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Socioeconomic Inequalities in Child Health in Ireland

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Abstract: There is extensive empirical evidence on the link between socio-economic status (SES) and child health outcomes. However, there is some international evidence that the SES gradient in child health is weaker for objective indicators of child health (e.g., anthropometric measures such as height) than for subjective indicators (e.g., parental assessments of general health status). In this paper, we use detailed cross-sectional micro-data on two cohorts of children in Ireland (aged 9 months and 9 years) to examine the SES gradient in various indicators of child health (length/height; weight/BMI; general health status; chronic illness incidence). Using two main indicators of SES, namely household income and mother's highest level of education, we find only limited support for the contention that the SES gradient in child health in Ireland is stronger for more subjective measures of child health.

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Socioeconomic Inequalities in Child Health in Ireland

1 Introduction

There is extensive empirical evidence on the link between socio-economic status (SES) and health outcomes in both children and adults. For adults, the observed SES gradient in health status has been found to be robust to the definition of both SES (income, wealth, education, social class, *etc*.) and health (mortality, morbidity) (Palloni *et al.*, 2009; Stowasser *et al.*, 2011). The evidence is also consistent within and across countries, at all ages and at all points in the distribution of SES (Case and Paxson, 2010). In terms of child health inequalities however, there is some debate in the literature over the extent to which the SES gradient widens as children age (Case *et al.*, 2002), over whether the gradient may be weaker in countries with universal access to free/heavily subsidised public health care (Propper *et al.*, 2007), and over the degree to which the gradient may be weaker for objective indicators of child health (Currie *et al.*, 2007).

Explanations for the observed link between SES and health include the direct effect of SES (i.e., via access to health care, housing quality, diet, *etc*.), the influence of early childhood circumstances (e.g., in-utero conditions), the influence of parental health and behaviours, and reverse causation between health and SES (see Smith (1999), among others, for a review). Distinguishing among these explanations is important as it has direct implications for public policy; for example, if a causal link between economic resources and health is identified, this advances the case for universal access to health care (Stowasser *et al.*, 2011). In addition, strong causal links have been demonstrated between childhood health and later outcomes (e.g., health status, educational attainment, labour market participation, *etc*.) (Case *et al.*, 2005). In this context, an understanding the links between SES and child health is important not only for policymakers seeking to improve child health, but also for efforts to improve health and other outcomes throughout the lifecycle (Chen *et al.*, 2006). In recognition of the importance of child health inequalities, numerous national and international policy documents contain targets for reducing child health inequalities (DoHC, 2001; WHO, 2008).

While a large international literature has examined the link between SES and child health, the evidence for Irish children is less well developed; notable exceptions include Institute of Public Health (2006) and Layte and Clyne (2010).[1] In addition, previous research has tended to concentrate on inequalities in a single indicator, although as discussed below, the international evidence suggests that the strength of the inequality often depends on whether objective or subjective indicators are used. The purpose of this paper is therefore to examine SES inequalities in *both* objective and subjective child health outcomes in Ireland, using detailed cross-sectional micro-data on two cohorts of children (aged nine months and nine years). Section 2 discusses previous research on SES inequalities in child health, while Section 3 describes the Growing up in Ireland (GUI) data employed

[1] An emerging Irish literature has analysed the impact of early life conditions on later outcomes such as overweight and obesity, educational test scores, etc. (McCrory and Layte, 2011; McGovern, 2011; McCrory and Layte, 2012).

in this paper. Section 4 outlines the methodology. Section 5 presents the empirical results while Section 6 concludes with a discussion of the main findings.

2 Previous Research

As noted, there is a large international literature on SES inequalities in child health. An important early contribution to the literature was a series of studies from the US which examined the causal impact of public health insurance on child health outcomes (Currie, 1995; Currie and Gruber, 1996; Currie *et al.*, 2008). Currie and Gruber (1996) and Currie *et al.* (2008) adopted a quasi-experimental approach to the issue by exploiting differences in Medicaid expansion to children across US states and time periods to identify the effect of public health insurance on various health outcomes. Currie and Gruber (1996) found that expansions in Medicaid caused reductions in child mortality in children aged less than 15 years of age, and in particular in mortality from internal causes, while Currie *et al.* (2008) found that more generous insurance cover in early life was associated with better health status at older ages. A related paper by Lin (2009) attributed approximately 40 per cent of the narrowing gap in Apgar scores[2] in the US over the 1980s and 1990s to increases in access to health care. A related debate has examined the extent to which SES gradients in child health may be weaker in countries with universal access to free or heavily subsidised public health care. For example, Currie *et al.* (2007) and Propper *et al.* (2007) maintained that the absence of a SES gradient in parental assessed general health status in the UK (in contrast to the strong gradient found by Case *et al.* (2002) for the the US) may be due to the differing health-care financing structures in the two countries.[3]

The age at which the SES gradient in child health emerges has been the subject of much recent discussion. One of the first studies to examine this issue was that by Case *et al.* (2002), which examined the SES gradient in child general health status in the US and found a steepening gradient as children age. Case *et al.* (2002) found that the 'origin of the gradient' was partly explained by the incidence and impact of chronic conditions across children with different SES. Similar results have also been observed in Canada (Currie and Stabile, 2003; Allin and Stabile, 2012) and in the US using a different data source (Murasko, 2008), but no evidence for a steeping gradient with age has been found in a number of studies focussing on the UK (Currie *et al.*, 2007; Propper *et al.*, 2007), Germany (Reinhold and Jurges, 2011) and Indonesia (Cameron and Williams, 2009). Using Australian data, Khanem *et al.* (2009) found that while there was a steeping SES gradient with age, SES became an insignificant predictor of child health once controls for parental health were included in the model. Chen *et al.* (2006) found a steeping SES gradient with age for a number of acute health conditions,

[2] The Apgar score is an overall measure of infant health at birth; it was designed to evaluate a newborn's physical condition after delivery and to determine any immediate need for extra medical or emergency care (Lin, 2009).

[3] However, a response by Case et al. (2008) to the Currie et al. (2007) study found that the differences between England and the US were reduced when data from the same time period were examined.

but not for general health status.[4] A longitudinal study of child height in England and Scotland in the 1970s concluded that child height inequalities were established before the age of five years (Smith *et al.*, 1980) while Howe *et al.* (2010) found that the SES gradient in height during childhood arose largely via inequalities in birth length, with small increases in the inequality from differences in growth in later childhood.

The extent to which the SES gradient in child health persists when controls for other influences on child health, particularly mother's health, are included, is the subject of conflicting findings. For example, studies by Case *et al.* (2002), Currie *et al.* (2007) and Reinhold and Jurges (2011) found that the significant SES gradient in general health status was robust to the inclusion of controls for parental health, while Khanem *et al.* (2009) and Propper *et al.* (2007) found that it was not. However, there is some debate in the literature over whether parental health is truly exogenous (i.e., the SES gradient in child health might be observed if parents with poorer health have lower earnings, and poor health is transmitted from parents to children) (Case *et al.*, 2002).

