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CAYT Centre for Analysis of Youth Transitions

Teenage Pregnancy in England

CAYT Impact Study: Report No. 6

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Executive Summary

In 1999, the government launched a 10-year national teenage pregnancy prevention strategy for England, whose aim was to halve under 18 conception rates. Although the target was missed, the rate of conception per 1,000 15-17 year old girls fell by 34% between 1998 and 2011. However, evidence on the apparent negative consequences of teenage motherhood for mothers and children means that policymakers continue to have an interest in reducing teenage conception rates still further (e.g. DCSF & DoH, 2010). To do so requires a detailed understanding of the risk factors associated with teenage pregnancy – and the decision to continue with that pregnancy – but there is relatively little robust quantitative evidence on these issues.

This report makes use of a unique new administrative dataset linking maternity and abortion records to the education records of all girls attending state schools in England to help fill this evidence gap. Using information on conceptions that occurred before the end of compulsory education for girls born between September 1989 and August 1992, our results provide new insights into the individual, school and area-level risk factors associated with teenage conceptions and the decision to continue with a pregnancy conditional on conceiving.

This analysis should not be interpreted as *causal*. For example, a finding that low attainment at age 11 is associated with higher conception rates does not *necessarily* imply that raising attainment will help to reduce conception rates, because girls with low attainment may have other characteristics (that are not included in our data) that increase the likelihood that they conceive and also cause them to have lower test scores. However, our results may provide some guidance for policymakers and others interested in the design and targeting of teenage pregnancy prevention strategies.

We find that:

- Teenage conceptions occur in all social groups, areas and types of school. For example, the number of conceptions is higher amongst girls who are not eligible for free school meals than amongst those who are (because only 16.5% of pupils in secondary school are eligible for free school meals, compared to more than 80% who are not). Similarly, teenage conceptions occur in rich and poor areas and in schools with high and low levels of attainment: no characteristic provides complete "protection" from teenage conception. However, some groups experience higher conception and maternity rates than others.

Individual characteristics

- Amongst the individual characteristics to which we have access, eligibility for free school meals (FSMs) and being persistently absent from school are the most strongly associated with teenage conceptions and the decision to continue with a pregnancy, even after accounting for all the other ways in which girls who conceive differ from

those who do not. This means that girls with these characteristics are more likely to become teenage mothers both because they are more likely to conceive and because they are more likely to continue with their pregnancy conditional on conceiving.

- Low prior educational attainment is also associated with a higher risk of conceiving as a teenager and of deciding to continue with a pregnancy, but to a lesser extent than FSM eligibility and persistent absence. Deterioration in academic performance between Key Stages 2 and 3 (ages 11 and 14) is, however, a strong risk factor: girls who make slower than expected progress during the early years of secondary school are significantly more likely to conceive, and to continue with the pregnancy after conception, than those who progress as expected.

- Amongst girls who give birth at least once as a teenager, less than 10% have more than one maternity that results from a conception before the age of 18. Multiple maternities are more common amongst girls who are eligible for free school meals, but there are few other significant differences (in terms of the individual characteristics that we observe) between girls who have one or more than one maternity.

- FSM eligibility, persistent absenteeism and making slower than expected academic progress during early secondary school can therefore be thought of as risk factors associated with conceiving as a teenager and of continuing with that pregnancy. Amongst those who continue with their first pregnancy, FSM eligibility is also a risk factor associated with having a second conception that results in a maternity.

School characteristics

- Girls who attend higher performing schools are less likely to conceive, and more likely to have an abortion if they do conceive, even after accounting for the other ways in which such girls differ from one another. This relationship is stronger when performance is measured using a high absolute standard (such as the proportion of pupils achieving 5 A*-C grades at GCSE) than when it is measured using a high relative indicator (such as Key Stage 2 to 4 value-added).

- The relationships between other school characteristics (such as school composition, gender mix and religiosity) and the likelihood of teenage conception and pregnancy decisions were generally small and not always significantly different from zero. This suggests that these school characteristics are not important risk factors for teenage pregnancy or motherhood once differences in other characteristics are accounted for.

Area characteristics

- Teenage conception and maternity rates are higher in deprived areas, even after accounting for the characteristics of girls themselves (and the schools they attend). This suggests that the relationship between conception and pregnancy decisions and area deprivation is not entirely driven by the selection of girls into areas, and that living

in a deprived area is a risk factor associated with conceiving and giving birth as a teenager, over and above the risk associated with individual deprivation.

- Girls living in deprived areas are also disproportionately more likely to have more than one conception before the age of 18 that results in a maternity, even after accounting for other individual and school characteristics. Again, this highlights the importance of both individual and area level deprivation in predicting girls who are likely to give birth more than once as teenagers.

Context matters

- There is some evidence that individual deprivation is a stronger risk factor for teenage conception and pregnancy outcomes in less deprived areas than in more deprived areas: whilst girls who are eligible for free school meals are, on average, more likely to conceive than those who are not, regardless of where they live, eligibility for free school meals is a greater risk factor in richer areas than poorer areas. Moreover, these results are stronger for maternities than for abortions.

- There is also some evidence that the increased risk of conception associated with slower than expected progress in early secondary school (between ages 11 and 14) is greater in high performing schools than in low performing schools, although this relationship is less stark than that between individual and local area deprivation.

Relationship between teenage conceptions and educational attainment

- Girls that conceive receive fewer GCSE passes and are less likely to continue in post-compulsory education (at a sixth form attached to a school) than those who do not. This relationship is stronger for girls who continue with their pregnancy, but those who conceive and have an abortion also have significantly fewer GCSE passes and are substantially less likely to stay in education than girls who do not conceive.

- This analysis is not causal, however, and hence does not necessarily imply that these girls performed poorly *because* they conceived. The results should therefore not be used to draw conclusions about the impact of teenage conceptions on educational attainment. It does, however, indicate that more work is needed to understand whether schools could better support girls to prevent conceptions in the first place, or to continue their education following a conception.

Policy implications

While there has been a substantial reduction in the rate of teenage conception in England over the last 15 years, policymakers are keen to reduce the conception rates still further. Our results have the following implications for strategies designed to prevent teenage conceptions and maternities in future:

- Interventions designed to target girls with the highest rates of conception and maternity should be aimed at girls who are eligible for free school meals, persistently absent from school, or who have poor attainment at the end of primary school or make slower than expected progress at the start of secondary school.

- School or area level interventions should focus on poorly performing schools or more deprived areas, not only because that is where individuals at highest risk are most prevalent, but also because such environments represent a separate risk factor for teenage conceptions and maternities.

- However, high performing schools and less deprived areas should not be neglected, as some individual risk factors – such as eligibility for free school meals – are more strongly associated with teenage conception and birth in less deprived areas.

- Moreover, a teenage pregnancy prevention strategy that seeks to reduce conception rates by a substantial margin cannot concentrate on high risk groups alone. Although certain girls are at much greater risk of conceiving and giving birth as teenagers than others, the majority of girls that conceive do not share these risk factors.

1. Introduction

Internationally comparable data from 1998 suggested that the UK had the highest rates of teenage motherhood in Europe (UNICEF, 2001). In 1999, the government launched a 10-year national teenage pregnancy prevention strategy for England, whose aim was to halve under 18 conception rates. Although the target was missed, the rate of conception per 1,000 15-17 year old girls in England fell by 34% (from 46.6 to 30.7 per 1,000) between 1998 and 2011. Over the same period, the share of conceptions that lead to a legal abortion rose from 42.4% to 49.3%, meaning that birth rates amongst 15-17 year old girls in England fell by 42% between 1998 and 2011 (from 26.9 to 15.6 per 1,000).[1]

Although there is a dearth of more recent internationally comparable data, evidence on the apparent negative consequences of teenage motherhood for both mothers (e.g. Ashcraft et al., 2013; Chevalier & Viitanen, 2003; Fletcher & Wolfe, 2009; Hobcraft & Kiernan, 2001) and children (e.g. Berthoud et al., 2004; Francesconi, 2008) means that policymakers continue to have an interest in reducing teenage conception rates still further (e.g. DCSF & DoH, 2010).[2]

To do so requires a detailed understanding of the risk factors associated with teenage pregnancy – and the decision to continue with that pregnancy – but there is relatively little robust quantitative evidence on these issues. Most previous quantitative studies have focused on the characteristics associated with teenage motherhood (e.g. Berrington et al., 2005; Berthoud, 2001; Berthoud et al., 2004; Botting et al., 1998; Ermisch & Pevalin, 2003; Kiernan, 1997; Kneale et al., 2013). These studies typically find that girls born to teenage mothers, those from disadvantaged families (e.g. those whose mother's had low educational attainment or whose fathers were of relatively low social class), those of Black Caribbean, Pakistani and Bangladeshi ethnic origin, and those who had low educational attainment themselves were more likely to give birth as a teenager.

Most studies investigating the characteristics associated with teenage pregnancy and pregnancy outcomes have been either qualitative in nature or are based on area-level data. For example, Lee et al. (2004) use data aggregated to the level of the local authority and find that teenage conception rates are higher in more deprived local authorities, and that a lower proportion of conceptions in such areas end in abortion. Wilkinson et al. (2006) investigate which local authorities experienced greater falls in conception rates following the introduction of the government's teenage pregnancy strategy and find that more deprived areas experienced the largest declines, albeit from a higher base.

This report builds on the existing literature by using a unique new dataset, linking individual-level administrative data on maternities and abortions to the education records of girls in England, to make two important contributions to the literature: first, we consider the risk factors associated with both conceptions and the decision to have an abortion or a maternity

[1] Source: authors' calculations based on data underlying ONS (2013).

[2] Although not all studies agree that there is a *causal* link between giving birth as a teenager and subsequent outcomes (e.g. Ribar, 1994; Hotz et al, 2005).

as a teenager, including the associations with a large range of pupil, area and school characteristics; second, the large sample sizes to which we have access mean that we are also able to investigate the characteristics associated with having more than one maternity as a teenager, something which, to our knowledge, no studies to date have been able to do.[3]

The report aims to provide a useful tool for policy makers to help target or implement teenage pregnancy prevention strategies, for example towards particular individuals or particular areas. However, it says nothing about the best methods or interventions for preventing teenage conceptions. In particular, it does not suggest that programmes aimed at changing a girl's characteristics (for example, reducing her chances of experiencing material deprivation) will necessarily reduce the chances of her conceiving, as all estimates are associations and do not necessarily identify causal relationships.

The remainder of the report proceeds as follows. Section 2 describes the data and methodology. Section 3 presents differences in conception rates, and decisions to have a maternity or abortion by different pupil, area and school characteristics. Section 4 provides two extensions to our analysis in Section 3, by considering academic progress between ages 11 and 14, and the relationship between individual and area or school characteristics. Section 5 describes the incidence of and characteristics associated with repeat maternities. Section 6 considers the relationships between teenage conceptions and outcomes at Key Stage 4 (age 16) and Key Stage 5 (age 18). Section 7 concludes.

[3] Unfortunately, due to problems linking in abortion records, it is not possible to look at repeat abortions, or at girls with one maternity and one abortion. This is discussed in more detail in Section 2.

2. Data and methods

2.1 NPD-ONS data

The National Pupil Database (NPD) is a census of pupils attending state schools in England held by the Department for Education (DfE). It includes name, date of birth and postcode (although these are not generally made available to external researchers), plus a limited range of personal characteristics, such as gender, ethnicity, whether English is spoken as an additional language (EAL), eligibility for free school meals (FSM) and special educational needs (SEN) status. It also includes results from national achievement tests taken at the end of each Key Stage.[4] It should contain reasonably up-to-date information for all girls in compulsory education, plus those staying on beyond age 16 and studying in institutions covered by the NPD (i.e. in sixth form colleges attached to schools); it does not include those studying at further education colleges.

The Office for National Statistics (ONS) collects and holds information on conceptions (via records on maternities and legal abortions) from the Department of Health (DoH). Both datasets contain date of birth, postcode and marital status; maternity records additionally include name (but abortion records do not).

The contributions and analysis discussed in this report have been made possible by joint work between DfE and ONS to create a unique new dataset linking NPD records for individuals born in academic years 1989–90, 1990–91 and 1991–92 to conception records up to and including 2008. Matching between NPD and abortion/maternity records was carried out by ONS on the basis of date of birth and postcode, and additionally on the basis of name between NPD and maternity records. Where there is more than one girl with the same date of birth living in the same postcode (e.g. twins), the records may not be uniquely matched. This is particularly true in the case of abortion records, for which names were not available. We discuss issues of match quality and their consequences for our analysis in more detail below

Table 2.1 Cohorts included in the matched NPD-ONS data, and the availability of conceptions data

	Cohort A	***Cohort B***	***Cohort C***
Academic year born	1989–90	1990–91	1991–92
Academic year turn 16 (Year 11)	2005–06	2006–07	2007–08
Academic year turn 18 (Year 13)	2007–08	2008–09 (beyond scope of data)	2009–10 (beyond scope of data)

[4] While the NPD also includes results from tests taken at ages 16 and 18 for pupils attending private schools, postcode information is not available for these pupils, hence they are unlikely to have been successfully matched to the conceptions data provided by the Office for National Statistics.

This data therefore enables us to consider conceptions under the age of 16 or up to the end of Year 11 (which will include some girls who have already turned 16) for all three cohorts, and conceptions under the age of 18 for the oldest cohort only. The timing of the available conceptions data is displayed in Table 2.1.

2.2 Match quality of NPD-ONS data

The ONS data identifies 37,178 conceptions that occurred before the end of Year 11 amongst our three cohorts of interest, of which 44.3% resulted in a maternity. Of these conceptions, 72.9% of maternities and 61.4% for abortions could be uniquely matched to NPD records. An additional 2,272 conceptions were matched to more than one NPD record, accounting for 1.7% of maternity records and 10.6% of abortion records. The proportion of abortions that can be uniquely matched to an NPD record is lower at least partly because ONS did not have access to names in the abortion records.[5]

For Cohort A, the ONS data identifies 36,228 conceptions that occurred before the age of 18, of which 53.0% resulted in a maternity. Of these, 66.2% of maternities and 58.1% of abortions were uniquely matched to an NPD record, with a further 1,410 conceptions (2.7% of maternities and 7.8% of abortions) being matched to more than one NPD record. Match rates are lower for under 18s, as we are less likely to observe up-to-date postcode information for girls who leave school or study at establishments (such as further education colleges) not covered by the NPD, thus making it more difficult to correctly match records.

Table 2.2 compares conception rates and rates of maternity conditional on conception in the full ONS and the matched NPD-ONS data, to illustrate the difficulties associated with less than 100% match rates. It shows that while 3.8% of girls conceived before the end of Year 11 according to the full ONS data, the matched NPD-ONS data suggests that just 2.7% of girls conceive over the same period. This occurs because we are not able to match all conceptions to the NPD data, so the proportion of girls that we identify as conceiving will be lower than it should be because it omits these unmatched conceptions. By contrast, a greater proportion of conceptions end in maternities in the matched data than in the ONS data (48.4% compared to 44.3% before the end of Year 11); we *overestimate* the maternity conditional on conception rate in the matched data, because the match rate for maternities is higher than for abortions.

