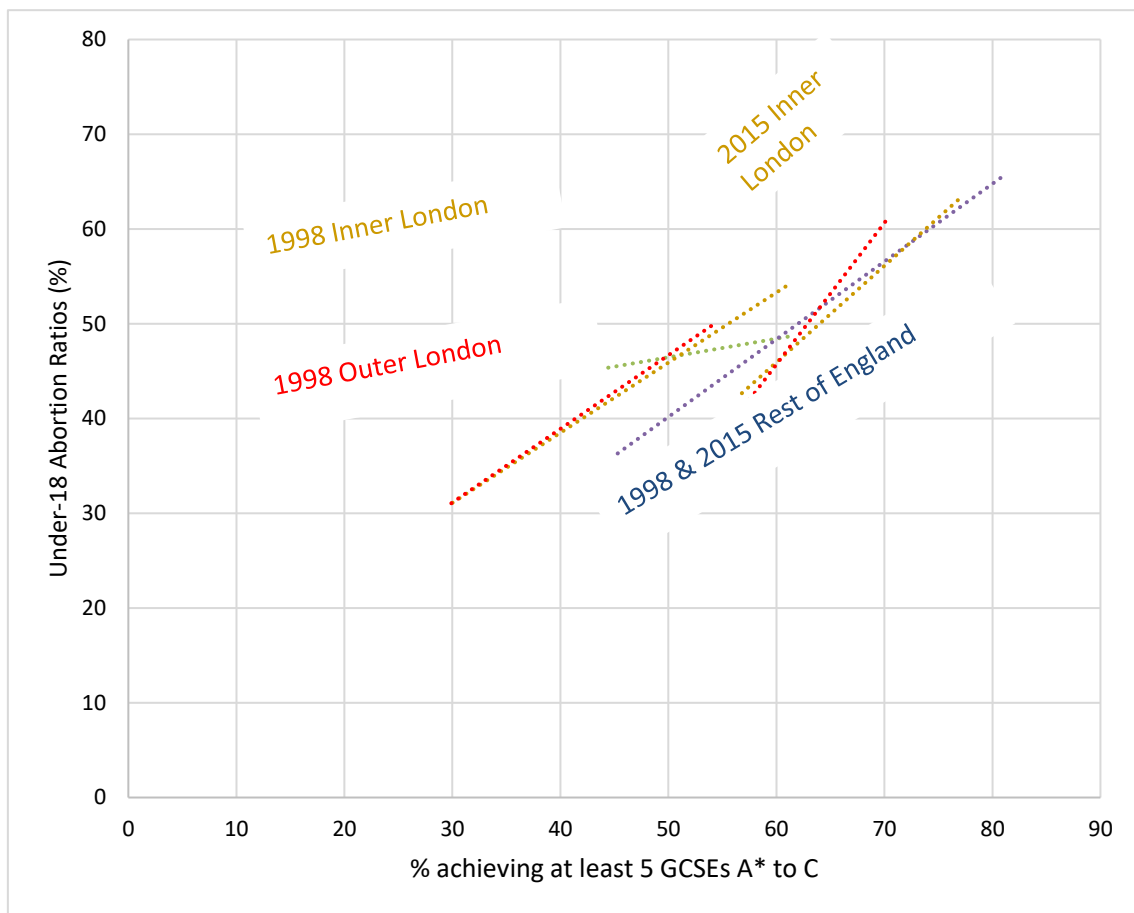
Figure C.2 The trend lines for the relationship between under-18 abortion ratios and the percentage of pupils eligible for Free School Meals in 2004 and 2015, by whether the LADs are in London



Education

GCSE attainment has similar positive associations with under-18 abortion ratios across London and the rest of England in 1998 and 2015 (Figure C.3).

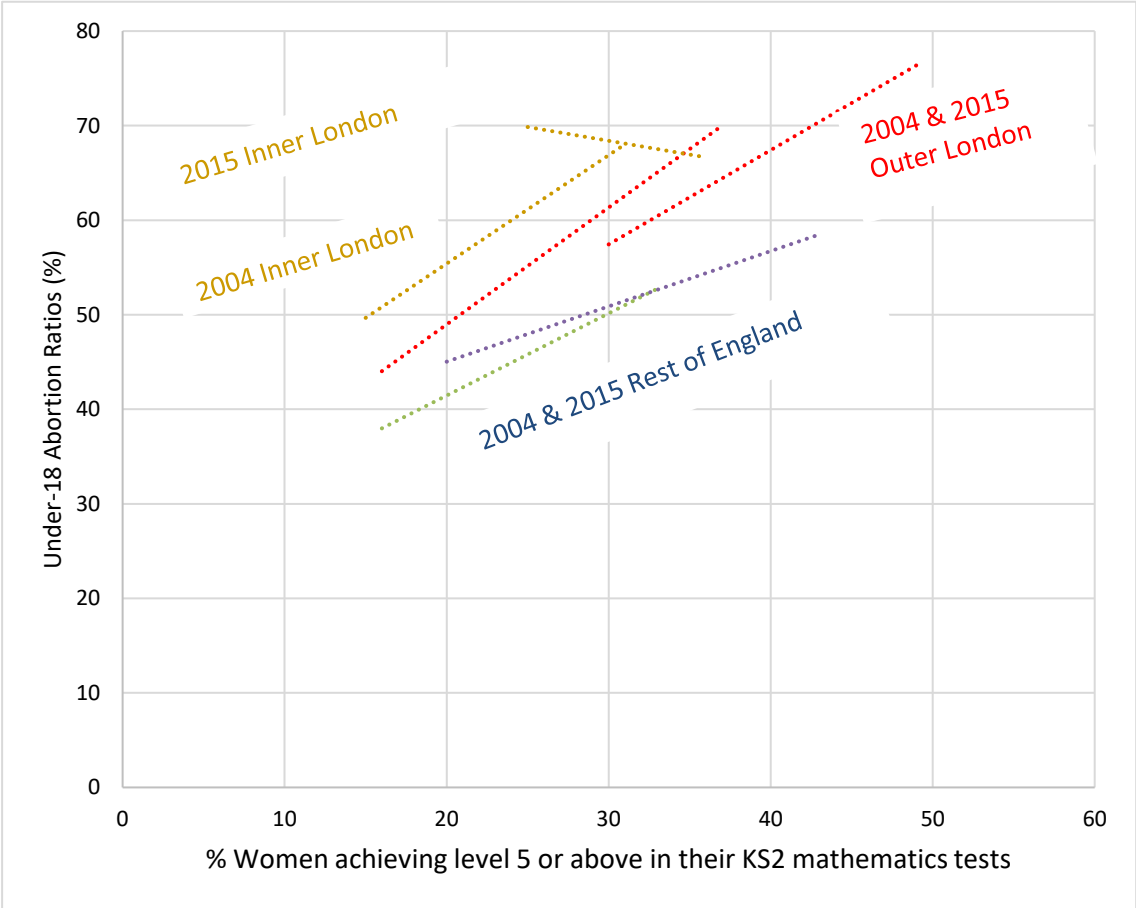
Figure C.3 The trend lines of the relationship between under-18 abortion ratios and the percentage of pupils achieving at least 5 GCSEs at level A* to C in 1998 and 2015, by whether the LADs are in London