Part of this ambiguity in research findings stems from differences in the indicators of child health that are examined. However, in studies that have examined both objective and subjective indicators of child health, the general finding is that the SES gradient is stronger for subjective indicators of child health. For example, Reinhold and Jurges (2011) examined the SES gradient in child health in German children aged 0-17 years using various indicators of health (parental assessed general health, blood pressure, obesity, height-for-age, blood haemoglobin, ferritin, vitamin D), and found a significant SES gradient for parental assessed general health and vitamin D levels, weak evidence for ferritin levels and no significant gradient for the other objective indicators. A similar study by Currie *et al.* (2007) found a significant (although small) SES gradient in parental assessed general health in England, but no evidence for indicators collected from nurse examinations and blood test results (birth weight, height, obesity, blood pressure, haemoglobin count, ferritin level). While self-assessed health is frequently used in research on adult health inequalities due to its strong relationship with both mortality and health-care utilisation (Idler and Benyamini, 1997; Burstrom and Fredlund, 2001), objective measures of health are less frequently available, although are potentially a more accurate indicator of underlying health. On the other hand, it has been noted that parental assessments of child health (and incidence of doctor-diagnosed conditions) may be influenced by a) differential reporting of health status between low- and high-SES parents and/or b) differences in diagnosis of health conditions between low- and high-SES children which may reflect differences in access to health care (Reinhold and Jurges, 2011).[5] Therefore, both objective and subjective indicators can help to understand patterns and determinants of SES inequalities in health.

[4] As Chen et al. (2006) used the same data as Case et al. (2002), the result for general health status was puzzling. A follow-up analysis by Case et al. (2007) attributed the differences to the inclusion of a small number of young adults in the Chen et al. (2006) study.

[5] While these analyses for children do not compare subjective and objective measures of the same condition, Johnston et al. (2009) found that the income gradient in hypertension among English adults was underestimated when self-reported hypertension was used as the outcome variable; this was because the probability of false negative reporting of hypertension was significantly higher for those on lower incomes.

The extent to which the relationship between SES and child health may be interpreted as causal when using cross-sectional data is obviously limited. Ideally, a source of exogenous variation in SES would be used to identify causal effects. For example, Lindeboom *et al.* (2009) exploited an exogenous change in the school-leaving age in the UK in 1947 to examine the impact of parental education on child health (using a regression discontinuity design). IV approaches are another alternative, although finding appropriate instruments is always a challenge (for example, the papers by Currie and Gruber (1996) and Currie *et al.* (2008) used variations in the extension of Medicaid eligibility to children in the US across states and time as instruments for public health insurance). An alternative strategy using cross-sectional data is to control for unobserved factors using 'within family fixed effects' (Joyce *et al.*, 2000). This requires detailed information on siblings within families (which is not available in the data used in this study). In addition, Propper *et al.* (2007) has questioned the validity of fixed effects estimation techniques for analyses using children, as individual characteristics which may considered fixed (time-invariant) for adults may only become so during childhood (e.g., allergies).

3 Data

In this paper we use micro-data from a nationally-representative survey of children in the Republic of Ireland. *Growing up in Ireland (GUI)* surveys two cohorts of children (i.e., an Infant Cohort, and a Child Cohort). Currently, the micro-data from the first wave of each cohort are available for analysis. The Infant Cohort is made up of the families of 11,134 nine month old children. The children were born between 1st December 2007 and the 30th June 2008 and data collection for that group took place between September 2008 and April 2009 (Quail *et al.*, 2011). The sampling frame for the Infant Cohort was the Child Benefit Register. The achieved sample of over 11,000 nine month olds represents approximately 27 per cent of eligible children over that period (Quail *et al.*, 2011).

The Child Cohort represents 8,568 children born between 1st November 1997 and 31st October 1998. Data collection for this group took place between August 2007 and May 2008, meaning that the children were aged nine years old on average. The sampling frame for the Child Cohort was the primary school system. This allowed for the collection of additional data from the teacher and principal in the school, as well as the administration of various academic achievement tests in a group setting (thus reducing respondent burden in the home). The sample design was based on a two-stage selection process in which the school was the primary sampling unit and the children in the school were the secondary units. The achieved sample of over 8,500 nine year olds represents approximately 14 per cent of the total population of Irish nine year olds (Murray *et al.*, 2011).

In this study we concentrate on singleton children. This results in the exclusion of 398 children from the Infant Cohort sample and 275 children from the Child Cohort sample. We do not pool the data from the two cohorts as some of the variables are constructed from underlying questions with differences in wording and response categories. After excluding observations with missing data (largely due to missing data on household income), final samples of approximately 9,000 (nine month olds) and 6,000 (nine year olds) are available for analysis (final sample sizes differ due to differences in the number of missing observations for different variables). For the main analysis, we run the models using the same set of independent variables for both samples to ensure comparability between the results (while recognizing that there may be some differences in variable definition).

We focus on four broad indicators of child health in this study; two 'objective' (length/height and weight/BMI) and two 'subjective' (parental assessed child health and chronic illness incidence).

Length/Height

In the Infant Cohort, the length of the infant was measured by the interviewer using a SECA 210 measuring mat, and measured in centimetres (cms) (Quail *et al.*, 2011). In the Child Cohort, height was measured by the interviewer using a standard measuring stick (Leicester portable height measure), and recorded in centimetres (Growing up in Ireland, 2009). In common with other studies (Rona *et al.*, 1978; Chinn *et al.*, 1989; Finch and Beck, 2011; Reinhold and Jurges, 2011), we analyse child length/height in the form of a length/height-for-age z score or standard deviation score; this is calculated for each child as the difference between his length/height and the median length/height of a population of the same age and sex divided by the standard deviation for that population. It removes the effects of age and sex on length/height, while also standardising for the increasing variance between length/height and age as children grow older. We use the World Health Organisation (WHO) length/height-for-age z scores to construct our dependent variables.[6]

Weight/BMI

In the Infant Cohort, we calculate a weight-for-length z score based on measured length and weight (child weight was recorded by the interviewer using SECA 835 weighing scales) (Quail *et al.*, 2011). For the Child Cohort, we calculate a BMI-for-age z score based on measured height and weight (child weight was recorded by the interviewer using medically approved weighing scales, i.e., SECA 761 flat mechanical scales) (Thornton *et al.*, 2011). Once again, we use data from the WHO to construct these indicators.

General Health Status

Assessments of the child's general health status were provided for both cohorts by the primary caregiver.[7] The Infant Cohort information refers to the child's general health at the time of interview (i.e., at nine months), while the Child Cohort information refers to the child's general health over the previous year.

[6] We use the STATA do files supplied by the WHO to generate length/height-for-age z scores (www.who.int/growthref/tools/en/ (last accessed 14 October 2011).