[5] Unfortunately there was also an error in the matching process undertaken by ONS which means that a small number of uniquely matched abortion records were mistakenly recoded as multiple matches, which may additionally explain some of this gap. ONS also provided only a single matching indicator per individual (rather than per conception). We do not include multiple matches in our main analysis. While we might be concerned that the omission of multiple matches could bias our results if girls to whom conceptions cannot be uniquely matched differ from those to whom they can be uniquely matched, randomly including half of the girls to whom conceptions have been multiply matched does not materially affect our results. We also carried out an additional robustness check in which we included the maternities of girls whose first conception was a multiply matched abortion (and hence would not otherwise be included in our analysis); the rationale here was that the use of names to match maternity records is likely to mean that the maternity is a definite rather than only a potential match. Again, this makes no qualitative difference to our results. See Section 3.3 for further discussion of these important issues.

The imperfect match rate in the NPD-ONS data means that conception rates are likely to be underestimated, so our interest is in the differences between groups, rather than conception levels per se. However, the extent to which we underestimate conception rates also varies by group: we will underestimate conceptions relatively more for girls that are more likely to move house and/or drop out of school, for whom we are less likely to observe up-to-date postcode information. For example, match rates by local authority, indicates that match rates are lower in poorer areas and in inner London.

Table 2.2 Percentage of girls that conceive and percentage of conceptions that result in a maternity, in the full ONS and matched NPD-ONS data

	Conceptions/100 girls		*Maternities/100 conceptions*	
	Before end Y11	**Under 18**	**Before end Y11**	**Under 18**
ONS	3.8%	11.3%	44.3%	53.0%
Matched NPD-ONS	2.7%	7.3%	48.4%	56.2%

Notes: ONS conception rates divide the total number of conceptions by the cohort size multiplied by 100. Matched NPD-ONS rates divide the number of matched conceptions by the cohort size, multiplied by 100.

Nonetheless, the conclusions discussed in this report will still hold if individuals who are more likely to move house and/or drop out of school are also more likely to conceive, as in this case, our figures will understate the relative differences across groups. For example, Machin et al. (2006) find that non-White British girls, those who speak English as a second language, those who are eligible for free school meals and those who have special educational needs are more likely to move school. This suggests that we are likely to be underestimating the conception rates of these girls by more than those of their peers, and hence understating the differences in conception rates between, for example, girls who are and are not eligible for free school meals. This suggests that our conclusions would be even stronger if we were able to match every conception to NPD data. The one exception to this rule is in the case of some ethnic groups, a point to which we return in more detail below. Even in this case, however, our results will still be valid if we can assume that the differences in match rates do not dominate the associations between conceptions and pupil characteristics.

The analysis of repeat conceptions is even more problematic, as there is no individual identifier available in either maternity or abortion records to enable us to identify multiple conceptions for the same girl. This means that each conception must be matched independently to NPD records, and the higher the number of conceptions, the higher the probability that a girl will not be matched to her full conceptions history. Linking multiple abortions to the same girl appears to have proved particularly problematic, as there are fewer than 50 girls who have more than one abortion in the matched data. This is perhaps not overly surprising, given that names are not included in abortions records.

Given the uncertainty about the quality of the matched data, particularly for repeat conceptions, we used NHS hospital records to assess whether the NPD-ONS sample is

representative of conceptions that result in a maternity. This will help gauge, although not prove, the extent to which our results might be biased by the imperfect match rate.[6]

2.3 NHS maternity data

The Hospital Episode Statistics (HES) admitted patient care or inpatient data contain details of all admissions to hospitals in England, including maternities. Information about the patient includes the age, sex, ethnicity, GP practice and local area (LSOA). Information on the admission includes diagnoses (up to 20) and any operations performed, along with dates of admittance, discharge and any procedures. Patient level identifiers allow admissions to be linked across time. The data provide an accurate measure of the number and location of maternities by cohort, but give only a very limited picture on abortion, as the data include abortions that take place in NHS hospitals, but not those that take place at non–NHS clinics (even if the abortion is funded by the NHS).

Table 2.3 shows the number of girls in Cohort A that have at least one maternity by the age of 18 in the matched and unmatched ONS data, and how this compares with the number of girls that have at least one maternity in NHS hospital records.[7]

Table 2.3 Number of girls who have at least one maternity before the age of 18 in ONS, NPD-ONS and NHS hospital data (Cohort A only)

	ONS data		*Hospital records*
Number of maternities	Matched dataset	Full dataset	
1	12,155	18,602	16,992
2+	520	527	1,225
Number of girls	12,675	19,129	18,217

Notes: Girls born in academic year 1989-90. Hospital records are from the HES 2003 to 2009.

The numbers of conceptions that lead to a maternity are very similar in the unmatched ONS and NHS data (at approximately 19,500).[8] However, the number of girls that have repeat conceptions in the hospital data is more than twice as large as in the ONS data (1,225

[6] Unfortunately, just before publication ONS discovered that, for a small number of girls who had been matched to two or more conceptions, only the first conception (a maternity) had been included in the dataset to which we had access. These were girls for whom the first conception had been matched using name rather than date of birth and postcode. This means that around 200 second conceptions were not included in our analysis of the characteristics associated with girls who conceive (and their pregnancy outcomes) and that we are missing around 50 girls in our analysis of the characteristics associated with repeat maternities (around 10% of the sample). Our view is that these omissions are highly unlikely to bias our overall results and are relatively unlikely to bias our analysis of repeat maternities, as the characteristics of girls matched in this way would have to be very different to those matched on the basis of date of birth and postcode to overturn the existing findings.

[7] We focus on girls in Cohort A as this enables us to provide a more accurate picture of the extent of overlap in the number of repeat maternities as datasets.

[8] Assuming that all those with 2+ conceptions have just two conceptions, there are 19,656 maternities (18,602+(2x527)) in the ONS data and 19,442 maternities (16992+(2x1,225)) in the NHS hospital data.

relative to 527). Moreover, while only about two thirds of girls with a single maternity in the ONS can be matched to their NPD records, the numbers of girls with repeat maternities in the matched and unmatched ONS data are similar. This is because there is no individual identifier linking maternities to one another, so the same reasons that make it difficult to match a maternity to an NPD record make it hard to match conceptions to one another as well.

To check whether the less than perfect match rates in the NPD-ONS data are likely to bias our results, we compare the characteristics of the local areas in which girls live in the matched NPD-ONS and NHS maternity data. Table 2.4 compares the mean and median percentiles from the Income Deprivation Affecting Children Index (IDACI) amongst girls who have zero, one or two or more maternities, where 0 represents the poorest area and 100 the richest.[9] If girls that gave birth were evenly spread across the country, the IDACI percentile for the median girl would be 50 or, equivalently, half of maternities would occur in the poorest 50% of areas. A median IDACI percentile of less than 50 indicates that a disproportionate number of births occur in deprived areas. The lower the median (or mean) IDACI percentiles, the more deprived the population of girls that give birth.

Table 2.4 Mean and median IDACI percentiles for girls that give birth resulting from conceptions before age 18, by number of maternities in the matched NPD-ONS and NHS hospital data

	IDACI percentile of girls that have maternities (poorest LSOA=0 ;richest LSOA=100)	
	Mean	**Median**
Matched NPD data		
None	47.9	47.0
1	33.1	26.4
2+	26.4	20.4
NHS Hospital Data		
1	31.2	24.5
2+	26.6	20.9

Notes: Girls born in academic year 1989-90. Hospital records come from the HES 2003 to 2009.

Table 2.4 provides three points of note. First, girls who give birth live in poorer areas than girls who do not, as evidenced by the fact that the mean and median IDACI percentiles for those who do not give birth are substantially higher (i.e. less deprived) than for those who do not. Second, those that have multiple maternities live in poorer areas than those that have one maternity. In the matched NPD-ONS data, half of those with more than one maternity live in the poorest 20.4% of areas (compared to the poorest 26.4% of areas for those with one

[9] IDACI is an index measuring the proportion of children under 15 living in families that are income deprived, i.e. in receipt of income support, income based jobseeker's allowance or pension credit, or those not in receipt of these benefits but in receipt of Child Tax Credit with an equivalised income (excluding housing benefits) below 60% of the national median before housing costs (for further details, see: http://data.gov.uk/dataset/income-deprivation-affecting-children-index). Areas are ranked on the basis of this index, and the IDACI percentile is calculated by dividing this rank by the total number of areas.

maternity), and the mean IDACI percentile for those that have one maternity is 33.1 compared to 26.4 for those with two maternities.[10] Third, the mean and median IDACI percentiles from the NPD-ONS data look very similar to those from the NHS maternity records. For example, amongst girls with one maternity, the matched NPD-ONS data indicates a median IDACI percentile of 26.4, compared to a median of 24.5 in the NHS hospital data, indicating that approximately half of all births occur in the poorest quarter of areas.[11]

The fact that the mean and median IDACI percentiles in the NHS data are slightly lower than indicated by the matched NPD-ONS data suggests that lower match rates in poorer areas might affect the magnitude or strength of the relationship between deprivation and teenage maternities that we report. However, the principal message from both samples is that conceptions under 18 that lead to maternities are concentrated in poorer areas. We thus have some confidence that the matched data will provide an accurate picture of the factors associated with a higher risk of teenage conceptions.

We also check the validity of our matched data by comparing conception rates by ethnicity in the matched NPD-ONS and NHS datasets. This is more problematic, as ethnicity information is missing for 15% of mothers in the NHS data (ONS, 2012)[12]; this does mean, however, that we can regard this as a lower bound of the true number of maternities by ethnic group. Comparing these figures to the matched NPD-ONS data indicates that the matched data appears to create substantive biases in the relative prevalence of maternities amongst certain minority ethnic groups. Thus, while there is a close correspondence between the number of births to White British non-British and Black Caribbean mothers – with the linked data capturing over 90% of the maternities in NHS records – the NPD-ONS data captures just 29% of maternities to Black African mothers and 65% of maternities to South Asian mothers recorded in the NHS data, which is itself an underestimate of the true numbers[13]. As a result, 91% of girls with matched NPD-ONS maternities are White British, relative to 86% of NHS maternity patients with a valid ethnicity record. This compares to 77% of all mothers (of all ages) who gave birth in England between 2005 and 2008 (ONS, 2012). The reasonable

[10] It is also interesting to note that 62% of mothers move area between their first and second births. On average, these girls relocate to more deprived areas, with a mean change in IDACI percentile between births of -4.0 (and a median change of -2.2). The distribution of IDACI percentiles at the time of the second birth is therefore very similar for movers and non-movers. The greater tendency for girls from less deprived areas to move may be attributable to other characteristics of these individuals, such as family background, or because suitable accommodation is cheaper in the more deprived areas.

[11] The samples are also similar at the 25th and 75th percentile of the IDACI distribution: in the matched NPD-ONS data the poorest 25% girls give birth in the poorest 11.4% of LSOAs, compared to the poorest 10.9% of areas in the NHS data; the poorest 75% of girls in the NPD data give birth in the poorest 50.6% of areas, compared to the poorest 47% of areas in the NHS data.

[12] ONS data on live births comes from birth registrations linked to NHS maternity records (NHS birth notifications), and information on ethnicity of the mother is based on that recorded in the hospital data. ONS analysis indicates that rates of missing ethnicity are slightly lower for younger, poorer mothers and where the child is jointly registered with the parents living at different addresses.

[13] It should be noted that neither dataset provides a full and complete picture of the ethnicity of girls that give birth. It is therefore important to show caution when using NHS data to draw definite and precise conclusions about the quality of the ONS-NPD data.

match for Black Caribbean girls suggests that poor match rates are not a feature of all ethnic minority groups. One possible explanation is that ethnic groups differ in their mobility, which might reduce match rates. This suggests that we should interpret differences in conception rates across ethnic groups with particular caution.

Finally, for girls for whom we observe two or more maternities, we can compare the gap between births in the matched NPD-ONS data with that in the NHS hospital data. The differences are very similar, with a mean difference of 20.2 months and a median of 19 months matched NPD-ONS sample, compared to a mean of 19.2 and a median of 18 months in the NHS data.

Overall, these comparisons provide some reassurance that the matched NPD-ONS data may be reasonably representative, at least in terms of maternities.

2.4 Outcomes and controls

We create four measures of teenage conceptions and pregnancy outcomes using the matched NPD-ONS data:

1. ***Conceptions***: an indicator equal to one if the girl conceives and zero otherwise.
2. ***Maternities***: an indicator equal to one if a girl has a conception that results in a maternity, and zero otherwise.
3. ***Abortions***: an indicator equal to one if a girl has a conception that results in an abortion, and zero otherwise.[14]
4. ***Maternity per first conception***: this indicator is only defined for the sample of girls who conceive at least once during the period of interest, and is equal to one if their first conception results in a maternity and zero if it results in an abortion.

The majority of analysis in this report focuses on conceptions that occur before the end of Year 11 (i.e. up to and including the August of the academic year in which girls turn 16); we focus on conceptions before the end of Year 11 rather than before the age of 16 because it enables us to consider all pregnancies that occur during compulsory education, a period of particular interest to DfE. We also consider conceptions before the age of 18 (for those born in 1989-90 only), including when analysing the characteristics associated with repeat maternities. (For this analysis, we derive an additional indicator equal to one if a girl has more than maternity and zero if she has a single maternity, i.e. it focuses on the subset of girls for whom our maternity indicator is equal to one.)

[14] It should be noted that girls who have an abortion during the period of interest are included in the zeroes for the maternity outcome, while girls who have a maternity are included in the zeroes for the abortion outcome. This is because policy-makers typically observe abortions and maternities separately, without knowledge of whether the girl has had previous conceptions. Whether or not they are included in the analysis makes no substantive difference to our results, however, because the number of girls who conceive is very small compared to the number who do not.

To assess the risk factors associated with teenage conception, and the choice to have a maternity or an abortion, we investigate the relationships between the outcomes listed above and a range of individual, school and area characteristics.

Individual characteristics include:

- Ethnicity;
- Free school meal (FSM) eligibility;
- Special educational needs status;
- English as a second language;
- Persistent absenteeism in Year 9 (age 13/14); available for cohort C only;[15]
- Key Stage 2 attainment (age 11).[16]

School or area based characteristics include:

- Single sex school;
- Religious school;
- % of pupils that are White British;
- % of intake eligible for FSMs;
- % of pupils that achieve 5 A* to C grades at Key Stage 4 (age 16);
- Average value added between Key Stage 2 and Key Stage 4;
- Income Deprivation Affecting Children Index (IDACI) score based on the local area (lower super output area, LSOA) in which the girl lives.

We control for binary indicators (including for each ethnic group) directly. In the case of continuous school and area level variables, we split our sample into five equally sized groups (quintiles) on the basis of the measure and include dummy variables for all but the lowest group in our models. This also means that it is possible to compare girls at various points of the distribution of a school or area level variable.

Most characteristics are measured in Year 8 (the earliest point at which we observe girls in each cohort). However, as mentioned above, the persistent absence indicator is constructed on the basis of information from Year 9 and all school level characteristics are measured when the pupil is in Year 10, as this is when there are the fewest missing values. Nonetheless, a significant number of missing values remain, particularly for girls that conceive. To prevent observations from being lost, we include binary indicators for missing values in our models.

[15] A persistent absentee is a pupil with 46 or more sessions of absence (authorised or unauthorised) during the academic year, indicating that they were absent for at least 15% of the time. To ensure that we do not capture absences that occur as a result of a conception, we run a robustness check restricting attention to girls who conceive after the end of Year 9. This makes little difference to our results.