Appendix C

The relationship between KS2 attainment and under-18 abortion ratios are largely positive (Figure C.4); higher attainment predicts higher under-18 abortion ratios in Outer London and the rest of England in 2004 and 2015. The relationship between KS2 attainment and under-18 abortion ratios is positive for 2004 but becomes weak and negative for 2015 (R^2 around 10%).

Figure C.4 The trend lines of the relationship between under-18 abortion ratios and the percentage of women attaining level 5 or above in their Key Stage 2 mathematics tests (above the national standard) in 2004 and 2015, by whether the LADs are in London



Housing

LADs with more social housing per adult population have lower under-18 abortion ratios in 1998 and 2015 (Figure C.5). The steepness of the trendlines are similar across London and the rest of England, and for 1998 and 2015. However, the relationship between social housing and abortion ratios are flat for Inner London in 2015.

Figure C.5 The trend lines for the relationship between under-18 abortion ratios and the social housing per adult population in 1998 and 2015, by whether the LADs are in London

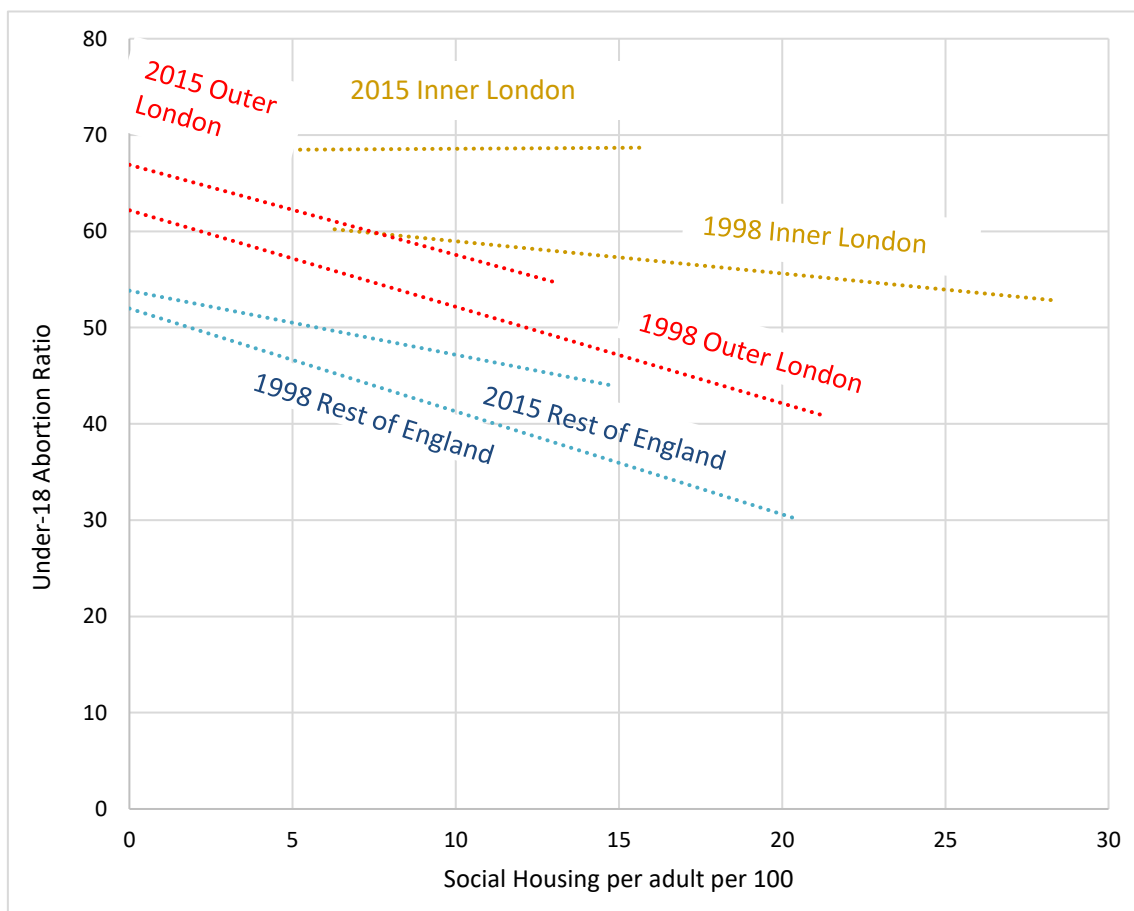
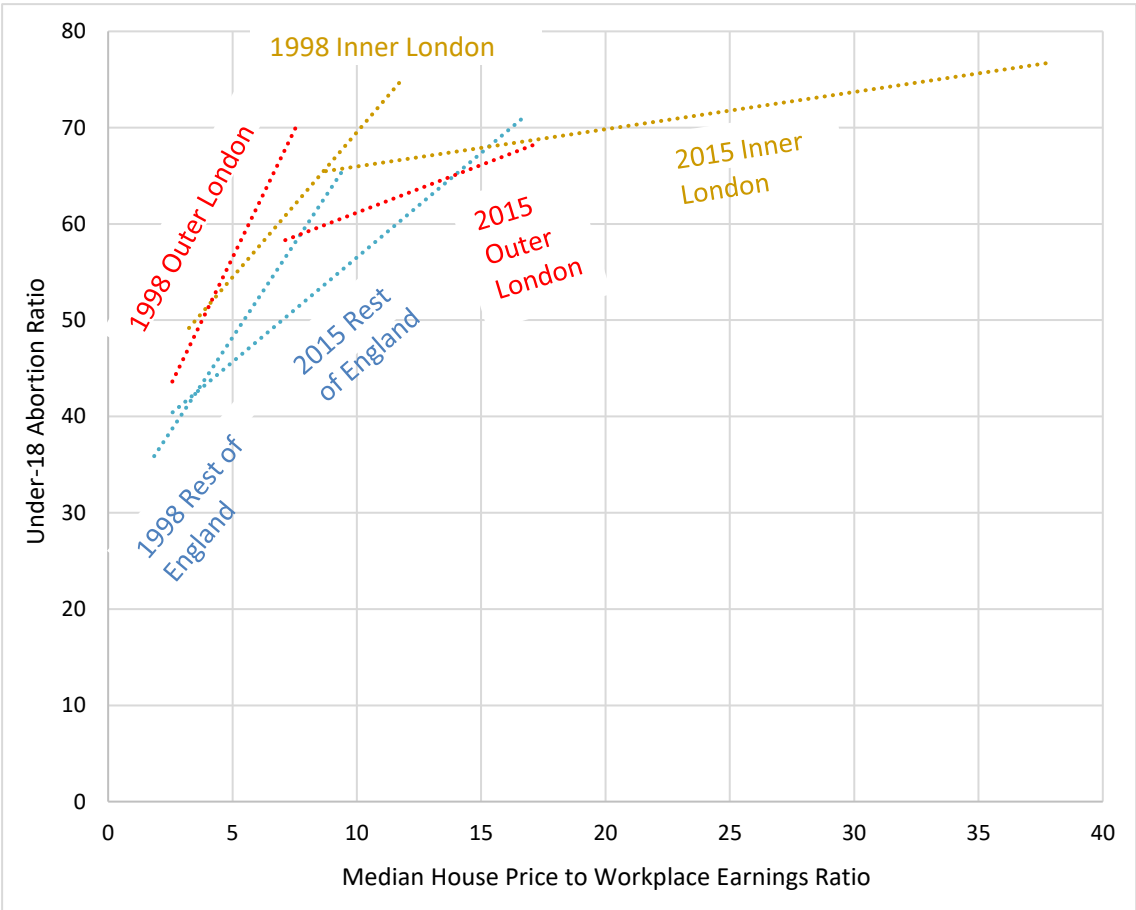