[7] In most cases, the primary caregiver is the child's biological mother. In the GUI Infant sample, 99.9 per cent of observations have the biological mother as the primary caregiver, while in the GUI Child sample, 98.9 per cent of cases have the biological mother as the primary caregiver.

Chronic Illness Incidence

The indicators of chronic illness incidence are very different for the two cohorts. In the Infant Cohort, the primary caregiver is asked whether the child has ever been diagnosed with a number of specified health conditions (e.g., eczema or a skin allergy, asthma, *etc*.). In the Child Cohort, the primary caregiver is asked more generally whether the child has any on-going chronic physical or mental health problem, illness or disability.

Table 1 contains further details on each of the dependent variables used in our analysis.

[insert Table 1 here]

Table 2 presents summary statistics on each of the four main dependent variables for both cohorts, separately for males and females. For both length/height and weight/BMI, Irish children are above average (as the z score is greater than zero). In all cases, boys are longer/taller/heavier than girls, although the differential is smaller for BMI at age nine years. In terms of parental assessments of child health, over 80 per cent of infants are regarded as currently 'very healthy', while just over three-quarters of nine year olds are regarded as having been 'very healthy' over the previous year. The majority of Irish children do not have a chronic illness (whether doctor diagnosed, or based on the assessment of their primary caregiver), although boys have a higher incidence than girls in both cohorts.

[insert Table 2 here]

Independent Variables

Our primary indicator of SES in this paper is household income but we also examine the gradient in child health by mother's highest level of education. Household income is net weekly household income, adjusted for the composition of the household using equivalence scales.[8] Mother's education is a six-category variable based on the ISCED level of the mother's highest level of education. We also test the influence of alternative indicators of SES (i.e., social class, housing tenure, father's education, eligibility for free public health care, household deprivation and mother's SES during her childhood).

Additional independent variables include child characteristics such as age and sex (where appropriate) and birth order (to proxy increased exposure to infections/less investment in child

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[8] GUI uses the 'ESRI' equivalence scale which assigns a value of 1 to the first adult in the household, 0.66 to all others aged 14 years and over, and 0.33 to all children aged 13 years and younger.

health). A set of variables representing circumstances of birth and the early life of the child, namely, birth weight, gestation length, breastfeeding status and mother's smoking and alcohol consumption during pregnancy are also included. There are strong genetic influences on child health, which we account for by variables describing mother's health.[9] We also include indicators for mother's age, lone parent status and ethnic/cultural background. As with child's height and weight, parental heights and weights are also measured by the interviewer in the GUI (Growing up in Ireland, 2009).

Wherever possible, variables are constructed in such a way as to minimise differences in definition across the two analyses. Table 3 presents variable definitions for all independent variables used in this analysis, and contains more detailed information on any underlying differences in question wording.

[insert Table 3 here]

4 Methods

We estimate simple cross-sectional reduced form models of child health for each cohort as follows:

$$y_i = \alpha_0 + \alpha_1 I_i + \alpha_2 E_i + \alpha_3 X_i + u_i \qquad (1)$$

where y_i represents the health of child *i*, I_i represents household equivalised income, E_i represents mother's education and X_i represents the vector of additional control variables (i.e., gestation, *etc*.). Robust standard errors are calculated for the Infant Cohort and the standard errors are adjusted for the clustering of observations by the primary sampling unit (i.e., the school) for the Child Cohort. All models are estimated using STATA 12.1. For the analyses of the objective indicators of child health (length/height; weight/BMI), we use OLS estimation techniques. For the analysis of general health status, we estimate an ordered logit model, while for the analysis of chronic illness incidence, we estimate a binary probit model.

We begin by estimating restricted versions of the models that control for household income only, i.e., assuming that $\alpha_2 = 0$ and $\alpha_3 = 0$. We then add controls for a) mother's education, b) child and mother characteristics, including the relevant indicator of mother's health (e.g., for the analysis of child height, we include mother's height; for the analysis of child general health status, we include mother's assessment of her own health, *etc*.) and c) additional mother's health variables. While the results for the restricted and three unrestricted versions of the models are presented in Tables 4-7,

[9] We do not include father's health as a much larger proportion of observations are missing information on father's health in both cohorts.

the unrestricted versions of the models are superior in terms of model fit (and in most cases, the models with the full set of mother's health variables are preferred). However, we also discuss the results from the restricted models, as many of our control variables are potentially correlated with our SES indicators (e.g., smoking behaviour, mother's health, *etc*.).

As noted above, inferring a causal relationship between SES and health outcomes is impossible with the data available. However, to some extent if the results for SES (income, education) are robust to the inclusion of additional variables reflecting initial health conditions and parental behaviours, then we can be more assured that we are actually measuring the causal effect of SES (Reinhold and Jurges, 2011). While the availability of longitudinal data can allow the researcher to control for time-invariant unobserved effects, there is some debate in the literature over the applicability of longitudinal data techniques to analyses of children (Propper *et al.*, 2007).

Robustness Checks

To ensure that our results are robust to differences in variable construction, sample coverage, *etc*., we run a number of robustness checks. First, we test for the existence of a SES gradient in child health using various other indicators of SES, such as social class, housing tenure, father's education, access to free public health care, household deprivation and the financial situation of the mother's family when she was aged 16. The latter is intended to capture the possibility that the childhood SES of the mother is a stronger influence on the health of her children than current SES. Second, the effect of the exclusion of missing observations on income needs to be examined. In both cohorts, approximately 7-8 per cent of observations are missing information on household income. We therefore include an indicator for the missing income observations to test the robustness of our results to the exclusion of these cases. Finally, a common criticism of research on SES inequalities in health is that the observed relationship between SES and health may be subject to reverse causation. While the problem is less pressing when examining child health (because children do not work) (Case *et al.*, 2002; Reinhold and Jurges, 2011), it is still possible that child health is correlated with parental labour supply and by extension, household income. It is less likely for mother's education, as most mothers should have completed their education before starting a family. Nevertheless, as per Currie *et al.* (2007), we therefore repeat the analysis excluding children with severe or limiting chronic illnesses, as it is possible that parental labour supply, particularly on the part of the mother, might be affected if a child has a condition that requires more intensive care on the part of parents.

5 Empirical Results

Bivariate Results

Before presenting the results of the multivariate OLS models, Figures 1 to 4 plot the relationship between each of our four indicators of child health and household equivalised income.[10] As is evident from the figures, there is a clear SES gradient in child length/height for both cohorts, particularly for the nine year olds, and particularly for boys. For example, nine year old boys in the highest income quintile are 2.1cms taller on average than boys in the lowest income quintile (or 1.5 per cent taller). While there is also an SES gradient in child weight, the relationship suggests that, with the exception of nine year old boys, children in lower income quintiles are heavier than children in higher income quintiles (and note that these figures present weight in kilogrammes (kgs), unadjusted for length/height). This effect is particularly strong for nine year old girls, where girls in the highest income quintile are nearly 1.2kgs (or 3.4 per cent) lighter than their counterparts in the lowest income quintile. In contrast, nine year old boys in the higher income quintiles are heavier than their counterparts in the lower income quintiles. For parental assessed health status, and chronic illness incidence, an interesting pattern emerges. While the patterns for the Infant Cohort suggest little relationship between SES and parental-assessed child health (and a positive SES gradient for chronic illness incidence)[11], for the Child Cohort there is a clear SES gradient with respect to both parental assessed health and chronic illness incidence (i.e., children from better-off families are healthier on average). However, SES is correlated with numerous other factors that might influence child health (e.g., mother's behaviour during pregnancy), and therefore a full multivariate analysis is necessary to untangle the independent effect of SES on child health.