[16] We also have access to Key Stage 3 test scores (age 14). Given that these tests are no longer compulsory, we did not focus on them in our main analysis. The association between conceptions, Key Stage 3 test scores, and progress between Key Stage 2 and Key Stage 3 is explored in Section 4.

2.5 Empirical method and interpretation

Our main analysis estimates differences in the rates of conception, maternity, abortion and maternity conditional on conception before the end of Year 11 according to a variety of individual, school and area characteristics. We start by comparing the characteristics of girls that conceive with those that do not, before moving on to show whether girls who have maternities and abortions differ from those who do not. The final outcome provides a direct measure of the differences in characteristics between those who choose to have a maternity rather than an abortion; however, it is also possible to assess this indirectly by comparing the results for those who have a maternity or an abortion.

The associations between various individual, school and area characteristics and our four teenage conception outcomes are estimated using logistic regression models, applying two separate specifications. The first estimates raw or 'unconditional' mean associations, where the dependent variable is one of our four binary outcome measures and the independent variable is the individual or school/area variable of particular interest. Such analysis illustrates how more or less likely some girls are to conceive than others, before accounting for any of the other ways in which they might differ. These specifications are closest to the associations that might be observed by policy-makers or those who work to prevent teenage conceptions.

The second specification includes controls for all individual and school/area characteristics in a single model (i.e. it "conditions upon" these characteristics). We also include regional fixed effects and cohort effects to account for differences in conception and maternity rates by area and over time, but these coefficients are not presented.[17] Many characteristics associated with teenage pregnancy will be correlated with one another. Multivariate analysis therefore allows us to assess which factors remain most strongly associated with an increased likelihood of conception once we account for a range of individual, school and area characteristics.

The results of both sets of analysis are presented in figures that display odds ratios, which indicate how more or less likely some girls are to conceive relative to a reference group. An odds ratio of one indicates that the groups do not differ in terms of their rates of conception or pregnancy outcomes. Odds ratios above one indicate that mean rates are higher amongst the group of interest than the reference group; odds ratios below one indicate that mean rates are lower amongst the group of interest.

As already discussed, the objectives of our analysis are to establish which characteristics are associated with teenage conceptions, in order to improve the design and targeting of prevention strategies. None of the analysis should be interpreted as establishing *causal* relationships. For example, a finding that low attainment at age 11 is associated with higher conception rates does not *necessarily* imply that raising attainment will help to reduce

[17] This is equivalent to adding a dummy variable for each region and each cohort (A, B or C) in our model. It essentially allows us to estimate the associations between particular characteristics and teenage conception and pregnancy outcomes within rather than between regions and cohorts.

conception rates. This is because girls with low attainment may have other characteristics that increase the probability that they conceive, independently of their test scores, even after controlling for other pupil, school and area characteristics in the multivariate analysis. Examples could include the pupil's ability to concentrate or home learning environment.

3. Characteristics associated with teenage conceptions and pregnancy outcomes

This section considers the individual, school and area characteristics associated with higher rates of teenage conception, and whether conceptions result in a maternity or an abortion, before the end of Year 11. Overall rates of conception are substantially higher if we focus on those that occurred before the age of 18 rather than before the end of Year 11, but the patterns in terms of the characteristics associated with conceptions and pregnancy outcomes are very similar in both cases. Summary statistics for conceptions that occur before the age of 18 can be found in Appendix 1.[18]

3.1 Pupil characteristics and teenage conceptions

Raw differences

Table 3.1 shows how the number and mean rates of conception, maternity and abortion by the end of Year 11 vary by pupil characteristics; it also illustrates the proportion of girls whose first conception during this period resulted in a maternity.

As discussed in Section 2, the imperfect match rate between the NPD and ONS data means that we are missing around one third of conceptions, hence the numbers and proportions of conceptions reported below are likely to be underestimates. However, in most cases, we remain confident about the validity of the sign (if not the magnitude) of the relative differences in conception rates, because the types of girls for whom we are most likely to underestimate conceptions are also those who are more likely to conceive, hence our figures will understate the relative differences. The one exception to this rule is in the case of some ethnic groups, a point to which we return in more detail below.

Table 3.1 provides two initial points of note. First, there are substantive differences in conception rates amongst different pupil groups. For example, those who are eligible for free school meals (FSMs) are more than twice as likely to conceive (4.9%) as those who are not (2.3%). Second, none of the factors we consider provides complete "protection" from teenage conception. Hence, although conception rates are higher for FSM eligible pupils than for non-FSM pupils, the majority of those that conceive are not eligible for free school meals. This is because only 16.5% of pupils in secondary school are eligible for free school meals, compared to more than 80% who are not (DfE, 2012). The same is also true for individuals with different prior achievement: high attainment at Key Stage 2 does not preclude girls from becoming pregnant.

We explore these relationships further in Figures 3.1 to 3.3, which present differences in conception behaviour amongst pupils with different characteristics using raw or 'unconditional' odds ratios. This means that they show how more or less likely some girls are

[18] Multivariate results are available from the authors on request.

to conceive relative to a reference group, before accounting for any of the other ways in which these girls might differ. These results are based on the figures shown in Table 3.1. The regression results underlying these estimates can be found in Table A2.1 in Appendix 2.

Table 3.1 Rates of conception, maternity and abortion behaviour by the end of Year 11 in the matched NPD-ONS data, by pupil characteristics

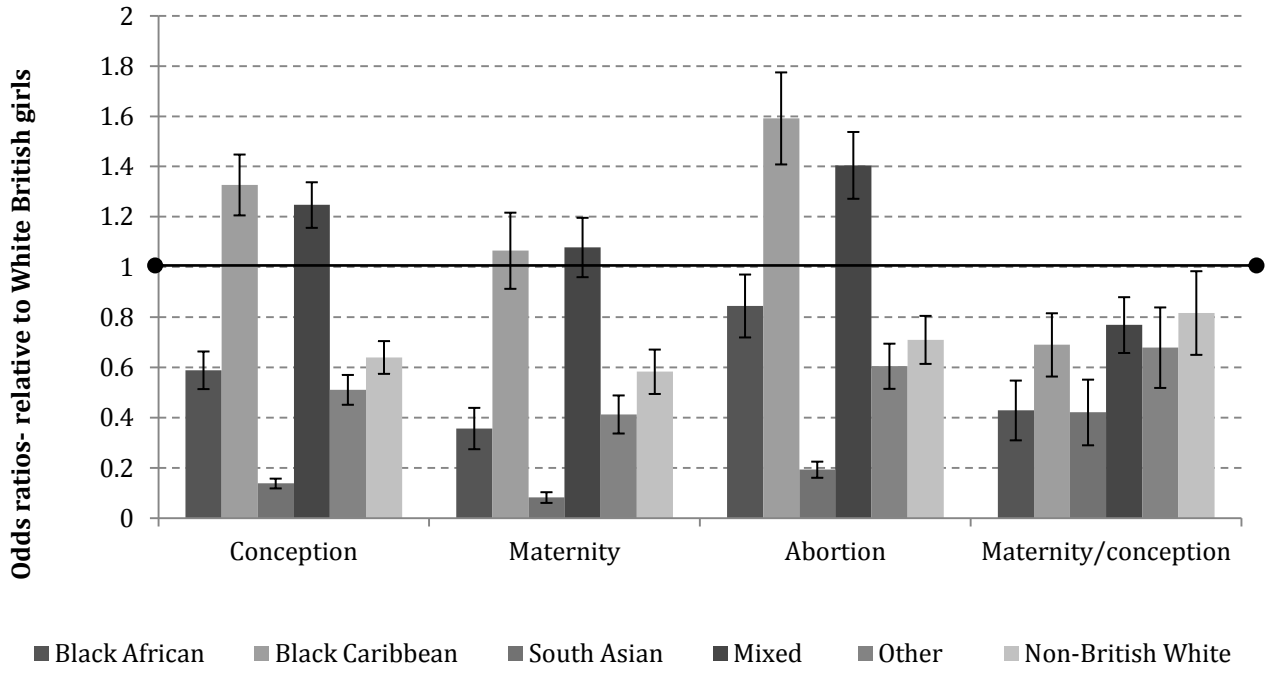
	Percentage of girls who, by the end of Year 11 have had a:						
	Conception		**Maternity**		**Abortion**		**Maternity/ first conception**
	%	**N**	**%**	**N**	**%**	**N**	**%**
Ethnicity							
White British*	2.9%	21,112	1.4%	10,415	1.5%	10,926	48.8%
Black African	1.7%	245	0.5%	73	1.3%	180	29.0%
Black Caribbean	3.8%	491	1.5%	196	2.4%	305	39.6%
South Asian	0.4%	196	0.1%	57	0.3%	140	28.6%
Mixed	3.6%	781	1.5%	335	2.1%	456	42.3%
Other	1.5%	293	0.6%	116	0.9%	178	39.7%
Non-British White	1.9%	382	0.8%	171	1.1%	218	40.7%
Other pupil characteristics							
SEN	3.9%	4,940	2.4%	3,019	1.5%	1,949	60.5%
Not SEN*	2.5%	19,401	1.1%	8,762	1.4%	10,761	44.5%
FSM eligible	4.9%	7,137	3.1%	4,547	1.8%	2,635	63.1%
Not FSM eligible*	2.3%	17,204	1.0%	7,234	1.4%	10,075	41.4%
Persistent Absentee^{+}	9.0%	1,859	6.0%	1,235	3.1%	637	65.7%
Not Persistent Absentee*$^{+}$	2.4%	6,565	1.0%	2,703	1.4%	3,894	40.7%
Key Stage 2 English score							
Level 2	4.8%	314	2.6%	216	1.8%	100	59.0%
Level 3	4.2%	5,389	2.1%	3207	1.8%	2,213	54.9%
Level 4*	3.0%	12,439	1.2%	5734	1.5%	11,018	44.1%
Level 5	1.5%	4,393	0.5%	1447	1.0%	2,972	33.0%

Notes: because the match rate is less than 100%, these figures will underestimate the actual conception, maternity and abortion rates. * indicates that the category is used as the reference group for the estimated odds ratios in later Figures. $^{+}$ indicates that the characteristic is only available for individuals in Cohort C. The South Asian ethnic group includes girls of Bangladeshi, Pakistani and Indian origin. The mixed ethnic group includes White and Black Caribbean, White and Black African, White and Asian, and any other mixed background. White and Black Caribbean girls account for more than half of conception in this group. Other includes: Any other Black background, any other Asian Background, any other ethnic group, Chinese, Gypsy-Romany, and Traveller. Other white includes: Any other White background and Irish.

Figure 3.1 presents the odds of conception (or maternity, abortion or maternity conditional on conception) for girls from various ethnic minority backgrounds relative to White British girls (who form the reference group). An odds ratio of one, marked with a capped horizontal line, indicates that the groups do not differ in terms of their conception rates or pregnancy outcomes. Odds ratios above one indicate that mean rates are higher amongst ethnic minorities than amongst their White British counterparts; odds ratios below one indicate that

mean rates are lower. The black capped vertical lines represent the standard errors of each odds ratio; if the standard error spans an odds ratio of one, then it indicates that mean rates do not differ significantly between White British and ethnic minority girls; otherwise they significantly differ from one another.

Figure 3.1 Raw differences in conception behaviour by the end of Year 11, by ethnicity: estimated odds ratios relative to White British girls



Notes: the horizontal capped black line indicates odds equal to those of White British girls. The capped vertical lines give the 95% confidence intervals, which are estimated accounting for clustering at the school level. Odds ratios do not control for any other background characteristics.

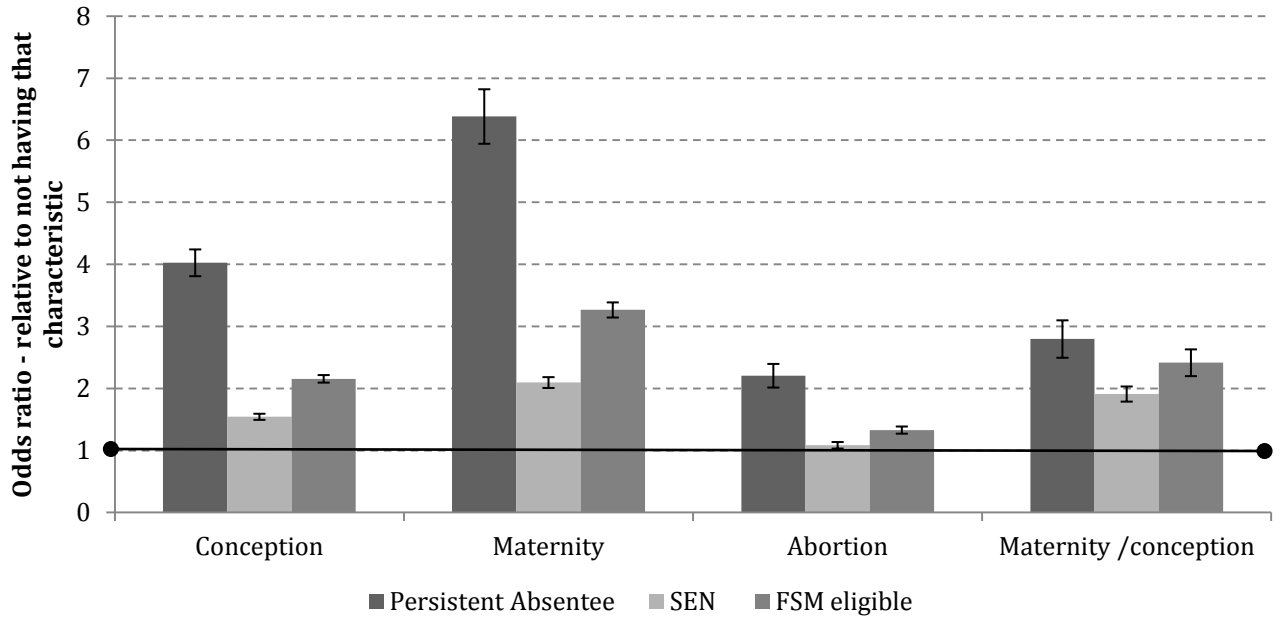
Figure 3.1 confirms the findings reported in Table 3.1 that there are very large variations in conception rates by ethnic group. For example, our results suggest that South Asian girls are 85% less likely to conceive than White British girls, while Black African girls are 36% less likely. In contrast to the results for Black African girls, those of Black Caribbean ethnic origin are 33% more likely to conceive than their White British counterparts, and those of mixed ethnic origin 25% more likely to conceive. Comparing the difference in the rates of abortion and maternity indicates that the increased likelihood of a conception amongst these two groups is driven by a much higher rate of abortions: there is no statistical difference in the probability that White British and Black Caribbean girls (or those of mixed ethnic origin) have a conception that results in a maternity, but the rate of abortion amongst Black Caribbean girls and girls of mixed ethnicity is 59% and 40% higher respectively. In fact, all minority ethnic groups appear less likely to have a maternity conditional on conception than White British girls.

As highlighted in Section 2.3, however, we are likely to be under-estimating the conception rates for these ethnic groups. While our assumption is that the missing conceptions should

not dominate the relationships that we observe, given the relatively small size of these ethnic groups – and hence the relatively small numbers of additional pregnancies that could overturn these results – our view is that ethnic differences in conception behaviour in the linked NPD-ONS data should be treated with some caution. This issue is explored further in Section 3.3.