Figure C.6 shows that LADs with less affordable housing through a higher house price to workplace earnings ratio have higher proportions of conceptions resulting in

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abortion in 1998 and 2015. The trend lines between the house price to workplace earnings ratio and under-18 abortion ratios became less steep in 2015 compared to 1998, meaning that a unit increase in housing unaffordability has a smaller positive effect on under-18 abortion ratios in 2015 compared to 1998.

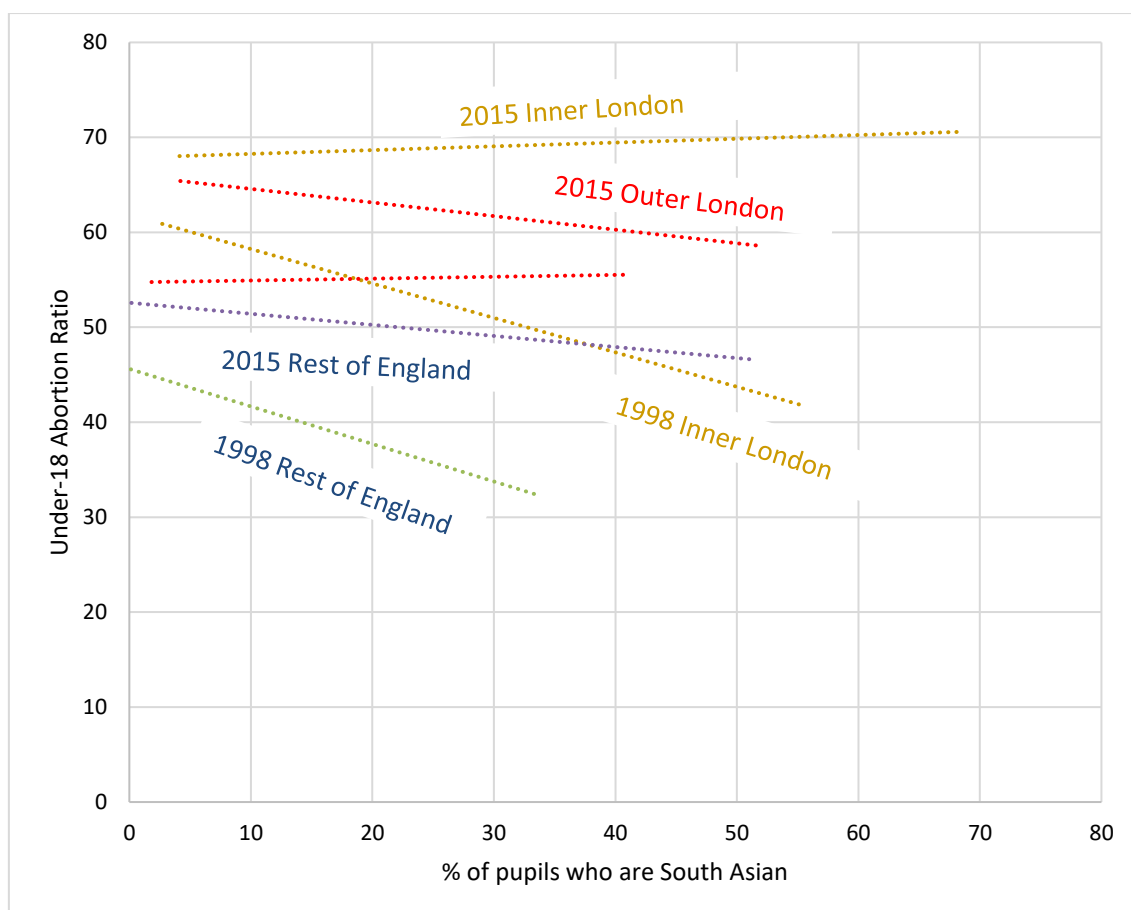
Figure C.6 The trend lines for the relationship between under-18 abortion ratios and the workplace earnings to house price ratio percentage in 1998 and 2015, by whether the LADs are in London



Ethnic Composition

Two measures of ethnic composition are included in these descriptive analyses. LADs with higher percentages of pupils registered as South Asian in state-funded secondary schools have lower under-18 abortion ratios in the rest of England in 1998 and 2015 (Figure C.7). While LADs in the rest of England have this negative association, the direction of the relationship is inconsistent in LADs in Inner and Outer London.