[insert Figures 1-4 here]

Multivariate Results

Tables 4-7 present the results of the multivariate analyses for each of our four indicators of child health. In each table, column (1) presents the results of the restricted model, i.e., with an indicator for household equivalised income only. Column (2) adds controls for mother's education. Column (3) adds controls for child characteristics (i.e., age, sex, birth order, childcare arrangements); pregnancy/early life characteristics (i.e., birth weight, gestation, breastfeeding, mother's smoking and drinking during pregnancy); mother characteristics (age, lone parent status, ethnic/cultural background, health). Finally, column (4) adds the full set of controls for mother's health. In the

[10] Sample weights are employed.

[11] As discussed later, the positive relationship between higher income and chronic illness incidence for the Infant Cohort is likely due to the fact that the chronic illness indicator asks about 'doctor diagnosed' illnesses, and health-care utilisation in the Irish context has been found to be positively correlated with household income (controlling for public health-care entitlements).

majority of cases, the models with the full set of independent variables (i.e., the models presented in column (4)) are preferred.[12]

Beginning with length/height in Table 4, the results indicate that there is a significant raw income gradient in child length/height. For both cohorts, children from higher income families are significantly longer/taller than children from lower income families. However, after adjustment for other factors that influence length/height, income becomes insignificant in determining length at age nine months, but remains significant in explaining variations in child height at age nine years. In contrast, while mother's education is initially significant for both cohorts, it becomes insignificant once additional controls are added to the models. The remaining independent variables have effects that are largely consistent with expectations (higher order children are shorter, children that were heavier at birth are longer/taller, *etc*.). For both cohorts, mother's height is highly significant, reflecting the strong genetic influence of parental height. However, there are a number of instances in which effects differ across the two cohorts, although in the absence of longitudinal data, it is impossible to determine whether this reflects an age or a cohort effect, or a combination of both. For example, the children of lone parents are shorter in infanthood, but taller at age nine, and we have no clear explanation for either result (except that we may have expected lone parenthood to act as an additional proxy for SES) (as found in other studies such as Gorman and Braverman (2008)). In addition, mother's age is only significant for nine year olds, and prenatal smoking and drinking are only significant for nine month olds. The effect for type of childcare (while only significant for the infants) suggests that children who are cared for in centre-based childcare are significantly shorter than children who are cared for at home by their parent(s), which might indicate a role for increased exposure to infections in impeding the growth of young children.

Examining the results for child weight-for-length/BMI-for-age in Table 5 reveals once again that while the children of higher income families are significantly lighter than their counterparts from lower income families, these effects become insignificant once other controls are added to the models. However, the results indicate that mother's education is the more important SES influence, and for nine year olds, it remains highly significant even after the inclusion of a variety of child and mother characteristics. The children of lower educated mothers have a significantly higher BMI than the children of mothers with a postgraduate qualification, and the effect is broadly linear. Again, one of the strongest influences on child weight is mother's BMI, and the marginal effect is particularly large for the nine year olds. Most of the remaining independent variables have effects that are consistent with expectations, although it is difficult to explain why the children of mothers who smoked during pregnancy should be heavier at nine months (except via the high correlation between low SES and smoking during pregnancy).

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[12] The exceptions are the models of infant length and weight, and child BMI. Results of these model selection tests are available on request from the authors.

Turning to the first of our ‘subjective’ indicators of child health in Table 6, the results for parental assessed child health illustrate that while household income is never significant in explaining infant general health status, it is highly significant in explaining general health status at age nine years, and remains significant even after controlling for a variety of child and mother characteristics. Mother’s education emerges as a more important predictor of general health status among infants, while it is insignificant for the older children. However, the effect of mother’s education for infants suggests that the children of lower educated mothers are significantly more likely to be reported as ‘very healthy’, which is perhaps contrary to initial expectations. However, it is possible that higher-educated mothers of infants are displaying the phenomenon of the ‘worried well’, and that this is reflected in their assessments of their child’s general health status. For both cohorts, there is a significant association between indicators of mother’s health and her child’s health, particularly mother’s self-assessed general health and depression score. Once again, there are some interesting differences in the effects between the two cohorts; for example, higher-order infants are significantly less likely to be ‘very healthy’, while the opposite is the case for higher-order nine year olds who are significantly more likely to be ‘very healthy’.

Finally, the results for the incidence of a chronic illness are presented in Table 7. As with the more objective indicators, there is a significant raw income gradient in chronic illness incidence for both cohorts, although the effect for infants is perhaps contrary to expectations. However, this result most likely reflects the nature of the underlying question, which asks about the incidence of 16 specific ‘doctor diagnosed’ chronic conditions; in a health-care system where only 30-40 per cent of the population have access to free primary care, it is not surprising that we observe this effect for household income. The results for mother’s education, in addition to its effect as a proxy for SES, again possibly reflect the ‘worried well’ phenomenon, where the children of mothers with lower levels of education are less likely to have a ‘doctor’ diagnosed chronic illness. Both these effects persist for the Infant Cohort even after the inclusion of additional controls. In contrast, household income is insignificant in determining chronic illness incidence among the Child Cohort sample (where the question simply asks whether the child has a chronic illness), and mother’s education is largely insignificant in determining chronic illness incidence at age nine years. For both cohorts, as with all other indicators, mother’s health is significant in determining child health, with mother’s depression score, self-assessed health, BMI (for the nine year olds only) and her own chronic illness incidence all highly significant.