Figure 3.2 presents the differences in the teenage pregnancy measures by FSM eligibility, SEN status, and whether the pupil was a persistent absentee in Year 9 (Cohort C only). There are two points to note. First, all three characteristics are associated with higher odds of conceiving, having a maternity, and having an abortion. The highest relative odds are for those who are persistently absent, followed by those who are eligible for free school meals, and those with special educational needs. For conceptions, persistent absentees are four times more likely conceive, compared to 2.2 times more likely and 1.5 times more likely for FSM and SEN pupils respectively. Second, the magnitudes of the differences are larger for maternities than they are for abortions. For example, persistent absentees are 6.4 times more likely to have a maternity, but only 2.2 times more likely to have an abortion. Hence, all three groups are more likely to have a maternity before the end of Year 11 both because they are more likely to conceive and because they are more likely to continue with their pregnancy after conceiving.

Figure 3.2 Raw differences in conception behaviour by the end of Year 11, by persistent absence, SEN status and FSM eligibility: estimated odds ratios relative to not having given characteristic

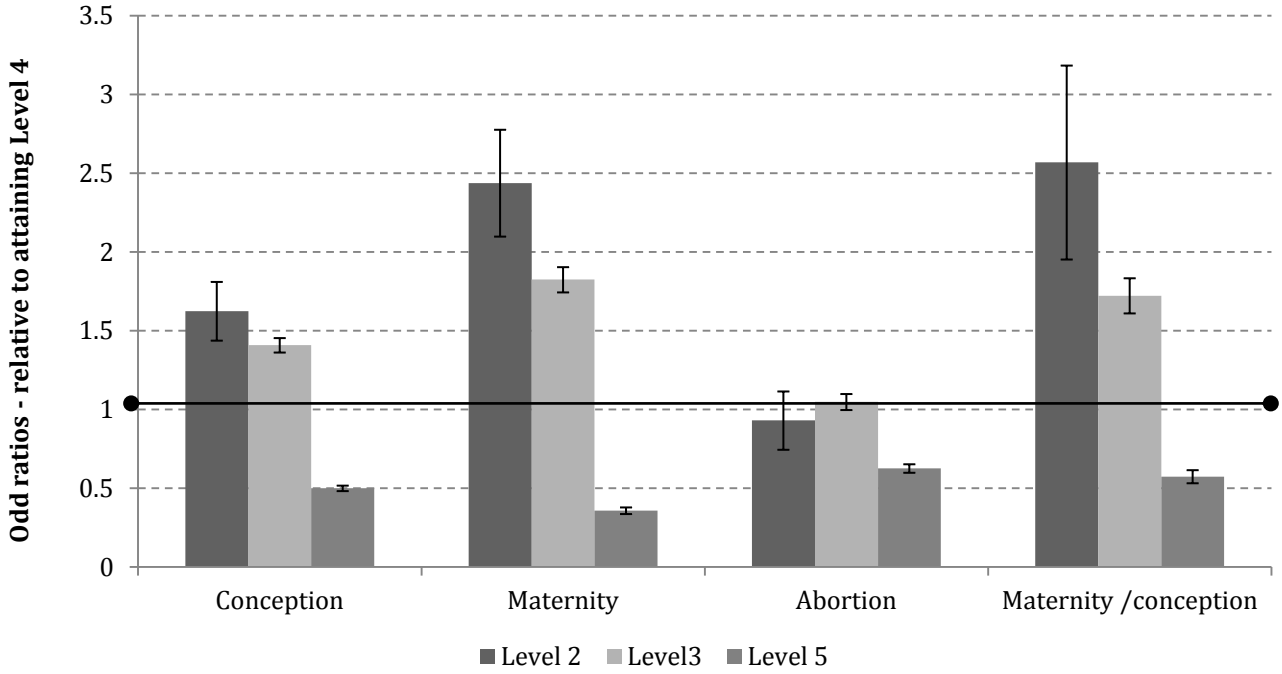


See notes to Figure 3.1.

Figure 3.3 presents mean rates of conception, maternity and abortion by attainment in Key Stage 2 English tests (taken at age 11) relative to girls who achieved the expected level (Level 4). It shows that all three outcomes fall as attainment rises (i.e. there is a negative relationship between prior attainment and the likelihood of conceiving), but that the

relationship is strongest for maternities. For example, those that reach Level 2 are no more likely to have an abortion than those that reach Level 4, while they are nearly 2.5 times more likely to have a maternity. The pattern according to science and maths attainment is very similar.[19]

Figure 3.3 Raw differences in conception behaviour by the end of Year 11, by Key Stage 2 English scores: estimated odds ratios relative to attaining Level 4



See notes to Figure 3.1.

Multivariate analysis

The previous section highlighted the raw or 'unconditional' differences in conception behaviour according to a variety of pupil characteristics. These relationships are designed to highlight the main risk factors associated with teenage conceptions. However, many of these risk factors are likely to be correlated with one another, hence it is also interesting to see which factors remain most strongly associated with an increased likelihood of conception once we account for (or "condition upon") a range of individual, school and area characteristics in a multivariate analysis. It should be noted that these results will not identify the *causal effect* of a particular characteristic on the likelihood of conception; rather they provide further insight into the largest risk factors for teenage conception.

[19] Achieving a Level 5 or 6 is associated with a similar reduction in the rate of conception for English (50%), Maths (47%) and Science (48%), relative to obtaining a Level 4. Lower attainment is associated with higher rates of conception for all three subjects. Results for Maths and English are very similar, with those obtaining a Level 2 in Maths and English 62% more likely to conceive than those obtaining a Level 4. For Science, the difference between those obtaining a Level 2 and a Level 4 is not statistically significant, due to a very low sample of girls attaining a Level 2. However, girls obtaining a Level 3 in Science are 38% more likely to conceive than those who obtained a Level 4.

As might be expected, differences in conception behaviour are substantially smaller once we account for a full set of individual, school and area characteristics, highlighting that many of the characteristics associated with teenage conception behaviour are correlated with one another. The results of the multivariate analysis can be found in Appendix 2.

In terms of ethnicity, the main difference between the raw and multivariate analysis is that it reduces the difference in conception rates between Black Caribbean and White British girls: the increased odds of a Black Caribbean girl having an abortion are reduced from 59% to 31%, while the overall conception rate is no longer statistically different from that of White British girls. This indicates that Black Caribbean girls have other characteristics that are associated with higher conceptions, or attend schools or live in areas with higher conception rates. By contrast, differences between White British girls and girls of mixed ethnic origin are left unchanged by multivariate analysis, suggesting that differential rates of conception (and in particular abortions) cannot be explained by other differences between White British girls and those of mixed ethnic origin.

The magnitude of other differences in conception rates by pupil characteristics – including FSM eligibility, persistent absenteeism and Key Stage 2 attainment – are also reduced or eliminated once we account for the other ways in which girls with these characteristics differ from one another. For example, conditional on individual, school and area characteristics, girls that achieved a Level 2 in English are 30% more likely to have a maternity than those that obtained Level 4, relative to 144% more likely in the unconditional analysis. Similarly, achieving above the expected level (Level 5 or 6) still reduces the odds of having an abortion relative to someone who obtains Level 4, but there is no increased risk associated with below expected attainment (Levels 2 or 3). In the case of SEN status, the significant raw relationship we saw in Figure 3.2 disappears once we condition on attainment at Key Stage 2, suggesting that attainment is a more important risk factor than SEN status in explaining teenage conception behaviour.

3.2 School and area characteristics and teenage conceptions

Raw differences

We next consider the relationship between conceptions and pregnancy outcomes before the end of Year 11 and a variety of school and area level characteristics. Summary statistics are displayed in Table 3.2. For variables specified as quintiles, we include just the top and bottom quintiles in the table, as the relationships are close to linear.[20]

Figures 3.4 and 3.5 focus on the differences in conception behaviour according to two important characteristics: local area deprivation, as measured by IDACI deprivation scores, and school attainment, as measured using the percentage of pupils that obtain 5 A*-C grades at Key Stage 4 (GCSE) in this case (although the results by school value-added between Key

[20] Summary statistics for the remaining quintiles are available from the authors on request.

Stage 2 and Key Stage 4 are very similar). The regression results underlying these estimates – and the relationships between all other school-level characteristics and teenage conceptions behaviour and pregnancy outcomes – can be found in Table A2.1 in Appendix 2.

Table 3.2 Conception, maternity and abortion rates by school/area characteristics (conceptions occurring before the end of year 11)

	Percentage of girls who, by the end of Year 11 have had a:						
	Conception		**Maternity**		**Abortion**		**Maternity/first conception**
	%	N	%	N	%	N	%
Single sex school	1.8%	2,063	0.7%	777	1.1%	1,286	37.7%
Mixed school	2.8%	21,815	1.3%	10,426	1.5%	11,389	47.8%
Religious school	2.2%	2,756	1.0%	1,189	1.3%	1,567	43.1%
Non religious school	2.7%	16,856	1.2%	7,764	1.4%	9,092	46.1%
% White British							
Q1 (lowest)	2.4%	4,327	1.1%	1,871	1.4%	2,456	43.2%
Q5 (highest)	3.0%	5,195	1.5%	2,617	1.5%	2,578	50.4%
% FSM eligible							
Q1 (lowest)	1.4%	2,617	0.5%	892	1.0%	1,725	34.1%
Q5 (highest)	3.6%	6,432	2.0%	3,522	1.6%	2,910	54.8%
% 5 A*-C GCSEs							
Q1 (lowest)*	3.7%	6,802	2.0%	3,672	1.7%	3,130	54.0%
Q5 (highest)	1.4%	2,219	0.4%	683	0.9%	1,536	30.8%
School VA KS2-4							
Q1 (lowest)	3.7%	6,482	2.0%	3,434	1.8%	3,048	53.0%
Q5 (highest)	1.4%	2,389	0.5%	797	0.9%	1,592	33.4%
IDACI score							
Q1 (lowest)*	1.4%	2,572	0.4%	746	1.0%	1,826	29.0%
Q5 (highest)	4.2%	7,443	2.4%	4,328	1.8%	3,115	58.1%

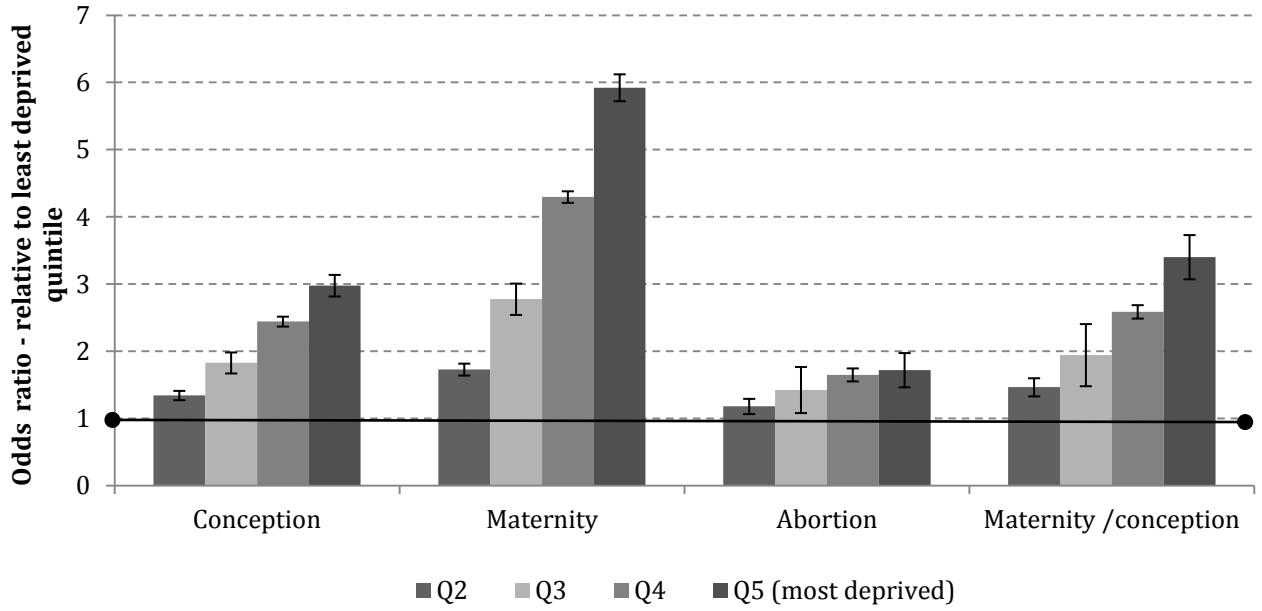
Notes: because the match rate is less than 100%, these figures will be underestimates of the actual conception, maternity and abortion rates. * indicates that the category is used as the reference group for the estimated odds ratios in later Figures.

Figure 3.4 compares conception rates in the least deprived fifth of areas (quintile 1), to conception rates in quintiles 2, 3, 4 and 5 (the most deprived). The figure provides two principal results. First, the likelihood of having a maternity rises dramatically with deprivation: relative to quintile 1, the odds of giving birth are 73% higher for those in quintile 2, rising to 590% higher (nearly six times more likely) for those in quintile 5. Second, while abortion rates also increase with deprivation, the gradient is much flatter, with increases in odds of 18% for quintile 2, rising to 72% for quintile 5. Hence, the likelihood of having a maternity conditional on conceiving rises steeply with deprivation.

Figure 3.5 presents differences in mean conception rates by school attainment. The reference category is the fifth of schools with the highest percentage of pupils achieving 5 A*-C grades at GCSE. It shows that the odds of both maternities and abortions rise as Key Stage 4 school attainment falls, with a much steeper gradient for maternities. For example,

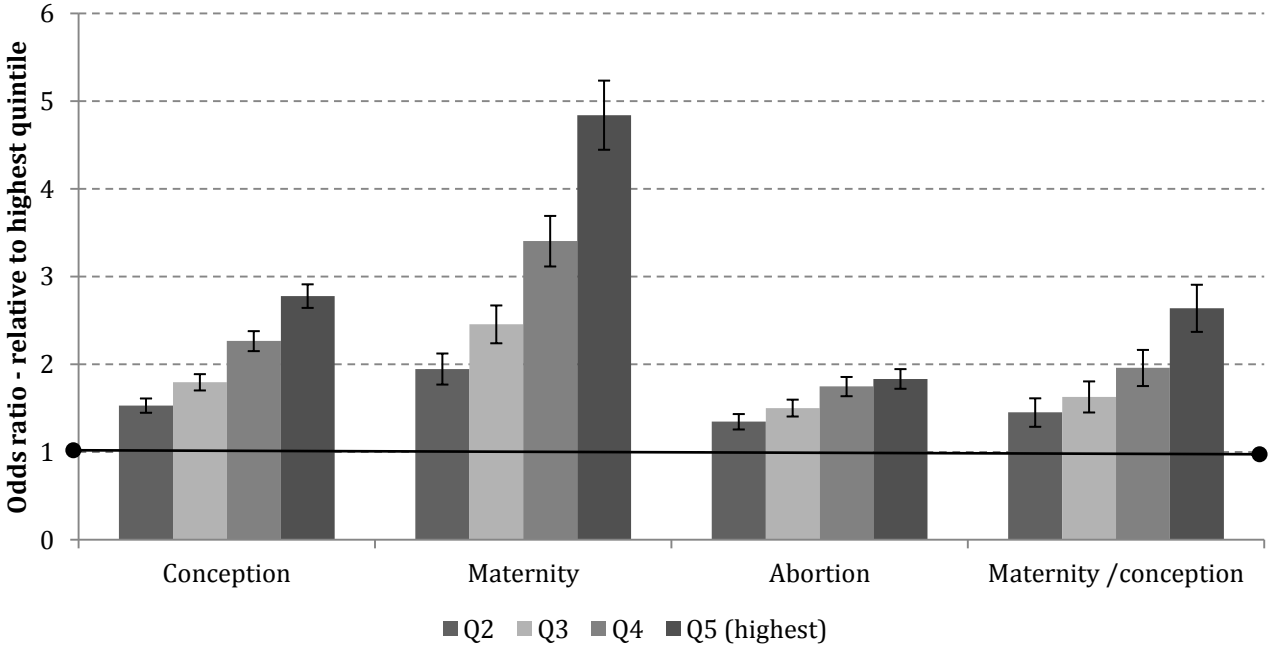
girls in the worst performing fifth of schools are almost five times more likely to have a maternity and 1.8 times more likely to have an abortion than girls in the best performing fifth of schools.