Figure C.7 The trend lines of the relationship between under-18 abortion ratios and the percentage of pupils registered as South Asian in 2004 and 2015, by whether the LADs are in London



The relationships between the percentage of Black pupils and under-18 abortion ratios is not consistent across LADs in London with very weak positive relationships in

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1998 and negative relationships in 2015. However, in LADs in the rest of England, LADs with higher proportions of Black pupils consistently have lower under-18 abortion ratios in 1998 and 2015.

Figure C.8 The trend lines of the relationship between under-18 abortion ratios and the percentage of pupils registered as Black in 2004 and 2015, by whether the LADs are in London

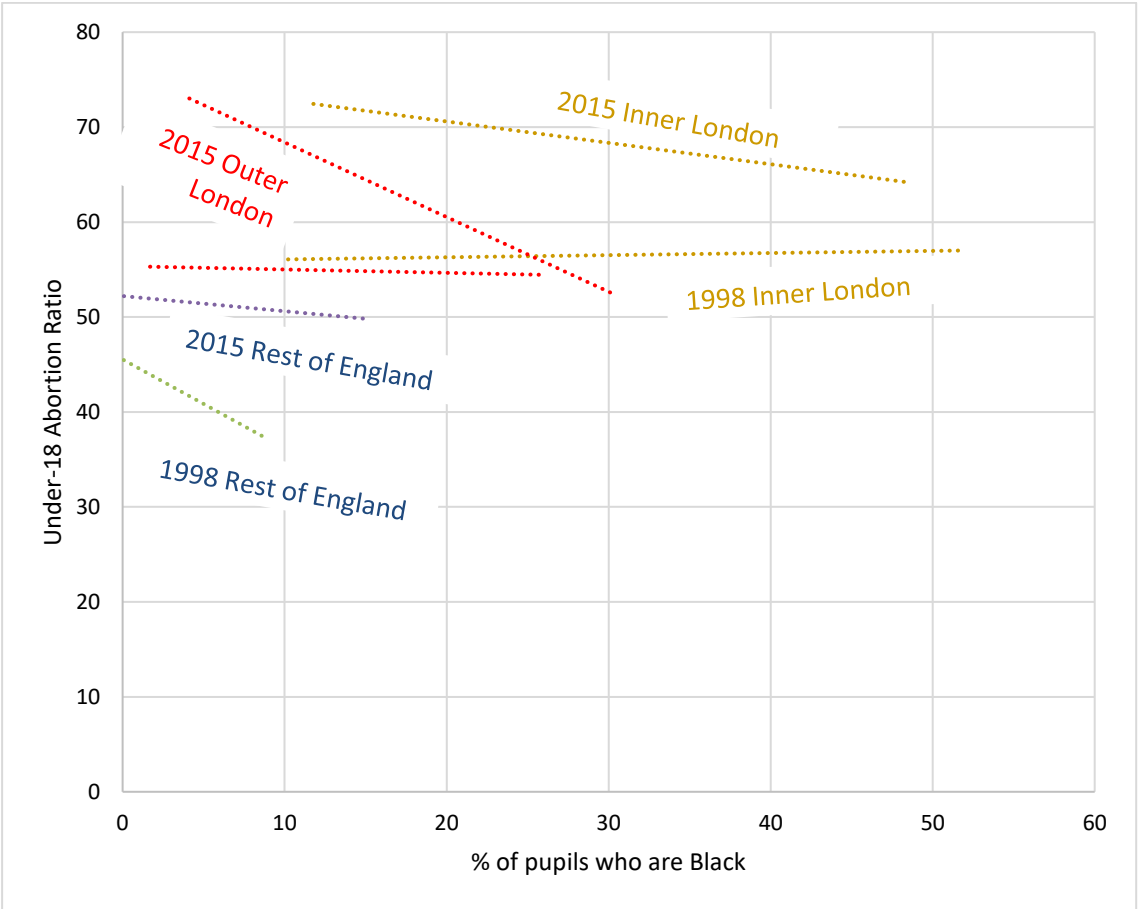


Table C.1 Sensitivity analyses for the random effect models of the relationships between Local Authority District characteristics with under-18 abortion ratios in England, 1998-2017

VARIABLES	Model 1 Urban/ rural & time period only	Model 2 All covariates, 1998-2017, Whole of England	Model 3 All covariates, 1998-2017, excluding London	Model 4 All covariates, 1998-2015, Whole of England	Model 5 All covariates, 1998-2015, excluding London	Model 6 FSM (instead of JSA), 1998- 2017, Whole of England	Model 7 FSM (instead of JSA), 1998- 2017, excluding London
Time Period (Ref. = 1998)							
1999-2005	4.29***	-1.28	-2.08	-1.50	-2.41	-7.39	-8.24
2006-2010	9.32***	0.62	-3.15	-0.07	-3.51	-7.50	-11.25*
2011-2017	11.35***	2.30	-0.37	0.78	-1.47	1.79	-1.38
Urban/ Rural Measure (Ref. = Major Urban)							
Large Urban	2.95	1.58	1.41	1.52	1.31	0.49	0.14
Other Urban	-1.76	-3.03	-3.41*	-2.59	-3.02	-3.94**	-4.59**
Significant Rural	2.45	-0.71	-0.87	-0.50	-0.65	-1.75	-2.25
Rural-50%	5.23***	0.48	0.33	0.84	0.74	-0.18	-0.63
Rural-80%	8.11***	4.57**	4.28*	4.41**	4.17*	3.59*	2.97
Inner London	15.04***	9.18*		10.19**		14.83***	