Robustness Checks

A number of robustness checks were carried out. First, we test the robustness of the household income and mother’s education effects by adding a number of alternative indicators of SES to the models, such as social class, housing tenure, access to free public health care, household deprivation and the financial situation of the mother’s family when she was aged 16. The results for household income and mother’s education are robust to the inclusion of alternative indicators of SES, which are generally insignificant. The exception is household deprivation and the financial situation of the mother's family when she was aged 16, where these effects were significant in the models of chronic illness incidence (Infant Cohort) and height (Child Cohort). Second, the effect of the exclusion of missing observations on income was examined. In all cases, the inclusion of an indicator for missing income cases does not change the results from the models presented in Tables 4-7.[13] Finally, a common criticism of research on SES inequalities in health is that the observed relationship between SES and health may be subject to reverse causation. While the problem is less pressing when examining child health (because children do not work) (Case *et al.*, 2002; Reinhold and Jurges, 2011), it is still possible that child health is correlated with parental labour supply and by extension, household income in particular. Nevertheless, as per Currie *et al.* (2007), we therefore repeat the analysis excluding children with severe or limiting chronic illnesses, and find no difference in the model results.[14]

6 Discussion and Conclusions

There is extensive empirical evidence on the link between SES and health outcomes in adults. The evidence for children is less conclusive. Recent debates focus on the extent to which SES gradients in child health increase as children age, whether the gradient is observed for objective as well as subjective indicators of health status, and whether the gradient is weaker in countries with universal access to free or subsidised primary care services. Using detailed cross-sectional micro-data on two cohorts of children in Ireland (aged nine months and nine years) from the Growing up in Ireland (GUI) study, the purpose of this paper was to add to this debate in two areas: i) examining the SES gradient in various objective and subjective indicators of child health (length/height; weight/BMI; general health status; chronic illness incidence), and ii) examining the degree to which any observed gradient may be stronger for subjective indicators of child health. As noted, the available evidence on this issue in Ireland is very sparse and this is the first paper to examine SES patterns across a variety of indicators of child health, and across two cohorts of children.

While the GUI study contains rich information on child health and family circumstances, there are several data limitations that must be noted. First, the analysis in this paper is cross-sectional, and therefore can only make inferences about the *association* between SES and child health, rather than about the possible causal mechanisms. However, the inclusion of additional variables representing early life conditions, parental behaviours and parental health status allows us to examine the factors that may mediate the relationship between SES and child health. Second, much of the research in this area examines the extent to which SES inequalities in child health widen as children age (see Section 2); with cross-sectional snapshots, albeit of children of different ages, we cannot shed any light on this debate here. Third, the international research also examines the extent to which SES gradients may be stronger in countries that do not have universal access to free public, and particularly primary, health care. Ireland is unusual in Europe in requiring the majority of the

[13] We also tested the use of a categorical income variable and found no difference in the effect.
[14] Results from these various robustness checks are available from the authors.

population (including children) to pay the full cost of primary care, but in the absence of longitudinal data which would capture changing eligibility for free primary care over time, we cannot examine this issue here. Finally, caution is necessary in comparing across cohorts for the chronic illness indicator as the underlying questions and response categories differ substantially.

Notwithstanding these data limitations, the results of this analysis confirm that for nine month old infants, there is little evidence of a significant income gradient in child health; the exception is for chronic illness where higher-income children are more likely to have a 'doctor diagnosed' chronic illness. These are similar findings to those in the international literature (for example, Currie *et al.* (2007) and Reinhold and Jurges (2011) find an insignificant income gradient when examining the height/length of English and German children). However, the effects for mother's education are more significant overall, and persist even when other influences on child health (such as child and mother characteristics) are included in the models of general health status and chronic illness incidence, lending some support to the international research findings in this area (Currie *et al.*, 2007).

The evidence is quite different when examining the findings from the Child Cohort analysis. For this group, a significant income gradient in height is observed, and this effect persists when other influences on child height are included in the models. In contrast, while there is a strong and significant income gradient in parental-assessed child health, there is no such effect for chronic illness incidence. Mother's education is highly significant in explaining variations in child BMI-for-age, and these effects persist when other important influences on child health (including mother's BMI) are included in the models. In general however, mother's education is insignificant in explaining variation in the other indicators such as parental-assessed child health.

For both cohorts, these results are robust to i) the inclusion of additional indicators of SES, ii) the exclusion of observations with missing values on income and iii) the exclusion of children with moderate or severe chronic/longstanding illnesses (to discount the possibility of reverse causation). The relative significance of the additional controls sheds some light on the possible factors that mediate the relationship between SES and infant health, albeit based on cross-sectional associations (with birthweight and mother's health the most important mediating factors in general). The significance of parental health in explaining child health has also been found for other countries. For example, Propper *et al.* (2007), using data from the UK, found that once they controlled for 'maternal inputs into child health' (i.e., smoking, employment, diet, housing, pre-birth self-assessed health, mental health, anthropomorphic measures, partner's health), there was no direct effect of low income on four of the five child health outcomes at age seven (the exception was BMI). Similarly, Khanam *et al.* (2009) found that including parental health (particularly mother's health) reduced the income coefficient to zero in an examination of the parental-reported health and chronic condition incidence of Australian children. However, studies by Case *et al.* (2002), Currie *et al.* (2007) and Reinhold and Jurges (2011) from the US, England and Germany respectively, found that the significant SES gradient in general health status was robust to the inclusion of controls for parental health (a similar finding was observed for our nine year olds).

However, to some extent the variables for mother's health are also capturing the cumulative impact of parental childhood SES, and as such represent an over-adjustment. To disentangle the genetic and socio-economic contributions of the mother's health variables would require detailed data on the SES of mothers (and partners) when they themselves were children. In the absence of such data, we investigated the use of a variable describing mother's financial background (i.e., her self-assessment of the financial status of her household when she was aged 16) as such an indicator. It is possible that the childhood SES of the mother is a stronger influence on the health of her children than current SES. However, as noted above, with the exception of the Infant Cohort chronic illness model, and the Child Cohort height model, this variable was always insignificant in explaining child health.[15] Similarly, it is possible that the more appropriate indicator of SES is a measure of permanent income rather than SES. For example, Cameron and Williams (2009) distinguish between income, consumption and wealth effects, albeit in a developing country, although Khanam *et al.* (2009), Case *et al.* (2002) and Currie *et al.* (2007) (Case *et al.*, 2002; Currie *et al.*, 2007)all found significant effects for both permanent and current income in Australia, the UK and US respectively. Propper *et al.* (2007) tried to distinguish the impact of current and permanent low income and found a significant effect for persistent financial hardship on child health. We investigated the use of an indicator of deprivation and found that it was only significant in explaining chronic illness incidence among infants, and height of nine year olds. Future research using the longitudinal GUI data should allow us to construct a more accurate indicator for permanent income and deprivation.

The data used in this analysis are cross-sectional, and therefore the extent to which conclusions about causal mechanisms can be drawn is limited. However, as a first step in documenting the extent of SES inequalities in child health in Ireland, and contributing to the international debate on whether the gradient may be stronger for subjective indicators of health, the results shed some light on the possible causal mechanisms (such as birth characteristics and parental health), that will be open to further investigation as extra waves of both data-sets become available.

[15] We also tested interactions between mother's financial situation as a child and current education/income (e.g., we might expect the effect of parental childhood disadvantage to persist even when current socio-economic position improves). However, all interactions were insignificant.