Figure 3.4 Raw differences in conception behaviour by the end of Year 11, by IDACI quintile: estimated odds ratios relative to first (richest) quintile



See notes to Figure 3.1.

Figure 3.5 Raw differences in conception behaviour by the end of Year 11, by school level percentage of pupils obtaining 5 A*-C grades at GCSE: estimated odds ratios relative to first (lowest performance) quintile



See notes to Figure 3.1

Multivariate analysis

As was the case for the pupil characteristics, discussed in Section 3.1, the association between school and area characteristics and teenage conception behaviour is substantially reduced – but in many cases remains significant – once we control for other characteristics. The results of this multivariate analysis can be found in Appendix 2.

Even once we control for all individual, school and area characteristics in the same model, we find that girls living in the most deprived fifth of areas are still nearly twice as likely to have a maternity and 7% more likely to have an abortion than girls living in the least deprived fifth of areas (although this compares to raw differences of 590% and 72%). School performance also remains correlated with the probability of having a maternity, but the differences approximately halve, while results for abortions suggest that only the best performing forty percent of schools differ from the worst performing fifth.

In terms of other school characteristics, we see that mean conception rates are lower for girls in single sex and religious schools; however, the effect of attending a single sex school is removed after controlling for other pupil and school characteristics (see Appendix 2). In terms of school deprivation, the increased odds of conception associated with higher proportions of pupils being eligible for FSM is similar to the effect of pupil FSM eligibility found in Section 3.1, but the association weakens after controlling for pupil level eligibility. Finally, school level value-added has a similar association with teenage conception and pregnancy outcomes as school level attainment, but under multivariate analysis the association is much weaker. Hence, if all other school and pupil characteristics were held constant, pupils at schools with high average attainment at Key Stage 4 would stand a lower risk of conceiving than those at a high value added school.

3.3 Robustness checks

The results presented in Sections 3.1 and 3.2 are in line with existing work on teenage conceptions and pregnancy outcomes using area-level data (e.g. Lee et al. 2004; Wilkinson et al., 2006) and on the characteristics associated with teenage motherhood (e.g. Berrington et al., 2005; Berthoud, 2001; Berthoud et al., 2004; Botting et al., 1998; Ermisch & Pevalin, 2003; Kiernan, 1997; Kneale et al., 2013).

However, there is still a concern that our results, and particularly the magnitude of our estimates, could be biased by the imperfect and non-random match rate. To address such concerns, we carry out four robustness tests. The first is to remove London from the sample, where local authority analysis indicates that match rates are particularly poor. The second is to include half of girls (at random) that were not uniquely matched to an abortion record. This is designed to address the concern that girls involved in multiple abortion matches might have different characteristics to those with uniquely matched abortions, which might potentially be biasing our results. The third is to include any subsequent conceptions that result in maternities amongst girls for which their first conception resulted in an abortion

which ONS could not uniquely match to NPD records. The last is to consider whether the results by ethnicity are robust to using maternity records from NHS hospital data.

The removal of London from the sample makes very little difference to our estimates of the associations between teenage conceptions and pregnancy outcomes, and individual and school/area characteristics. The only exception is for the relative prevalence of conceptions among Black African girls.[21] This group are most likely to live in London, with only 18% of conceptions taking place elsewhere In the full sample, Black African girls are 40% less likely to conceive, but excluding London increases this difference to 62%. The change in these estimates may be attributable to lower match rates in London, or underlying differences in the (unmeasured) characteristics of Black African girls that live in London.

Randomly including half of the girls associated with multiple matches to abortion records or including the subsequent maternities of girls whose first conception was an abortion that could not be uniquely matched makes no statistically significant difference to our estimated results. This suggests that any differences between girls with unique and multiple matches are not driving our results.

As we saw in Section 2.3, using the number of maternities by ethnicity from the NHS maternities data more than doubles the maternity rate amongst Black African and South Asian girls. However, the differences between these groups and White British girls are so large, that these groups remain significantly less likely to have a maternity. Our matched dataset therefore overestimates the difference, but the conclusion that South Asian and Black African girls are less likely to have a maternity appears robust.

These robustness checks provide some reassurance that the relative differences in teenage conception and pregnancy outcomes presented in this section are robust to the fact that we are unable to match all maternity and abortion records to girls in the NPD.

3.4 Summary

This section has presented differences in conception and pregnancy behaviour according to a variety of individual, school and area characteristics. It has shown that:

- FSM eligibility and persistent absenteeism are the characteristics considered that are most strongly associated with both teenage conception and the decision to have a maternity. This means that girls with these characteristics are more likely to have a maternity both because they are more likely to conceive and because they are more likely to continue with the pregnancy conditional on conceiving. Amongst the characteristics we consider, FSM eligibility and persistent absence can therefore be thought of as the strongest risk factors associated with both becoming pregnant as a teenager and of deciding to continue with that pregnancy.

[21] 81% of Black African girls that conceive live in London, as do 66% of Black Caribbean girls who conceive.

- Attainment at Key Stage 2 is significantly associated with the likelihood of conceiving as a teenager (and to a lesser extent giving birth conditional on conceiving), but to a much lesser extent than FSM eligibility and persistent absence. Girls who attend higher performing schools – whether measured by absolute GCSE performance, or Key Stage 2 to 4 value-added – are also less likely to conceive, and more likely to have an abortion if they do conceive.
- Conception rates are higher in poorer areas, even after controlling for the characteristics of girls themselves. Moreover, conditional on conception, girls in poorer areas are more likely to give birth than to have an abortion. This suggests that the relationship between conception and pregnancy decisions and area deprivation is not entirely driven by the selection of girls into areas and hence that it is worth considering prevention policies that target particular areas as well as girls with particular characteristics.
- It should be remembered, however, that although our results highlight a number of individual, school and area level factors that are associated with higher teenage conception rates, the majority of conceptions occur amongst girls who do not share these risk factors. For example, the absolute number of conceptions is higher amongst girls who are not eligible for free school meals than amongst those who are. Similarly, teenage conceptions occur in both rich and poor areas and in schools with both high and low levels of attainment: no characteristic provides complete "protection" from teenage conception. Targeting prevention strategies just at those with a higher risk of conception will therefore exclude a substantial proportion, if not the majority, of those that will conceive.

4. Extensions

In this section we consider two extensions to the multivariate analysis presented in Section 3. The first considers the relative importance of academic attainment at age 11 and age 14. The second estimates whether the association between pupil deprivation (as measured by eligibility for free school meals) and attainment and conception and pregnancy outcomes depends on area and school context.

4.1 Attainment at age 11 and age 14

The baseline specification used in Section 3 investigates differences in conception and pregnancy outcomes before the end of Year 11 on the basis of educational attainment at age 11 (Key Stage 2). Key Stage 2 tests were preferred to Key Stage 3 tests (taken at age 14), as the latter are no longer compulsory for pupils in England. However, attainment and progress whilst at secondary school may be important risk factors over and above attainment at the end of primary school. We therefore consider what happens when we add controls for attainment at Key Stage 3, or progress between Key Stages 2 and 3, to our models.

Table 4.1 presents the results of this analysis, which focuses on the relationship between educational attainment and progress in English between ages 11 and 14, and overall conception rates before the end of Year 11, but additionally controls for the full range of individual, school and area characteristics discussed in Section 3.[22] The coefficients presented are estimated odds-ratios. The figures in brackets are standard errors, which are used to calculate confidence intervals.[23]

Column 1 repeats the results of the multivariate analysis discussed in Section 3.1, in which the conception rate falls as attainment at Key Stage 2 rises. The odds of conceiving are 7.2% higher for those obtaining a Level 3 rather than a Level 4 (i.e. below rather than at the expected level), whilst the odds of conception amongst those who obtained a Level 5 or 6 (i.e. above the expected level) are 24.6% lower. Column 2 adds attainment at Key Stage 3 to this model. As might be expected, the estimated odds ratios for Key Stage 3 attainment show the same negative relationship with conceptions as Key Stage 2 attainment in Column 1: those achieving a Level 3 or 4 (i.e. below expectation) in English at Key Stage 3 are 33% and 19% respectively more likely to conceive than those that achieve the expected level (Level 5); by contrast, those achieving a Level 7 or 8 (above expectation) are 50% less likely to conceive than those that achieve the expected level.

[22] The results presented in this section also hold if we focus on attainment in science or maths rather than English, or if we consider pregnancy outcomes instead of overall conception rates.

[23] For example a coefficient of 1.072 with a standard error of 0.024 implies a 95% confidence interval (CI) of 1.072 ±(1.96 × 0.024), or between 1.024 and 1.12. As this CI does not cross 1, the odds ratio is statistically significant at the 5% level. The 90% and 99% CIs are given by replacing 1.96 with 1.645 and 2.326, respectively. In this case, the coefficient is also statistically significant at the 1% level, as the 99% confidence interval runs from 1.016 to 1.128.

Table 4.1 Multivariate analysis of the odds of conception by attainment at Key Stage 2 (age 11) and Key Stage 3 (age 14), relative to the expected level

	(1) Baseline	*(2) Baseline + Key Stage 3*	*(3) Baseline + change in attainment*
	KS2 English (relative to Level 4)		
KS2 Level 2	1.117 (0.0799)	0.861** (0.0619)	0.942 (0.0688)
KS2 Level 3	1.072*** (0.0242)	0.882*** (0.0205)	1.028 (0.0246)
KS2 Level 5-6	0.754*** (0.0166)	1.093*** (0.0253)	0.763*** (0.0194)
	KS3 English (relative to Level 5)		
KS3 Level 3		1.327*** (0.0623)	
KS3 Level 4		1.191*** (0.0273)	
KS3 Level 6		0.729*** (0.0173)	
KS3 Level 7-8		0.494*** (0.0236)	
	Moved up/down between KS2 and KS3		
Moved up			0.788*** (0.0177)
Moved down			1.412*** (0.0331)
Individual characteristics	Yes	Yes	Yes
School/area characteristics	Yes	Yes	Yes
Cohort	A/B/C	A/B/C	A/B/C
Observations	826,109	826,109	826,109
Psuedo R-squared	0.04	0.06	0.06

Notes: the dependent variable is equal to one if the girl conceives before the end of Year 11 and zero otherwise. *** denotes significance at the 1% level; ** at the 5% level, and * at the 10% level. Standard errors are clustered at school level and shown in parentheses.

However, Column 2 also shows that conditioning on (i.e. additionally controlling for) attainment at Key Stage 3 reverses the relationship between conceptions and attainment at Key Stage 2: for example, a pupil who obtained Level 2 (below expectation) at Key Stage 2 but Level 5 (the expected level) at Key Stage 3 is 13.9% less likely to conceive than someone who obtained the expected level at both Key Stage 2 and Key Stage 3. By contrast, a girl who scored above expectation (Level 5 or 6) at Key Stage 2, but only the expected level at Key Stage 3 is 9.3% more likely to conceive than someone who achieves the expected level at both stages. This suggests that, between the ages of 11 and 14, girls whose performance improves are less likely to conceive (and girls whose performance deteriorates are more likely to conceive) than girls whose performance progresses as expected over this period.

Column 3 investigates the relationship between pupil progress and conceptions more explicitly by replacing Key Stage 3 attainment with measures for whether the pupil's attainment moved up or down between Key Stages (relative to expectation).[24] It shows that, relative to those whose attainment progresses as expected between ages 11 and 14, girls whose attainment improves more rapidly are 21% less likely to conceive, while those whose attainment deteriorates are 41% more likely to conceive. These relationships are found not only for English, but also for maths and science; moreover, progress in science appears to be most strongly associated with reduced odds of conception, while progress in maths is most weakly associated.[25]

Taken together, this analysis suggests that poor attainment in primary and secondary school, and in particular a lack of progress during the first few years of secondary school, are strong risk factors for teenage conceptions. Moreover, it should be noted that these relationships hold over and above controls for other individual, school and area characteristics. Thus, while it might be expected that girls attending schools with low value-added between Key Stage 2 and Key Stage 4 would make less progress than girls attending schools with high value-added, these results hold regardless of the type of school that they attend.

4.2 Does context matter? Variation in the relationship between pupil characteristics and conceptions in different school/area environments

This section explores whether the association between pupil characteristics and conception rates and pregnancy outcomes varies according to the characteristics of the schools that girls attend or the areas in which they live. In particular, we are interested in whether the effect of eligibility for free school meals varies by quintile of local area deprivation (defined using IDACI scores) or whether the effect of individual attainment at Key Stage 2 varies by quintile of secondary school performance (measured using the proportion of pupils who achieve 5 GCSEs at grades A*-C). We do this by running our models separately by quintile of each area or school characteristic of interest. This analysis has two aims: first, to understand how the risks of conception associated with individual characteristics may depend on the pupil's environment; second, to provide a first step in assessing whether and why the effectiveness of interventions targeted at particular groups could vary by area or school characteristics.

Table 4.2 shows how the association between FSM eligibility and our conception and pregnancy outcomes of interest varies by IDACI quintile. We know from Section 3 that both FSM eligibility and area deprivation are strong risk factors for teenage pregnancy. What

[24] Pupils are expected to obtain a Level 4 at Key Stage 2 (KS2), and a Level 5 at Key Stage 3 (KS3). Pupils "move up" if they scored below the expected level at KS2 and at or above the expected level at KS3, or if they obtained the expected level at KS2 and above the expected level at KS3. Pupils "move down" if they obtained the expected level at KS2 and below the expected level at KS3, or if they achieved above the expected level at KS2 and at or below the expected level at KS3.

[25] Results available from the authors on request.

Table 4.2 makes clear is that the effects of FSM eligibility are strongest for those living in the least deprived areas. For example, girls who are eligible for free school meals are 40% more likely to conceive than those who are not FSM-eligible if they live in the 20% most deprived areas, while they are nearly twice as likely to conceive if they live in the least deprived fifth of areas. Similarly, girls who are eligible for FSM are 76% more likely to have a maternity if they live in the most deprived quintile, but nearly three times more likely to have a maternity if they live in the least deprived quintile.

Thus, whilst girls who are eligible for free school meals are, on average, more likely to conceive than those that are not, regardless of where they live, it is nonetheless the case that FSM eligibility is a greater risk factor for teenage pregnancy in richer areas than it is in poorer areas. These results are stronger for maternities than for abortions.