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	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7
Outer London	13.59***	9.54***		9.86***		9.15***	
Urban/Rural Interactions with Time Period							
Large Urban * 1999-2005	-4.06**	-3.82*	-3.84*	-3.79*	-3.81*	-3.06	-3.13
Large Urban * 2006-2010	-5.66***	-4.72**	-4.55**	-4.62**	-4.47**	-3.79*	-3.67*
Large Urban * 2011-2017	-5.83***	-5.21**	-5.04**	-4.74**	-4.59**	-4.22**	-4.16**
Other Urban * 1999-2005	0.59	0.20	0.34	0.19	0.35	0.68	0.76
Other Urban * 2006-2010	-0.95	-0.51	-0.18	-0.52	-0.18	0.38	0.63
Other Urban * 2011-2017	-5.40***	-4.24*	-3.36	-3.73*	-2.87	-4.12*	-3.02
Significant Rural * 1999-2005	-0.39	0.35	0.27	0.38	0.28	0.82	0.63
Significant Rural * 2006-2010	-2.55	-0.66	-0.69	-0.60	-0.66	0.23	0.13
Significant Rural * 2011-2017	-2.54	-0.89	-0.97	-1.41	-1.55	-0.06	-0.25
Rural-50% * 1999-2005	-1.76	-0.40	-0.51	-0.48	-0.61	-0.24	-0.51
Rural-50% * 2006-2010	-3.99**	-1.51	-1.65	-1.58	-1.75	-0.94	-1.18
Rural-50% * 2011-2017	-5.33***	-2.84	-2.96	-2.91	-3.14	-2.31	-2.54
Rural-80% * 1999-2005	-3.82**	-3.97*	-4.04*	-3.91**	-3.98*	-3.40*	-3.57
Rural-80% * 2006-2010	-6.56***	-5.63***	-5.76**	-5.51***	-5.64***	-4.62**	-4.79**
Rural-80% * 2011-2017	-6.79***	-5.64***	-5.69***	-6.27***	-6.45***	-4.67**	-4.82**

	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7
Inner London * 1999-2005	-1.71	-0.82		-1.27		-2.54	
Inner London * 2006-2010	-3.47	-3.22		-3.65		-5.96	
Inner London * 2011-2017	-1.22	-0.60		-0.35		-1.94	
Outer London * 1999-2005	-1.24	-1.46		-1.52		-0.99	
Outer London * 2006-2010	-1.71	-1.68		-1.74		-0.88	
Outer London * 2011-2017	-3.12	-2.88		-2.46		-1.68	
% of 18-24-year-olds claiming Jobseekers Allowance		0.00	-0.05	-0.12	-0.15		
1999-2005 * Youth Jobseekers Allowance		-0.52**	-0.60**	-0.58***	-0.65***		
2006-2010 * Youth Jobseekers Allowance		-0.42*	-0.38	-0.44**	-0.41*		
2011-2017 * Youth Jobseekers Allowance		-0.69***	-0.57**	-0.64***	-0.54**		
% of Pupils Eligible for Free School Meals						-0.36***	-0.50***
1999-2005 * Free School Meals						0.09	0.07
2006-2010 * Free School Meals						0.19	0.19
2011-2017 * Free School Meals						0.10	0.12
% of Pupils Attaining at least 5 GCSEs A-C		-0.03	-0.02	-0.02	-0.00	-0.13	-0.12
1999-2005 * GCSE		0.17**	0.17*	0.17**	0.17*	0.21**	0.20*
2006-2010 * GCSE		0.13	0.14	0.14*	0.14	0.17*	0.17*

Appendix C

	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7
2011-2017 * GCSE		0.15*	0.13	0.15*	0.13	0.10	0.09
Median House Price to Workplace Earnings Ratio		1.59***	1.38**	1.40***	1.12**	1.19***	0.89*
1999-2005 * Housing Unaffordability		-1.08**	-0.87	-0.98**	-0.73	-0.67	-0.37
2006-2010 * Housing Unaffordability		-0.80	-0.35	-0.72	-0.24	-0.30	0.20
2011-2017 * Housing Unaffordability		-1.05**	-0.50	-0.85*	-0.27	-0.58	0.00
Total Number of Social Housing Units for each LAD per 100 people (18 and over)		-0.41***	-0.44***	-0.39***	-0.42***	-0.35***	-0.39***
1999-2005 * Social Housing		0.22*	0.24	0.23*	0.25*	0.17	0.20
2006-2010 * Social Housing		0.26*	0.27*	0.27**	0.28*	0.21	0.25
2011-2017 * Social Housing		0.20	0.20	0.19	0.18	0.14	0.16
% Pupils in Secondary Schools who are Black		0.24	0.84	0.23	0.88	0.35**	1.33**
1999-2005 * % Black		-0.00	-0.35	0.00	-0.37	-0.07	-0.47
2006-2010 * % Black		-0.11	-0.47	-0.10	-0.49	-0.21	-0.84
2011-2017 * % Black		-0.19	-0.64	-0.21	-0.78	-0.29*	-1.01*
% Pupils in Secondary Schools who are South Asian		-0.15*	-0.30**	-0.15*	-0.31**	-0.05	-0.18
1999-2005 * % South Asian		0.08	0.15	0.08	0.16	0.05	0.11
2006-2010 * % South Asian		0.13*	0.22	0.13*	0.23*	0.08	0.17
2011-2017 * % South Asian		0.11	0.23*	0.14*	0.28**	0.06	0.16

	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7
TPS Funding per each Female aged 13-17		-0.02	-0.01	-0.02	-0.01	-0.05**	-0.04
2006-2010 * TPS Funding (REF. = 1999-2005)		0.00	0.00	-0.00	-0.00	0.02	0.03
Constant	41.43***	42.12***	43.08***	42.77***	43.71***	52.81***	55.74***
<u>Random Effects</u>							
σ_u Between LAD variation	6.94	4.34	4.26	4.52	4.44	4.75	4.63
σ_e Within LAD variation	7.35	7.32	7.51	6.94	7.11	7.33	7.52
Rho	0.47	0.26	0.24	0.30	0.28	0.30	0.27
*** p<0.01, ** p<0.05, * p<0.1							

Appendix C

Table C.2 The fixed effect models of under-18 abortion ratios including the varying sensitivity analyses