Tables and Figures

Table 1 Dependent Variable Definitions

	GUI Infant Cohort (Average Age 9 Months)	GUI Child Cohort (Average Age 9 Years)
LFAZ score	Length-for-age z score	n/a
HFAZ score	n/a	Height-for-age z score
WFLZ score	Weight-for-length z score	n/a
BMIFAZ score	n/a	BMI-for-age z score
Very healthy[a]	=1 if very healthy, no problems (reference group)	=1 if very healthy, no problems (reference group)
Healthy[a]	=1 if healthy but a few minor problems	=1 if healthy but a few minor problems
Ill[a]	=1 if sometimes quite ill/almost always unwell	=1 if sometimes quite ill/almost always unwell
No chronic illness[b]	=1 if no chronic illness (reference group)	=1 if no chronic illness (reference group)
Chronic illness[b]	=1 if at least one chronic illness	=1 if at least one chronic illness

Notes:

[a] In the Infant Cohort, the variable is constructed from responses to the question 'In general, how would you describe <Baby's> Current Health?', while the corresponding question in the Child Cohort is 'In general, how would you describe the Study Child's health in the past year?'.

[b] In the Infant Cohort, the variable is constructed from responses to the question 'Has a medical professional ever told you that <baby> has any of the following conditions?, with 16 conditions specified (e.g., asthma, diabetes, epilepsy, *etc*.). In the Child Cohort, the variable is constructed from the responses to the question 'Does the Study Child have any on-going chronic physical or mental health problem, illness or disability?', and respondents are asked to specify up to three conditions.

Table 2 Dependent Variable Summary Statistics

	GUI Infant Cohort (Average Age 9 Months)		GUI Child Cohort (Average Age 9 Years)	
	Males	**Females**	**Males**	**Females**
LFAZ score	0.8202088	0.7371738	n/a	n/a
HFAZ score	n/a	n/a	0.7646287	0.6237472
WFLZ score	0.9507745	0.9028812	n/a	n/a
BMIFAZ score	n/a	n/a	0.6964518	0.6928692
Very healthy (%)	81.3	84.5	72.9	73.2
Healthy (%)	17.4	14.6	25.9	24.9
Ill (%)	1.3	0.9	1.2	1.9
No chronic illness (%)	72.6	78.5	87.9	90.2
Chronic illness (%)	27.3	21.5	12.1	9.85

Note: Sample weights are employed.

Table 3 Independent Variable Definitions

	GUI Infant (Average age 9 months)	GUI Child (Average age 9 years)
SES		
Equivalised income[a]	Natural logarithm of equivalised net income	Natural logarithm of equivalised net income
Primary	=1 if mother's highest level of education is primary level	=1 if mother's highest level of education is primary level
Lower secondary	=1 if mother's highest level of education is Intermediate/ Junior/ Group Certificate	=1 if mother's highest level of education is Intermediate/ Junior/ Group Certificate
Upper secondary	=1 if mother's highest level of education is Leaving Certificate or equivalent	=1 if mother's highest level of education is Leaving Certificate or equivalent
Non-degree	=1 if mother's highest level of education is Diploma/Certificate	=1 if mother's highest level of education is Diploma/Certificate
Degree	=1 if mother's highest level of education is Primary Degree	=1 if mother's highest level of education is Primary Degree
Postgraduate	=1 if mother's highest level of education is Postgraduate Degree	=1 if mother's highest level of education is Postgraduate Degree
Child Characteristics		
Child Age[b]	n/a	Child's age in years
Male	=1 if male	=1 if male
Female	=1 if female	=1 if female
Birth Order[c]	Child's birth order	Child's birth order
Care at home	=1 if looked after by parent(s) at home	=1 if looked after by parent(s) at home
Care by relative/au pair	=1 if looked after by relative/au pair in own/relative home	=1 if looked after by relative/au pair in own/relative home
Care in centre	=1 if centre-based childcare	=1 if centre-based childcare
Pregnancy/Early Life Characteristics		
Birth weight[d]	Child birth weight in kgs	Child birth weight in kgs
Less than 37 weeks	=1 if early delivery (36 weeks or earlier)	=1 if early delivery (36 weeks or earlier)
37-41 weeks	=1 if on time delivery (37-41 weeks)	=1 if on time delivery (37-41 weeks)
42+ weeks	=1 if late birth (42+ weeks)	=1 if late birth (42+ weeks)
Smoke[e]	=1 if mother smoked during pregnancy	=1 if mother smoked during pregnancy
No smoke[e]	=1 if mother did not smoke during pregnancy	=1 if mother did not smoke during pregnancy
Drink[f]	=1 if mother drank alcohol during pregnancy	=1 if mother drank alcohol during pregnancy
No drink[f]	=1 if mother did not drink alcohol during pregnacy	=1 if mother did not drink alcohol during pregnacy
Breastfeeding[g]	=1 if child was ever breastfed	=1 if child was ever breastfed
No breastfeeding[g]	=1 if child was never breastfed	=1 if child was never breastfed

Notes: [a] Net income refers to weekly income after deductions for tax and pay-related social insurance (PRSI). The equivalence scale used assigns a value of 1 to the first adult, 0.66 to all others aged 14 years and over, and 0.33 to all children aged 13 years and younger.

[b] Age is recorded in years in the GUI. All infants are aged 0, and while the majority of children from the Child Cohort are aged 9 years of age, smaller proportions are aged 8 and 10 years.

[c] Only and eldest children are given the value 1, children with one older sibling are given the value 2, children with two older siblings are given the value 3, *etc*.

[d] Birth weight is not included as an independent variable in the model of infant weight.

[e] In the Infant Cohort, the variable is constructed from the question 'Did you smoke at all during your pregnancy?. In the Child Cohort, the variable is constructed from the responses to the question 'Did you smoke during your pregnancy with the Study Child?', with respondents answering 'occasionally' or 'daily' regarded as smokers.

[f] In the Infant Cohort, the variable is constructed from the question 'Did you consume alcohol during your pregnancy?. In the Child Cohort, the variable is constructed from the responses to the question 'Did you consume alcohol during your pregnancy with the Study Child?', with respondents answering 'occasionally', 'weekly' or 'daily' regarded as drinkers.

[g] In the Infant Cohort, the variable is constructed from the question 'Was <Baby> ever breastfed?'. In the Child Cohort, the variable is constructed from the question 'Was the Study Child ever breastfed, even if only for a short time?'.