Table 4.2 Multivariate analysis of conceptions behaviour by the end of Year 11: effect of FSM eligibility by IDACI quintile of local area

	Conception	***Maternity***	***Abortion***	***Maternity/ Conception***
IDACI Q1 (least deprived)	1.976*** (0.189)	2.869*** (0.427)	1.612*** (0.198)	1.921*** (0.389)
IDACI Q2	1.859*** (0.114)	2.514*** (0.223)	1.461*** (0.122)	1.794*** (0.220)
IDACI Q3	1.763*** (0.0752)	2.431*** (0.144)	1.278*** (0.0773)	2.059*** (0.174)
IDACI Q4	1.557*** (0.0481)	2.019*** (0.0829)	1.142*** (0.0533)	1.841*** (0.118)
IDACI Q5 (most deprived)	1.400*** (0.0376)	1.760*** (0.0658)	1.031 (0.0426)	1.724*** (0.101)
Individual characteristics	Yes	Yes	Yes	Yes
School/area characteristics	Yes	Yes	Yes	Yes
Cohort	A/B/C	A/B/C	A/B/C	A/B/C

Notes: the dependent variables in Columns 1 to 3 are indicators for whether the girl has at least one conception, maternity, or abortion. The dependent variable in Column 4 is an indicator for whether a girl's first conception results in a maternity. The coefficient estimates show the relationship between eligibility for free school meals and each of these outcomes of interest estimated from separate regression models. *** denotes significance at the 1% level; ** at the 5% level, and * at the 10% level. Standard errors are corrected for clustering at the school level and shown in parentheses.

Table 4.3 shows how the association between below expected attainment in English at Key Stage 2 and our conception and pregnancy outcomes varies by quintile of school performance (as measured by the proportion of pupils achieving 5 A*-C grades at GCSE). While both individual Key Stage 2 attainment and school-level GCSE attainment were significantly associated with the likelihood of conceiving (and pregnancy outcomes) in Section 3, Table 4.3 provides no evidence that the association between low attainment and conceptions and pregnancy outcomes varies according to the academic performance of the girl's secondary school. These results are very similar if we use individual Key Stage 3 results, or school value-added rather than absolute GCSE performance as our measure of school quality.

There is, however, some suggestive evidence that girls whose performance weakens between Key Stage 2 and Key Stage 3 are more likely to conceive if they attend high performing schools (those in the top two quintiles on the basis of Key Stage 4 performance) than if they attend lower performing schools (those in the bottom two quintiles). This suggests that girls who make slower than expected progress in the early years of secondary school are at particular risk of conceiving relative to their peers if they attend high performing schools.

Table 4.3 Multivariate analysis of conceptions behaviour by the end of Year 11: effect of achieving below the expected level in English at KS2 by quintile of school performance (% of pupils achieving 5 GCSEs at grades A*-C)

	Conception	Maternity	Abortion	Maternity/ Conception
Q1: lowest average performance	1.327*** (0.111)	1.679*** (0.218)	1.145 (0.121)	1.724*** (0.277)
Q2	1.347*** (0.0734)	1.634*** (0.134)	1.162** (0.0843)	1.494*** (0.152)
Q3	1.364*** (0.0624)	1.700*** (0.113)	1.137** (0.0708)	1.531*** (0.135)
Q4	1.315*** (0.0543)	1.628*** (0.0905)	1.072 (0.0626)	1.539*** (0.119)
Q5: highest average performance	1.215*** (0.0411)	1.455*** (0.0656)	0.962 (0.0500)	1.603*** (0.107)
Individual characteristics	Yes	Yes	Yes	Yes
School/area characteristics	Yes	Yes	Yes	Yes
Cohort	A/B/C	A/B/C	A/B/C	A/B/C

Notes: see notes to Table 4.2.

4.3 Summary

This section further investigated the relationship between individual characteristics and conception and pregnancy behaviour. It has shown that:

- There continues to be a significant relationship between educational attainment and conception and pregnancy outcomes in the early years of secondary school. In particular, slower than expected progress between Key Stages 2 and 3 is a strong risk factor for both conceptions and the decision to continue with a pregnancy or not.
- The link between educational attainment and conceptions behaviour does not differ markedly according to the type of school attended: poor attainment is a risk factor for girls in low as well as high performing schools. However, there is some evidence that making slower than expected progress in early secondary school is a greater risk factor if it occurs at a high performing school than at a low performing school.
- Similarly, there is some evidence that individual deprivation is a greater risk factor for teenage conceptions and pregnancy outcomes in less deprived areas than in more deprived areas: whilst girls who are eligible for free school meals are, on average, more likely to conceive than those who are not, regardless of where they live, FSM

eligibility is a greater risk factor for teenage pregnancy in richer areas than in poorer areas. Moreover, these results are stronger for maternities than for abortions.

5. Repeat maternities

This section considers the characteristics associated with repeat maternities. Analysis focuses solely on conceptions under the age of 18 that result in a maternity (and hence on cohort A), as there are too few repeat conceptions before the end of Year 11 to conduct a robust analysis. In the matched NPD-ONS data, there are 520 girls with two conceptions that result in a maternity before the age of 18.[26] While we saw in Section 2.3 that this is only around half the number of girls with two or more maternities as in the NHS hospital data (1,225), the mean and median IDACI percentiles and birth spacings for the two samples are almost identical, suggesting that girls with repeat maternities in the matched NPD-ONS are representative of those in the NHS data, at least in terms of the areas in which they live and they time between first and second births.

There are also 555 girls that have one maternity and one abortion (of which 297 have an abortion followed by a maternity and 258 have a maternity followed by abortion) in the matched NPD-ONS data, but very few girls that have two abortions; this is not altogether surprising given the poorer match quality for abortions (discussed in detail in Section 2). Given the lack of appropriate data against which to compare the representativeness of these samples, this chapter focuses on repeat maternities only.

With this in mind, we investigate the pupil, school and area characteristics associated with having two or more conceptions before the age of 18 that result in a maternity, conditional on having at least one conception that results in a maternity. When we undertake this analysis using a multivariate regression model, there are very few factors that are significantly associated with having two maternities, conditional on having at least one maternity. This is at least partly the result of the small number of girls who have two maternities. The exceptions are a girl's own deprivation status (as measured by eligibility for free school meals), and the deprivation status of her neighbourhood (as measured using scores from the income Deprivation Affecting Children Index). These results are shown in Table 5.1 below.[27]

The table shows that girls who are eligible for free school meals are 35% more likely to have a second conception before the age of 18 that results in a maternity than girls who are not eligible for free school meals. Girls who live in the 60% most deprived areas are also around twice as likely to have multiple maternities as those who live in the 20% least deprived areas. These results suggest that girls who are eligible for free school meals, and girls who live in more deprived areas, are significantly more likely to go on to have a second conception before the age of 18 that results in a maternity, conditional on having already given birth at least once. There are no statistically significant effects of prior individual test scores or the academic attainment of the school.

[26] As discussed in Section 2.2, there are around 50 girls who should additionally have been included in our analysis of repeat maternities, but whose second maternity was mistakenly excluded from the dataset provided to us by ONS. However, it seems unlikely that their exclusion will bias our results in any substantive way.

[27] All other coefficients are available from the authors on request.

Table 5.1 Multivariate analysis of multiple maternities: odds of having more than one conception before the age of 18 that result in a maternity amongst girls that have at least one maternity

	Two or more maternities relative to one maternity
Eligible for free school meals	1.346*** (0.145)
IDACI quintile (relative to least deprived)	
Q2	1.436 (0.451)
Q3	1.899** (0.550)
Q4	2.168*** (0.624)
Q5: most deprived	2.108*** (0.607)
Observations	11,505
Individual characteristics	Yes
School/area characteristics	Yes
Cohort	A

Notes: the dependent variable is an indicator for having two or more conceptions before the age of 18 that result in a maternity defined for the population of girls that have one conception before age 18 that results in a maternity. *** denotes significance at the 1% level; ** at the 5% level, and * at the 10% level. Standard errors are corrected for clustering at the school level and shown in parentheses.

6. Conceptions and educational attainment

The previous two sections of the report have focused on the characteristics associated with teenage conception and pregnancy decisions. In this section, we consider the relationship between conception and maternity decisions made before the end of Year 11 and subsequent educational outcomes. Specifically, we consider the number of Level 1 qualifications that girls achieve (equivalent to the number of GCSE passes at grades A*-G) and whether she appears in the National Pupil Database (NPD) at age 17/18, i.e. whether she stays on for post-compulsory education and studies at a sixth form college attached to a school (or other institution included in the NPD).

Although our analysis will describe the associations between teenage conceptions and subsequent educational attainment, these results should not be interpreted as causal. In other words, a finding that girls who conceived teenagers had lower attainment, on average, than those who did not does not necessarily imply that becoming pregnant *caused* the low attainment or that those girls would have performed better had they not conceived. It could be that there are unobserved characteristics that are not fully captured by our multivariate analysis that help to explain both whether a girl conceives and whether she has low attainment. For example, girls who do not plan to stay in education beyond age 16 may regard it as less costly to take time off for a pregnancy (and hence may be more likely to conceive) and may also work less hard for their GCSE exams. It is very unlikely that our multivariate analysis fully captures such beliefs. Hence, this group will be both more likely to conceive and have lower levels of attainment, but the relationship is not causal. It is clear that girls who conceive before the end of Year 11 do have fewer GCSE passes and are less likely to continue in post-compulsory education (in an institution included in the NPD) than those who do not: the mean number of Level 1 GCSE passes is 9.75 for those that do not conceive, compared with 7.27 for those that do; similarly, 18% of those who conceive appear in the NPD at age 17/18, compared to 55% amongst those who do not.

The main focus of this section is, however, to investigate whether, after accounting for a variety of individual, school and area characteristics, there is any remaining association between teenage conceptions and educational attainment. In particular, we consider whether these associations vary according to the outcome of a girl's first conception (abortion or maternity) and whether the conception occurred in Year 10 (or earlier), the idea being to illustrate whether the association between attainment and conceptions varies according to the timing and outcome of the conception (both of which might plausibly affect the amount of time a girl is required to take off from studying).

Table 6.1 estimates the relationship between conceptions in Year 10 (or earlier) or Year 11 and number of Level 1 GCSE passes (Columns 1 and 2) and continuation to post-compulsory education at an institution included in the NPD (Columns 3 and 4), conditional on a full set of individual, school and area characteristics.

Table 6.1 Educational attainment by result of first conception

	Level 1 GCSE passes (passes)		Post-compulsory education participation at an institution included in the NPD (percentage points)	
	1	2	1	2
	Conceptions	Pregnancy Outcomes	Conceptions	Pregnancy Outcomes
	School year			
10 (or earlier)	-2.380*** -0.0279		-21.7*** -0.466	
11	-1.787*** -0.0199		-23.7*** -0.335	
	School year x conception			
10 (or earlier) x Maternity		-4.185*** -0.0424		-23.4*** -0.695
10 (or earlier) x Abortion		-1.045*** -0.0366		-20.4*** -0.623
11 x Maternity		-2.804*** -0.0285		-27.4*** -0.475
11 x Abortion		-0.867*** -0.0272		-20.1*** -0.467
Cohort	A/B/C	A/B/C	A/B/C	A/B/C
Individual characteristics	Yes	Yes	Yes	Yes
School/area characteristics	Yes	Yes	Yes	Yes
Observations	867,371	867,371	893,268	893,268
R-squared	0.299	0.303	0.276	0.276

Notes: the dependent variable in Columns 1 and 2 is number of Level 1 passes (A*-G) at Key Stage 4 (GCSEs or equivalents). The dependent variable in Columns 3 and 4 is whether the girl attended post-compulsory education in an institution included in the National Pupil Database. *** denotes significance at the 1% level, ** at the 5% level, and * at the 10% level. Standard errors are corrected to account for clustering at the school level and shown in parentheses.

Column 1 indicates that girls that conceive in Year 10 or Year 11 receive fewer GCSE passes than those who do not. Column 2 splits conceptions by pregnancy outcome. The poorest performers are girls that conceive and choose to have maternities: on average, these girls receive 4.2 fewer passes if they conceive in Year 10 or earlier and 2.8 fewer if they conceive in Year 11 compared to girls who do not conceive. Girls that choose to discontinue their pregnancies perform worse, on average, than those who do not conceive, but better than those who conceive and have a maternity.

Whilst it is perhaps not unexpected that girls who have a baby earlier (Year 10 or before) end up with fewer GCSE passes than those who have a conception that results in a maternity in Year 11, the same is also true (to a lesser extent) for those who have an abortion: those who choose to discontinue their pregnancy in Year 10 perform slightly worse (1.0 fewer GCSE passes) than those who conceive and terminate their pregnancy in Year 11 (0.87 fewer

passes). This may suggest that the selection effect – i.e. the unobserved characteristics that are associated both with conceiving in Year 10 (relative to those who conceive in Year 11 or not at all) and educational attainment – dominates the potential disruption of having an abortion close to exam time in Year 11.[28] However, our analysis does not and cannot establish the mechanism behind these relationships – or to what degree, if at all, conceptions directly affect or cause lower attainment.

Column 3 of Table 6.1 presents the percentage point difference in the likelihood of staying on for post-compulsory in an institution covered by the NPD for girls who conceive in Year 10 or 11, while Column 4 splits these results according to the girl's first pregnancy outcome. Column 3 indicates that those who conceive in Years 10 and 11 are 22 and 24 percentage points respectively less likely to continue in post-compulsory education in an institution included in the NPD compared to those who do not conceive before the end of Year 11. Column 4 suggests that those who give birth as a result of a conception in either Years 10 or 11 are slightly less likely to stay on than those who have an abortion, but the difference is relatively small compared to girls who do not conceive. Again, however, it is important to remember that these results do not imply that girls that conceive are less likely to continue in post-compulsory education *because* they conceived.

[28] Results remain unchanged if we restrict the sample to girls who took Key Stage 4 in the correct year.

7. Summary and conclusions

This report has made use of a unique new administrative dataset linking maternity and abortion records to the education records of all girls attending state schools in England. Using information on conceptions that occurred before the end of compulsory education for girls born between September 1989 and August 1992, our results provide new insights into the individual, school and area-level risk factors associated with teenage conceptions and the decision to continue with a pregnancy conditional on conceiving.

This analysis should not be interpreted as *causal*. For example, a finding that low attainment at age 11 is associated with higher conception rates does not *necessarily* imply that raising attainment will help to reduce conception rates, because girls with low attainment may have other characteristics (that are not included in our data) that increase the likelihood that they conceive and also cause them to have lower test scores. However, our results may provide some guidance for policymakers and others interested in the design and targeting of teenage pregnancy prevention strategies.

We found that:

- Teenage conceptions occur in all social groups, areas and types of school. For example, the number of conceptions is higher amongst girls who are not eligible for free school meals than amongst those who are (because only 16.5% of pupils in secondary school are eligible for free school meals, compared to more than 80% who are not). Similarly, teenage conceptions occur in rich and poor areas and in schools with high and low levels of attainment: no characteristic provides complete "protection" from teenage conception. However, some groups experience higher conception and maternity rates than others.

Individual characteristics

- Amongst the individual characteristics to which we have access, eligibility for free school meals (FSMs) and being persistently absent from school are the most strongly associated with teenage conceptions and the decision to continue with a pregnancy, even after accounting for all the other ways in which girls who conceive differ from those who do not. This means that girls with these characteristics are more likely to become teenage mothers both because they are more likely to conceive and because they are more likely to continue with their pregnancy conditional on conceiving.