VARIABLES	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7
	Urban/ rural & time period only	All covariates, 1998-2017, Whole of England	All covariates, 1998-2017, excluding London	All covariates, 1998-2015, Whole of England	All covariates, 1998-2015, excluding London	FSM, 1998- 2017, Whole of England	FSM, 1998- 2017, excluding London
Time Period (Ref. = 1998-2005)							
2006-2010	3.66***	2.29***	2.16***	1.98***	2.00***	2.28***	2.00***
2011-2017	5.20***	2.45***	2.26***	1.65***	1.59***	3.39***	3.33***
% of 18-24-year-olds claiming Jobseekers Allowance		-0.34***	-0.33***	-0.35***	-0.34***		
% of Pupils eligible for Free School Meal						-0.16***	-0.32***
% of Pupils Attaining at least 5 GCSEs A-C		0.05***	0.04**	0.07***	0.07***	-0.01	-0.01
Median House Price to Workplace Earnings Ratio		0.29***	0.36***	0.29***	0.28***	0.34***	0.41***
Total Number of Social Housing Units for each LAD per 100 people (18 and over)		-0.17***	-0.14**	-0.13**	-0.11*	-0.21***	-0.15**
% Pupils in Secondary Schools who are Black		0.21**	0.41**	0.19*	0.31	0.22**	0.44**
% Pupils in Secondary Schools who are South Asian		0.08	0.12	0.14*	0.17*	0.11	0.12
Constant	47.86***	45.46***	43.92***	43.95***	42.94***	48.84***	49.02***

	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7
<u>Random Effects</u>							
σ_u Between LAD variation	8.32	6.84	6.78	6.89	6.91	7.09	6.57
σ_e Within LAD variation	7.40	7.37	7.55	6.98	7.14	7.38	7.55
Rho	0.56	0.46	0.45	0.49	0.48	0.48	0.43
*** p<0.01, ** p<0.05, * p<0.1							

Appendix D. Ethics application for the analysis using the Next Steps study (Chapter 6)

Ethics Application Form for SECONDARY DATA ANALYSIS

Version September 2019

1. **Name(s):** Katie Heap

2. **Current Position:** PhD Student

3. **Contact Details:**

Division: Social Statistics and Demography

Email: -

Phone: -

4. **Is your research being conducted as part of an education qualification?**

Yes No

5. **If Yes, please give the name of your supervisor:**

Prof. Ann Berrington and Prof. Roger Ingham

6. **Title of your research project / study:**

'The Educational Aspirations and Sexual Behaviour of Teenagers Across Two Decades in England' as part of the PhD thesis 'Conceptions, Abortions and Maternities Amongst Under-18 Year Olds in England'

7. Briefly describe the rationale, aims, design and research questions of your research

Please indicate clearly whether you are applying for ethics approval for a specific piece of research, or for overarching ethics approval to use certain datasets for a range of research activities. Approval for the latter will only cover the datasets specified here, for a maximum of 3 years and then subject to renewal.

This piece of research considers relationships behind both the geographical variation in teenage fertility and the change over time. The future aspirations of teenagers have been found to be associated with experiencing or avoiding teenage fertility in many qualitative studies. The overall aim of this work is to understand whether the associations between aspirations and teenage childbearing are found using statistical methods and to consider how these findings relate to the decline in teenage fertility across different types of areas in England.

This project first considers whether there are statistical relationships between aspirations for further education at age 14 and sexual behaviour through age at sexual debut. As teenage fertility has more than halved in England in the last two decades, we consider whether the relationship between educational aspirations and sexual behaviour have altered over time using a cross-cohort comparison between young people born around 1990 (Next Steps) and those born around 2001 (Millennium Cohort Study).

To consider the relationships that occur behind the geographical variation in teenage fertility, this project will link these educational aspirations and age at sexual debut to important macro-level area characteristics that have been found to be important in the first part of this PhD project. To investigate whether macro-level factors such as living in an area within the most economically deprived quartile have relationships with life aspirations for further education at age 14, I will consider macro-level factors found in chapters one and two such as youth unemployment or ethnic composition in areas.

8. Describe the data you wish to analyse

Please give details of the title of the dataset, nature of data subjects (e.g. individuals or organisations), thematic focus and country/countries covered. Indicate whether the data are qualitative or quantitative, survey data, administrative data or other

types of data. Identify the source from where you will be obtaining the data (including a web address where appropriate).

This study will analyse two cohort studies of teenagers in England.

- The Next Steps study followed up young people from age 14 and this thesis focuses on data collected at age 14 in 2004.
- The Millennium Cohort Study has followed up from birth a sample born around 2001.

This paper focuses on the age 14 questionnaire fielded when cohort members were aged 14 in 2014/15. However, certain questions like age at sexual debut were not asked in the age 14 sweeps in both cohorts. For the first cohort, age at sexual debut will be measured using the question “How old were you when you first had sexual intercourse?” from the sixth wave of the Next Steps study that was asked when the respondents were 19. For the second cohort, age at sexual debut will be measured using the latest wave of the Millennium Cohort Study at age 17.

9. What are the terms and conditions around the use of the data? Did data subjects give consent for their data to be re-used? If not, on what basis is re-use of the data justified?

Please state what (if any) conditions the data archive imposes (e.g. registration, signing of confidentiality agreement, specific training etc.). In many cases the data controller will have given explicit permission for data re-use. Please explain how you justify the use of data if approval and consents for the original data collection and re-use are not in place. This may be the case where, for example, the original data collection predated requirements for ethics review or occurred in a jurisdiction where explicit consent and approval are not required.

The respondents in both the Next Steps study and the Millennium Cohort Study provided consent for data reuse, whereby their data can be accessed from the UK Data Service. The secure access data which includes geographical identifies is considered 'Controlled Data' by the UK Data Service and requires:

- Registration with the UK Data Service,
- The completion of a Research proposal form, an Accredited Researcher application form, request to import data form, and User Agreement forms 'which must be signed by you and your organisation before access can be given to the Secure Lab'.
- The researcher(s) to undergo their Safe Researcher training course.

I will access the datasets that include the geographical locations ONLY through secure access at my personal university desktop computer.