Table 3 continued

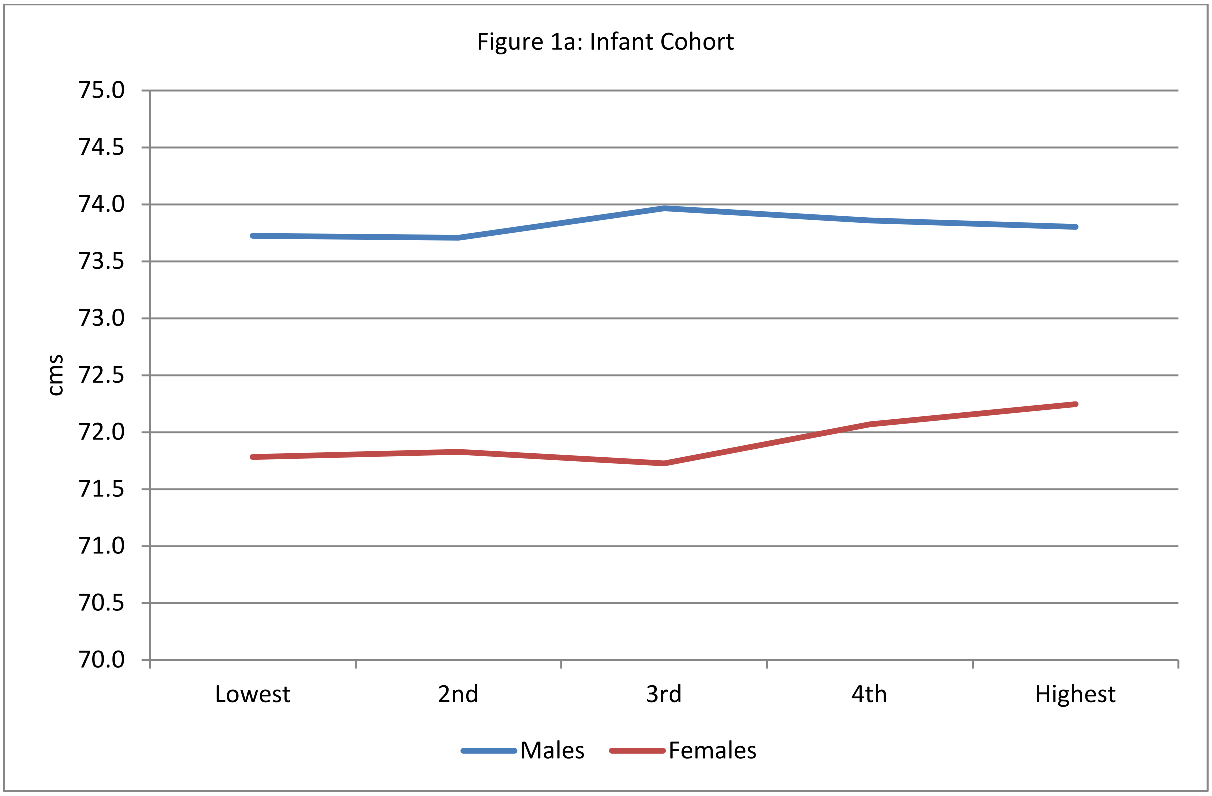
	GUI Infant (Average age 9 months)	GUI Child (Average age 9 years)
Mother Characteristics		
Age	Mother's age in years	Mother's age in years
Lone parent	=1 if lone parent family	=1 if lone parent family
Two parent	=1 if two-parent family	=1 if two-parent family
Height	Height in cms	Height in cms
BMI	BMI	BMI
Excellent[h]	=1 if excellent self-assessed health	=1 if excellent self-assessed health
Very good[h]	=1 if very good self-assessed health	=1 if very good self-assessed health
Good[h]	=1 if good self-assessed health	=1 if good self-assessed health
Fair/poor[h]	=1 if fair or poor self-assessed health	=1 if fair or poor self-assessed health
Chronic illness[i]	=1 if mother has a chronic illness	=1 if mother has a chronic illness
No chronic illness[i]	=1 if mother does not have a chronic illness (reference group)	=1 if mother does not have a chronic illness (reference group)
Depression score[j]	Total depression score	Total depression score
White	=1 if ethnic/cultural background is Irish, Irish Traveller or other white	=1 if ethnic/cultural background is Irish, Irish Traveller or other white
Black	=1 if ethnic/cultural background is African or other black background	=1 if ethnic/cultural background is African or other black background
Asian	=1 if ethnic/cultural background is Chinese or other Asian background	=1 if ethnic/cultural background is Chinese or other Asian background
Other	=1 if ethnic/cultural background is mixed, or other	=1 if ethnic/cultural background is mixed, or other

Notes: [h] In both cohorts, the variable is constructed from the question 'In general, how would you say your current health is?'.

[i] In both cohorts, the variable is constructed from the question 'Do you have any on-going chronic physical or mental health problem, illness or disability?'.

[j] The total depression score is constructed from responses to the short (8 item) form of the Center for Epidemiological Studies Depression Scale. Values range from a minimum of 8 to a maximum of 32.