- Low prior educational attainment is also associated with a higher risk of conceiving as a teenager and of deciding to continue with a pregnancy, but to a lesser extent than FSM eligibility and persistent absence. Deterioration in academic performance between Key Stages 2 and 3 (ages 11 and 14) is, however, a strong risk factor: girls who make slower than expected progress during the early years of secondary school are significantly more likely to conceive, and to continue with the pregnancy after conception, than those who progress as expected.

- Amongst girls who give birth at least once as a teenager, less than 10% have more than one maternity that results from a conception before the age of 18. Multiple maternities are more common amongst girls who are eligible for free school meals, but there are few other significant differences (in terms of the individual characteristics that we observe) between girls who have one or more than one maternity.

- FSM eligibility, persistent absenteeism and making slower than expected academic progress during early secondary school can therefore be thought of as risk factors associated with conceiving as a teenager and of continuing with that pregnancy. Amongst those who continue with their first pregnancy, FSM eligibility is also a risk factor associated with having a second conception that results in a maternity.

School characteristics

- Girls who attend higher performing schools are less likely to conceive, and more likely to have an abortion if they do conceive, even after accounting for the other ways in which such girls differ from one another. This relationship is stronger when performance is measured using a high absolute standard (such as the proportion of pupils achieving 5 A*-C grades at GCSE) than when it is measured using a high relative indicator (such as Key Stage 2 to 4 value-added).

- The relationships between other school characteristics (such as school composition, gender mix and religiosity) and the likelihood of teenage conception and pregnancy decisions were generally small and not always significantly different from zero. This suggests that these school characteristics are not important risk factors for teenage pregnancy or motherhood once differences in other characteristics are accounted for.

Area characteristics

- Teenage conception and maternity rates are higher in deprived areas, even after accounting for the characteristics of girls themselves (and the schools they attend). This suggests that the relationship between conception and pregnancy decisions and area deprivation is not entirely driven by the selection of girls into areas, and that living in a deprived area is a risk factor associated with conceiving and giving birth as a teenager, over and above the risk associated with individual deprivation.

- Girls living in deprived areas are also disproportionately more likely to have more than one conception before the age of 18 that results in a maternity, even after accounting for other individual and school characteristics. Again, this highlights the importance of both individual and area level deprivation in predicting girls who are likely to give birth more than once as teenagers.

Context matters

- There is some evidence that individual deprivation is a stronger risk factor for teenage conception and pregnancy outcomes in less deprived areas than in more deprived areas: whilst girls who are eligible for free school meals are, on average, more likely to conceive than those who are not, regardless of where they live, eligibility for free school meals is a greater risk factor in richer areas than poorer areas. Moreover, these results are stronger for maternities than for abortions.

- There is also some evidence that the increased risk of conception associated with slower than expected progress in early secondary school (between ages 11 and 14) is greater in high performing schools than in low performing schools, although this relationship is less stark than that between individual and local area deprivation.

Relationship between teenage conceptions and educational attainment

- Girls that conceive receive fewer GCSE passes and are less likely to continue in post-compulsory education (at a sixth form attached to a school) than those who do not. This relationship is stronger for girls who continue with their pregnancy, but those who conceive and have an abortion also have significantly fewer GCSE passes and are substantially less likely to stay in education than girls who do not conceive.

- Whilst this is not a causal analysis – and hence does not necessarily imply that these girls performed poorly *because* they conceived – it does indicate that more work is needed to understand whether schools could better support girls to prevent conceptions in the first place, or to continue their education following a conception.

Policy implications

Our results have the following implications for strategies designed to prevent teenage conceptions and maternities in future:

- Interventions designed to target girls with the highest rates of conception and maternity should be aimed at girls who are eligible for free school meals, persistently absent from school, or who have poor attainment at the end of primary school or make slower than expected progress at the start of secondary school.

- School or area level interventions should focus on poorly performing schools or more deprived areas, not only because that is where individuals at highest risk are most prevalent, but also because such environments represent a separate risk factor for teenage conceptions and maternities.

- However, high performing schools and less deprived areas should not be neglected, as some individual risk factors – such as eligibility for free school meals – are more strongly associated with teenage conception and birth in less deprived areas.

- Moreover, a teenage pregnancy prevention strategy that seeks to reduce conception rates by a substantial margin cannot concentrate on high risk groups alone. Although certain girls are at much greater risk of conceiving and giving birth as teenagers than others, the majority of girls that conceive do not share these risk factors.

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Appendix 1: Summary statistics for under 18 conceptions

Table A1.1 Summary statistics on conception behaviour under the age of 18 in NPD-ONS matched data, by individual characteristics

	% of girls who, by the age of 18, have had a:						Maternity/ first conception
	Conception		Maternity		Abortion		
	%	N	%	N	%	N	%
Ethnicity							
White British	7.9%	18,990	4.5%	10,656	3.5%	8334	56.1%
Black African	4.8%	202	1.5%	65	3.3%	137	32.2%
Black Caribbean	11.0%	490	5.0%	219	6.1%	271	44.7%
South Asian	1.7%	266	0.5%	74	1.2%	192	27.8%
Mixed	9.1%	592	4.2%	270	5.0%	322	45.6%
Other	4.8%	293	2.0%	124	2.8%	169	42.3%
Non-British White	5.0%	345	2.6%	176	2.5%	169	51.0%
SEN	10.9%	4,492	7.4%	3,077	3.4%	1,415	68.5%
Not SEN	7.0%	17,748	3.6%	9,107	3.4%	8,641	51.3%
FSM eligible	12.6%	6,228	8.7%	4,292	3.9%	1,936	68.9%
Not FSM eligible	6.5%	16,012	3.2%	7,892	3.3%	8,120	49.3%
KS2 English score							
Level 2	13.0%	257	9.6%	189	3.5%	68	59.0%
Level 3	11.8%	5,054	7.9%	3,392	3.9%	1,662	54.9%
Level 4	8.2%	11,095	4.3%	5,772	4.0%	5,323	44.1%
Level 5	4.2%	4,168	1.6%	1,618	2.6%	2,550	33.0%

Table A1.2: Summary statistics on conception behaviour under the age of 18 in NPD-ONS matched data, by school and area level characteristics

	% of girls who, by the age of 18, have had a:						Maternity/ first conception
	Conception		Maternity		Abortion		
	%	N	%	N	%	N	%
	School characteristics						
Single sex	5.3%	2,014	2.3%	884	3.0%	1,130	43.9%
Mixed	7.8%	20,008	4.3%	11,072	3.5%	8,936	55.3%
Religious	6.7%	2,708	3.2%	1,304	3.5%	1,404	48.2%
Non religious	7.3%	15,191	3.9%	8,198	3.3%	6,993	54.0%
% White British							
Q1 (lowest)	6.7%	4,074	3.3%	2,031	3.4%	2,043	49.9%
Q5 (highest)	8.4%	5,132	4.9%	2,970	3.5%	2,162	57.9%
% FSM eligible							
Q1 (lowest)	4.4%	2,578	1.9%	1,092	2.5%	1,486	42.4%
Q5 (highest)	9.6%	5,850	5.9%	3,578	3.7%	2,272	61.2%
% 5 A-C GCSEs*							
Q1 (lowest)	10.0%	7,752	6.1%	4,696	3.9%	3,056	60.6%
Q5 (highest)	4.0%	1,914	1.5%	702	2.5%	1,212	36.7%
School VA KS2-4							
Q1 (lowest)	10.3%	6,105	6.3%	3,712	4.1%	2,393	60.8%
Q5 (highest)	4.2%	2,435	1.6%	945	2.6%	1,490	38.8%
	Area characteristics						
IDACI score							
Q1 (richest)	4.3%	2,518	1.6%	923	2.7%	1,595	36.7%
Q5 (poorest)	11.2%	6,611	7.2%	4,257	4.0%	2,354	64.4%

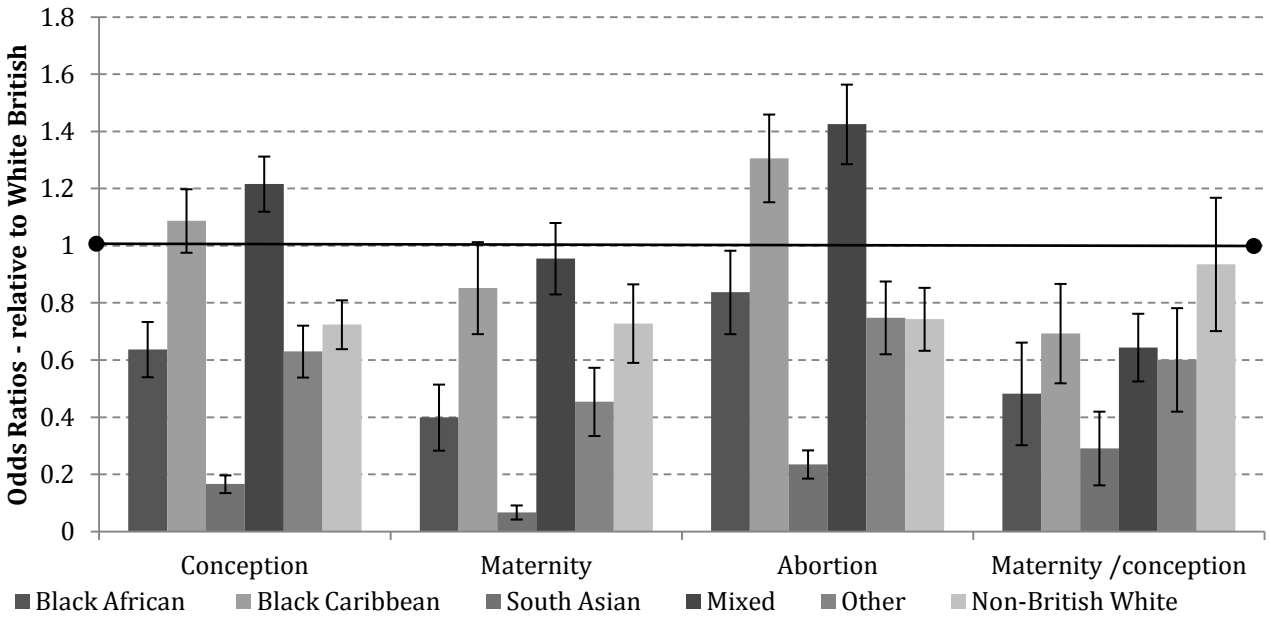
Appendix 2: Multivariate analysis for Year 11 conceptions

Table A2.1: Estimated odds ratios from raw and multivariate analysis for conceptions before the end of Year 11 and the outcomes of those conceptions

	Conception		Maternity		Abortion		Maternity/ Conception	
	Raw	Multi-variate	Raw	Multi-variate	Raw	Multi-variate	Raw	Multi-variate
Ethnicity - Relative to White								
Black African	0.589*** (0.038)	0.637*** (0.049)	0.357*** (0.042)	0.399*** (0.059)	0.845* (0.064)	0.837** (0.075)	0.429*** (0.061)	0.482*** (0.0916)
Black Caribbean	1.327*** (0.062)	1.087 (0.057)	1.065 (0.077)	0.852* (0.082)	1.592*** (0.094)	1.306*** (0.078)	0.690*** (0.064)	0.693*** (0.0887)
South Asian	0.138*** (0.010)	0.166*** (0.016)	0.082*** (0.011)	0.067*** (0.013)	0.193*** (0.016)	0.235*** (0.025)	0.421*** (0.067)	0.291*** (0.066)
Mixed	1.247*** (0.046)	1.216*** (0.049)	1.078 (0.060)	0.955 (0.064)	1.405*** (0.068)	1.425*** (0.071)	0.769*** (0.057)	0.644*** (0.060)
Other	0.511*** (0.030)	0.630*** (0.046)	0.413*** (0.039)	0.454*** (0.061)	0.605*** (0.046)	0.748*** (0.065)	0.679** (0.082)	0.601*** (0.092)
Non-British White	0.640*** (0.033)	0.724*** (0.044)	0.583*** (0.045)	0.728*** (0.070)	0.710*** (0.049)	0.743*** (0.056)	0.817 (0.085)	0.935 (0.119)
Special Educational Needs	1.544*** (0.025)	1.044* (0.024)	2.086*** (0.045)	1.102*** (0.034)	1.091*** (0.027)	0.983 (0.032)	1.913*** (0.062)	1.175*** (0.052)
EAL	2.867*** (0.101)	0.614*** (0.035)	3.566*** (0.200)	0.583*** (0.056)	2.366*** (0.105)	0.676*** (0.046)	1.522*** (0.110)	0.852 (0.092)
FSM eligible	2.156*** (0.029)	1.538*** (0.027)	3.251*** (0.062)	1.987*** (0.050)	1.348*** (0.030)	1.140*** (0.030)	2.411*** (0.070)	1.821*** (0.066)
Persistent absentee	4.026*** (0.110)	2.586*** (0.090)	6.378*** (0.224)	3.306*** (0.154)	2.278*** (0.097)	1.865*** (0.095)	2.801*** (0.154)	1.988*** (0.134)
KS2 Maths (relative to Level 4)								
KS2 Level 2	1.615*** (0.081)	0.985 (0.059)	2.136*** (0.139)	0.970 (0.077)	1.164* (0.090)	0.995 (0.090)	1.825*** (0.182)	0.949 (0.118)
KS2 Level 3	1.441*** (0.022)	1.033* (0.020)	1.791*** (0.038)	1.068** (0.030)	1.155*** (0.025)	0.999 (0.026)	1.547*** (0.046)	1.082** (0.042)
KS2 Level 5-6	0.528*** (0.011)	0.833*** (0.021)	0.399*** (0.014)	0.797*** (0.033)	0.635*** (0.016)	0.846*** (0.026)	0.626*** (0.027)	0.888** (0.047)
KS2 English (relative to Level 4)								
KS2 Level 2	1.624*** (0.095)	1.117 (0.080)	2.426*** (0.171)	1.315*** (0.113)	0.922 (0.094)	0.842 (0.101)	2.568*** (0.315)	1.457*** (0.211)
KS2 Level 3	1.408*** (0.023)	1.072*** (0.024)	1.816*** (0.041)	1.189*** (0.037)	1.060* (0.026)	0.953 (0.031)	1.725*** (0.057)	1.271*** (0.056)
KS2 Level 5-6	0.500*** (0.009)	0.751*** (0.017)	0.360*** (0.011)	0.637*** (0.023)	0.624*** (0.014)	0.820*** (0.023)	0.574*** (0.021)	0.777*** (0.036)
KS2 Science (relative to Level 4)								
KS2 Level 2	1.152 (0.113)	0.950 (0.111)	1.636*** (0.194)	1.057 (0.149)	0.722 (0.121)	0.826 (0.162)	2.271*** (0.468)	1.225 (0.305)
KS2 Level 3	1.382*** (0.026)	1.083*** (0.027)	1.785*** (0.043)	1.149*** (0.039)	1.007 (0.029)	1.001 (0.037)	1.772*** (0.067)	1.177*** (0.061)