10. Do you intend to process personal data (<https://ico.org.uk/for-organisations/guide-to-data-protection/guide-to-the-general-data-protection-regulation-gdpr/key-definitions/what-is-personal-data>) that are sensitive ('special category') personal data as defined by the the Data Protection Act 2018 following the General Data Protection Regulation (GDPR) (<https://ico.org.uk/for-organisations/guide-to-data-protection/guide-to-the-general-data-protection-regulation-gdpr/lawful-basis-for-processing/special-category-data/>), or data relating to a person's criminal convictions, even if such data are publicly available and/or have been pseudonymised (<https://ico.org.uk/for-organisations/guide-to-data-protection/guide-to-the-general-data-protection-regulation-gdpr/what-is-personal-data/what-is-personal-data/>)?

Yes No

If YES, please specify what personal data will be processed and why.

This project process sensitive data and identifiers. As one of the main focuses of this study is the sexual behaviour of these teenage respondents, the age at sexual debut will be included which could be deemed sensitive data.

As mentioned in the linked data section below, this project will apply to use the secure access versions of the datasets which include the geographical locations of the individuals This is to be able to link area characteristics to the individuals and to understand the context that the person is growing up in.

11. Do you intend to link two or more datasets?

Data linkage refers to merging of information from two or more sources of data to consolidate facts concerning an individual or an event that are not available in any separate record. Please note that for the purposes of research ethics we are not interested in the merging of different waves of a particular survey, or the merging of data from different countries for the same survey.

Yes No

If YES, please give details of which datasets will be linked and for what purposes.

This project intends to link the age 14 individual data to additional area characteristics of their local area. To do this, secure access from the UK Data Service would be used whilst Lower Super Output Area codes for the respondents' residence were linked to the area characteristics. Lower Super Output Areas fall into Local Authority District Areas, so that these Local Authority District level characteristics will also be included.

The 2001 Census characteristics would be linked to the Next Steps cohort and the 2011 Census characteristics would be linked to the Millennium Cohort Study cohort.

This imported data will provide context around the type of area that teenagers are living within at age of 14. This imported area-level data will enable this research to consider whether their personal/family characteristics explain the associations found between area type and under-18 conception rates through sexual behaviour and educational aspirations. Without this additional data, the context of the area will not be able to be considered and the project would not include these two levels of data analysis.

- 12. How will you store and manage the data before and during the analysis? What will happen with the data at the end of the project?**

Please consult the University of Southampton's Research Data Management Policy (<http://library.soton.ac.uk/researchdata/storage> and <http://www.calendar.soton.ac.uk/sectionIV/research-data-management.html>), and indicate how you will abide by it.

I will be the only person who can see the data throughout the analysis process, and only the aggregated findings will be viewed by others.

To use the secure access geographically linked version of the data, the UK Data Service will provide a secure remote link to my static IP address and desktop location. I will ONLY access these geographically detailed datasets at my personal university desktop. The desk that I will be using will not be able to be overlooked (as

per the UK Data Service requirements). I have relocated to a desk in the corner of the PGR room with my back to the wall so that I cannot be overlooked, and my screens have been placed at an angle so that I would be aware of anyone coming behind the desk and close to the screens. I will not leave my desktop unlocked when I am not at my desk.

All the data preparation and analysis of the geographically linked data will be completed within the remote secure access log in at my university desktop computer. Every output that I create from the geographically linked dataset will be considered by the UK Data Service before they are released to myself. All of these outputs will, therefore, avoid the identification of the respondents through aggregation. The destruction of this data will be carried out by the UK Data Service after I have completed the project.

To be able to consider the data without logging into the secure access version that will only be available remotely at my university desktop, the standard version will be also downloaded to my password-protected university account Home Filestore. This standard version of the data will be used to plan the data analysis that will be undertaken in the secure lab (i.e. understanding how many responses are missing, and considering how variable categories may need to be merged). This data will not be shared with anyone else and no outputs will be shared before aggregation. This version of the data will be destroyed after the completion of the project (particularly as the non-descriptive analysis will require the secure access versions).

- 13. How will you minimise the risk that data subjects (individuals or organisations) could be identified in your presentation of results?**

Please consider whether disclosive ID codes have been used (e.g. date of birth) and whether it is theoretically possible to identify individuals by combining characteristics (e.g. widow in Hampshire with 14 children) or by combining datasets. How will you protect individuals' anonymity in your analysis and dissemination?

To prevent any unintended identification of individuals I will only include aggregated results as outputs and will group behaviours that are uncommon.

The geographical location data will only be used to link the datasets. After the data is linked only the grouped versions of the area characteristics data that was linked to the cohorts (for example, job unemployment between 50 and 75% rather than the specific 62%) will be used in the analysis. These categorised versions of these area characteristics will then be assessed in conjunction with the individual teenage characteristics and behaviours. This means that their specific area will not be considered as an explanatory variable, but rather the type of area they live in by characteristics will be explanatory variables.

14. What other ethical risks are raised by your research, and how do you intend to manage these?

Issues may arise due to the nature of the research you intend to undertake and/or the subject matter of the data. Examples include: data or analysis that are culturally or socially sensitive; data relating to criminal activity, including terrorism, and security sensitive issues.

This research does involve the sensitive topic of teenage sexual behaviour through the age at sexual debut. To ensure that respect is given to the respondents this research will not include any negative connotations or opinions around teenage sexual behaviour and the data findings will not be sensationalised as such.

- 15. Please outline any other information that you feel may be relevant to this submission.**

For example, will you be using the services or facilities of ONS, ADRN, or HSCIC and/or are you obtaining ethical review from NRES (through IRAS) or other? Please confirm whether the data being used are already in the public domain.

n/a

- 16. Please indicate if you, your supervisor or a member of the study team/research group (including any institution that they act for, if different from the University) are a data controller and/or data processor in relation to the personal data you intend to process as defined by the Data Protection Act 2018 following the GDPR, and confirm that you/they understand your/their respective responsibilities (<https://ico.org.uk/for-organisations/guide-to-data-protection/guide-to-the-general-data-protection-regulation-gdpr/key-definitions/controllers-and-processors/>)**

I am not a data controller as I do not have control over the data and I will analyse the data after accepting the terms stated by the UK Data Service

Appendix E. Supplementary analyses for the work using the Next Steps study (Chapter 6)

Table E.1 The distribution of neighbourhood area characteristics and control variables in the sample used in the analysis and the sample before the attrition from the wave at age 19

Variables	Sample used in analysis*		Sample <i>including</i> those without a response at age 19	
	Unweighted %	Unweighted n	Unweighted %	Unweighted n
Expectation of going to university (ref = unlikely)	24.1	954	27.1	1703
Likely	75.9	3003	72.9	4587
Income deprivation IMD quartiles (ref= LSOA in the 25% lowest levels of income deprivation)	23.6	1054	20.3	1459
2	21.8	975	20.1	1447
3	22.2	990	22.5	1615
UQ (LSOA with the highest 25% of income deprivation)	32.4	1448	37.1	2670
Education, skills and training IMD quartiles (ref= LSOA in the 25% lowest levels of educational deprivation)	23.5	1049	20.5	1471
2	23.5	1048	22.1	1592
3	23.4	1045	24.8	1781
UQ (LSOA in the 25% highest levels of educational deprivation)	29.7	1325	32.6	2347
The percentage of population employed in the mining, quarrying, and construction sectors (ref= LAD with a low prevalence in these sectors)	34.7	1549	36.9	2650
2	24.6	1098	23.4	1684
3	20.6	920	19.9	1430
UQ (LAD or LSOA with the 25% most population in these sectors)	20.1	900	19.8	1427
Ethnicity of young person (ref=White)	68.9	3073	66.3	4761
Black	5.4	241	7.8	563
South Asian	18.1	807	17.8	1280
Mixed	5	222	5.5	394
Other	2.6	118	2.6	184
Ever smoked more than once (ref=no)	92.2	3887	89.8	6063
Yes	7.8	327	10.2	690
In last 7 days, how often gone out with friends (ref = never)	25.8	1151	26.3	1888
Sometimes	60.3	2688	57.5	4124
Most days	13.8	617	16.1	1156
Truancy in the last 12 months (ref = no)	87.6	3690	84.6	5697
Yes	12.4	523	15.4	1040

Appendix E

Variables	Sample used in analysis*		Sample <i>including</i> those without a response at age 19	
	Unweighted %	Unweighted n	Unweighted %	Unweighted n
Currently considered Special Educational Needs (SEN) (ref = no)	92.9	4089	92.4	6515
Yes	7.1	314	7.6	537
Ever do homework on weekdays (ref = no)	4.7	208	5.6	401
Yes	95.3	4228	94.4	6712
Highest qualification of mother (ref = degree)	12.5	512	10.6	699
Below degree but at least GCSE grade A-C or equivalent	57.1	2342	53.6	3518
None, qualifications level 1 or below, or qualifications with no reported level	30.4	1248	35.8	2350
Occupation of household reference person, NS-SEC class (ref = Higher managerial, administrative and professional occupations)	40.3	1623	36.1	2284
Intermediate occupations	19.2	772	19.2	1215
Routine and manual occupations	34.3	1383	36.4	2307
Never worked/ long term unemployed	6.2	251	8.3	528
Family composition (ref = two parent household, including adoptive parents but excluding step-parents)	68.6	3044	62.7	4466
Step-parent	8.9	393	10.7	762
Single-parent	21.8	968	25.5	1819
Other	0.8	34	1.1	81

* The sample used in analysis included respondents who had an interview at wave 14 and 19, and a parental interview at age 14.

Table E.2 The multiple logistic regression for experiencing a conception by the wave at age 19 which includes the interaction effect between LSOA-level income deprivation and household occupational class

Variables	Model 1a		Model 2a		Unweighted n
	Odds Ratio	P Value	Odds Ratio	P Value	
Income deprivation IMD quartiles (ref= LSOA in the 25% lowest levels of income deprivation)					959
2	0.86		0.87		873
3	0.99		0.98		861
UQ (LSOA with the highest 25% of income deprivation)	1.17		2.23	*	1085
Occupation of household reference person, NS-SEC class (ref = Higher managerial, administrative and professional occupations)		*		*	1623
Intermediate occupations	1.28		1.41		772
Routine and manual occupations	1.68	*	2.42	**	1383
Interaction - Income IMD quartiles * Occupation				*	
Income quartile 2 * Intermediate occupations			1.67		208
Income quartile 3 * Intermediate occupations			0.9		185
UQ income quartile * Intermediate occupations			0.32		210
Income quartile 2 * Routine and manual occupations			0.52		222
Income quartile 3 * Routine and manual occupations			0.9	*	354
UQ income quartile * Routine and manual occupations			0.39	*	629
Education, skills and training IMD quartiles (ref= LSOA in the 25% lowest levels of educational deprivation)					949
2	1.39		1.82		932
3	1.5		1.47		860
UQ (LSOA in the 25% highest levels of educational deprivation)	1.71		1.69		1037
The percentage of population employed in the mining, quarrying, and construction sectors (ref= LAD with a low prevalence in these sectors)					1218
2	1.37		1.37		956
3	0.9		0.89		803
UQ (LAD or LSOA with the 25% most population in these sectors)	1.03		1.03		801
Expectation of going to university (ref = unlikely)					802
Likely	0.78		0.77		2547
Ethnicity of young person (ref=White)		*		**	2778
Black	1.32		1.26		192
South Asian	0.34	***	0.34	***	530
Mixed	1.07		1.02		183
Other	1.15		1.16		90
Ever smoked more than once (ref=no)					3291
Yes	2.53	***	2.48	***	287
In last 7 days, how often gone out with friends (ref = never)		***		***	917
Sometimes	1.81	**	1.83	**	2313
Most days	3.08	***	3.16	***	537

Appendix E

Variables	Model 1a		Model 2a		Unweighted n
	Odds Ratio	P Value	Odds Ratio	P Value	
Truancy in the last 12 months (ref = no)					3155
Yes	1.34		1.36		424
Currently considered Special Educational Needs (SEN) (ref = no)					3492
Yes	1.35		1.37		270
Ever do homework on weekdays (ref = no)					169
Yes	1.1		1.08		3582
Highest qualification of mother (ref = degree)					458
Below degree but at least GCSE grade A-C or equivalent	1.27		1.31		2114
None, qualifications level 1 or below, or qualifications with no reported level	1.51		1.61		885
Family composition (ref = two parent household, including adoptive parents but excluding step-parents)		***		***	2624
Step-parent	2.53	***	2.52	***	348
Single-parent	2.07	***	2.05	***	785
Other	9.8	**	9.88	**	12
* (<0.10) ** (<0.05) ***(<0.01)					