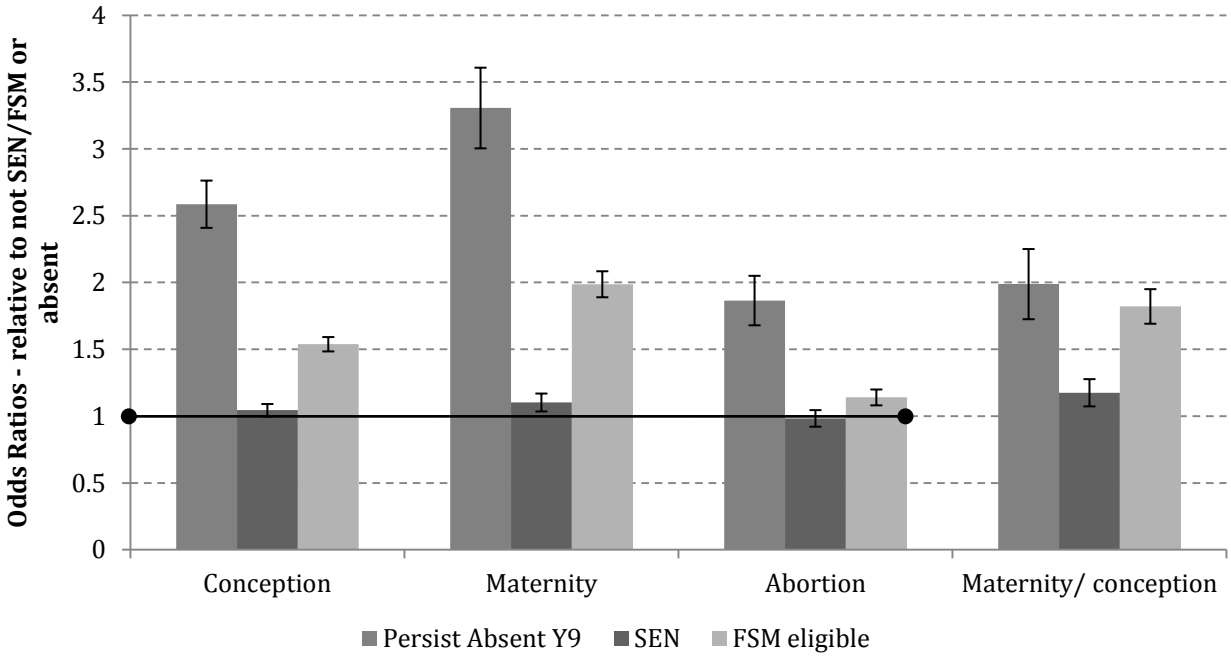
KS2 Level 5-6	0.518***	0.798***	0.382***	0.744***	0.649***	0.827***	0.588***	0.895**
	(0.008)	(0.017)	(0.010)	(0.025)	(0.013)	(0.022)	(0.020)	(0.040)
Single sex School	0.643***	0.919**	0.509***	0.866***	0.774***	0.950	0.659***	0.906
	(0.015)	(0.030)	(0.019)	(0.0442)	(0.023)	(0.038)	(0.031)	(0.059)
Religious School	0.831***	0.892***	0.780***	0.893***	0.876***	0.892***	0.888**	1.009
	(0.017)	(0.024)	(0.024)	(0.0343)	(0.024)	(0.031)	(0.037)	(0.053)
School % FSM (lowest omitted)								
Q2	1.508***	1.103***	1.792***	1.123**	1.361***	1.099**	1.317***	1.027
	(0.039)	(0.033)	(0.075)	(0.055)	(0.043)	(0.041)	(0.069)	(0.063)
Q3	1.932***	1.175***	2.576***	1.203***	1.589***	1.159***	1.626***	1.057
	(0.047)	(0.037)	(0.102)	(0.062)	(0.049)	(0.046)	(0.082)	(0.069)
Q4	2.428***	1.250***	3.478***	1.228***	1.854***	1.263***	1.883***	1.011
	(0.057)	(0.044)	(0.132)	(0.069)	(0.056)	(0.056)	(0.092)	(0.071)
Q5 (Highest)	2.554***	1.291***	4.063***	1.328***	1.752***	1.255***	2.341***	1.124
	(0.060)	(0.054)	(0.152)	(0.086)	(0.053)	(0.067)	(0.113)	(0.092)
School % 5 A*-C (lowest omitted)								
Q2	1.530***	0.949**	1.947***	0.907***	1.346***	1.006	1.451***	0.902**
	(0.042)	(0.021)	(0.090)	(0.030)	(0.045)	(0.030)	(0.083)	(0.040)
Q3	1.796***	0.892***	2.456***	0.837***	1.502***	0.959	1.629***	0.858***
	(0.047)	(0.024)	(0.110)	(0.032)	(0.049)	(0.034)	(0.090)	(0.044)
Q4	2.265***	0.865***	3.404***	0.818***	1.747***	0.918**	1.959***	0.887**
	(0.058)	(0.026)	(0.147)	(0.037)	(0.056)	(0.036)	(0.105)	(0.054)
Q5 (Highest)	2.778***	0.773***	4.840***	0.657***	1.834***	0.852***	2.639***	0.751***
	(0.069)	(0.032)	(0.201)	(0.044)	(0.057)	(0.043)	(0.137)	(0.059)
School VA KS2-4 (lowest omitted)								
Q2	1.456***	1.022	1.679***	1.042	1.332***	1.015	1.277***	1.024
	(0.039)	(0.024)	(0.074)	(0.034)	(0.044)	(0.032)	(0.071)	(0.046)
Q3	1.775***	1.006	2.199***	0.981	1.539***	1.029	1.445***	0.970
	(0.046)	(0.028)	(0.093)	(0.039)	(0.050)	(0.038)	(0.077)	(0.052)
Q4	2.219***	0.969	3.110***	0.962	1.743***	0.983	1.801***	0.989
	(0.055)	(0.030)	(0.125)	(0.044)	(0.055)	(0.040)	(0.092)	(0.061)
Q5 (Highest)	2.756***	0.899***	4.297***	0.886*	1.923***	0.906**	2.247***	0.989
	(0.067)	(0.036)	(0.167)	(0.056)	(0.060)	(0.044)	(0.112)	(0.076)
IDACI score (lowest omitted)								
Q2	1.344***	1.166***	1.731***	1.445***	1.183***	1.071**	1.466***	1.344***
	(0.035)	(0.033)	(0.079)	(0.072)	(0.038)	(0.036)	(0.082)	(0.081)
Q3	1.830***	1.420***	2.759***	1.959***	1.436***	1.219***	1.942***	1.603***
	(0.045)	(0.039)	(0.117)	(0.095)	(0.044)	(0.040)	(0.102)	(0.093)
Q4	2.442***	1.672***	4.277***	2.552***	1.668***	1.323***	2.596***	1.982***
	(0.058)	(0.046)	(0.173)	(0.123)	(0.050)	(0.045)	(0.131)	(0.116)
Q5 (Highest)	2.980***	1.796***	5.881***	2.922***	1.745***	1.301***	3.398***	2.297***
	(0.069)	(0.054)	(0.232)	(0.148)	(0.052)	(0.050)	(0.168)	(0.143)

Figure A2.1 Differences in rates of teenage conceptions, by ethnicity: estimated odds ratios relative to White British girls



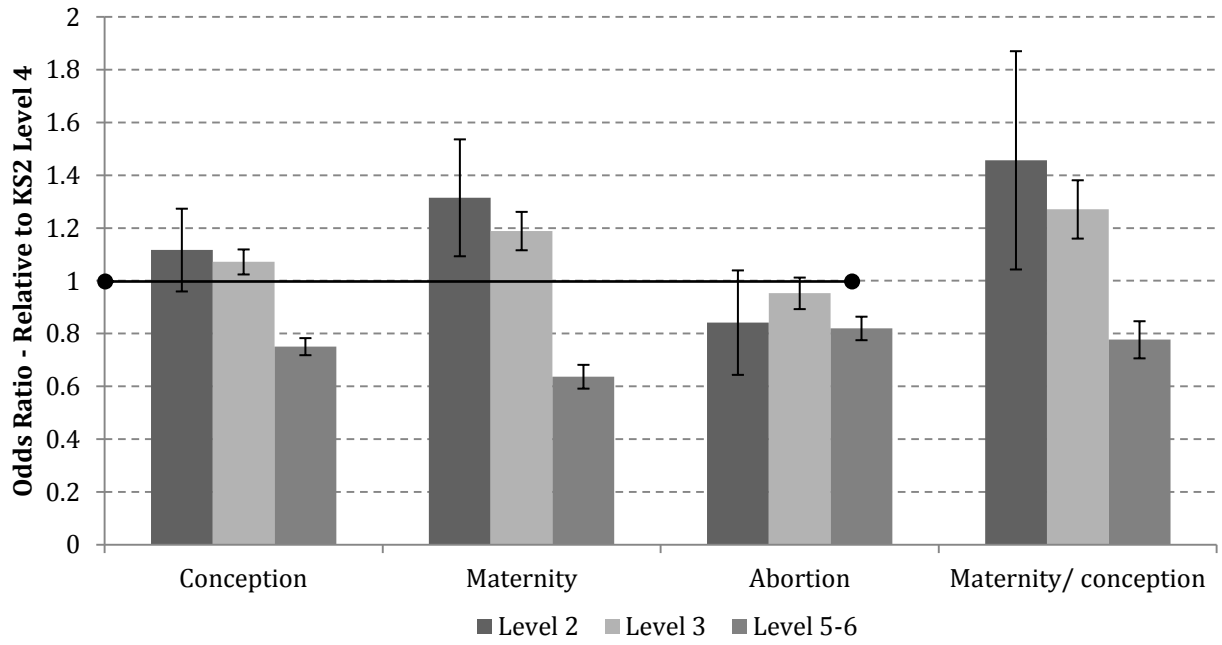
Notes: conceptions that occur before August of Year 11. Horizontal capped line indicates odds equal to those of White British girls. The capped vertical lines give the 95% confidence intervals. Odds ratios are estimated controlling for a full set of individual and area/school characteristics.

Figure A2.2 Differences in teenage conception rates, by SEN status, FSM eligibility, and persistent absenteeism: estimated odds ratios relative to other girls



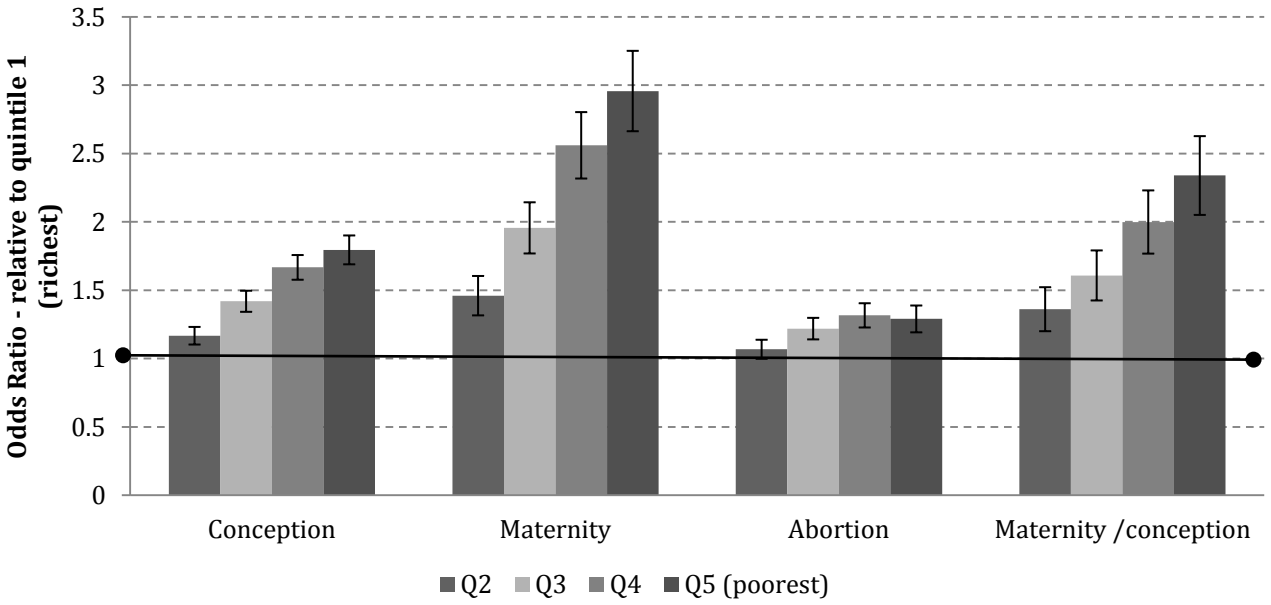
See notes to Figure A2.1.

Figure A2.3 Differences in teenage conception rates, by pupil attainment at English KS2 (age 11): estimated odds ratios relative to girls attaining Level 4



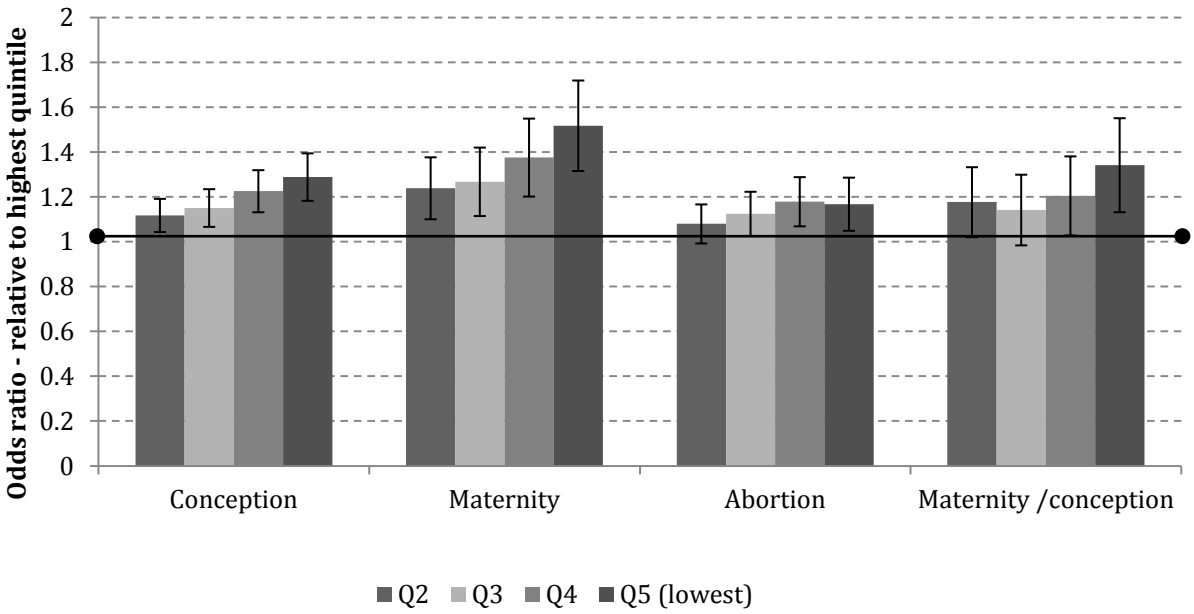
See notes to Figure A2.1.

Figure A2.4 Differences in conception rates by IDACI (deprivation) score: estimated odds ratios relative to the richest quintile (20%) of areas



See notes to Figure A2.1.

Figure A2.5 Differences in conception rates by % of pupils in the girl's school achieving at least 5 A*-C grades at GCSE: estimated odds ratios relative to the poorest performing quintile (20%) of schools



See notes to Figure A2.1.

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