Figure 1 Child Height/Length (cms) by Equivalised Income Quintile



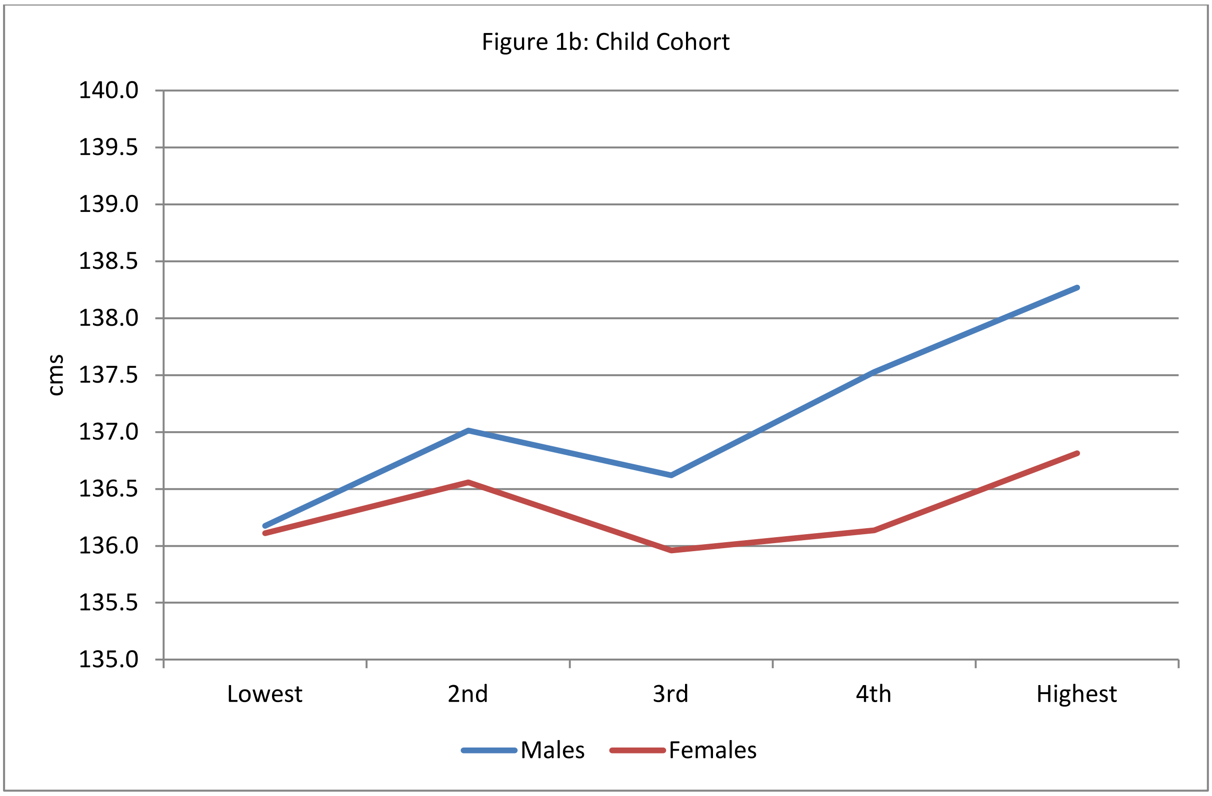
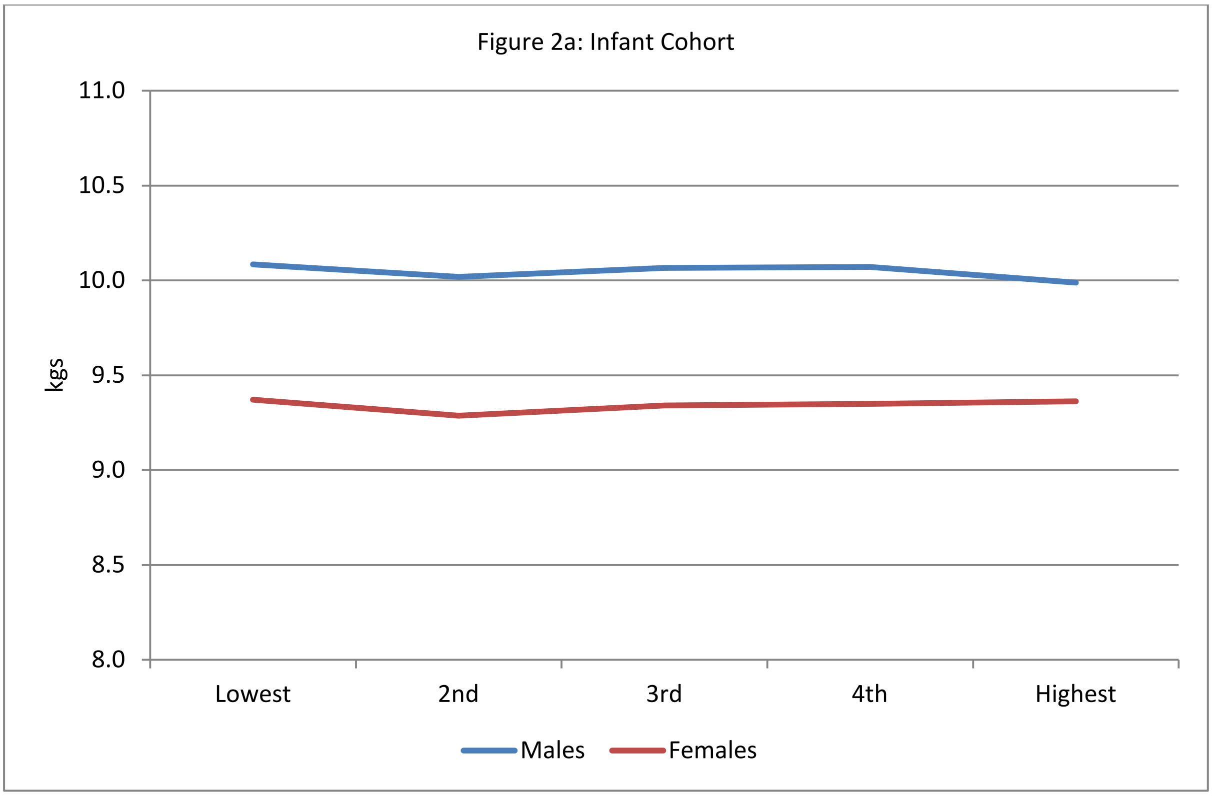


Figure 2 Child Weight (kgs) by Equivalised Income Quintile



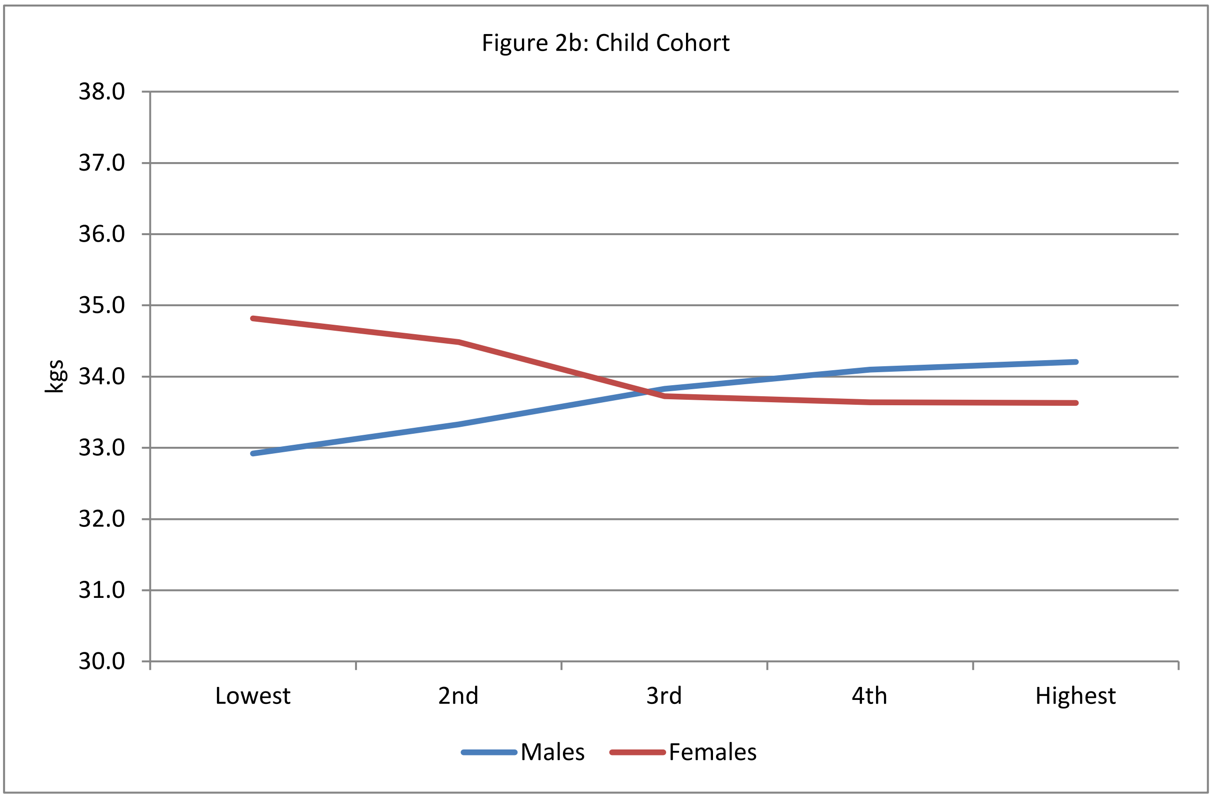
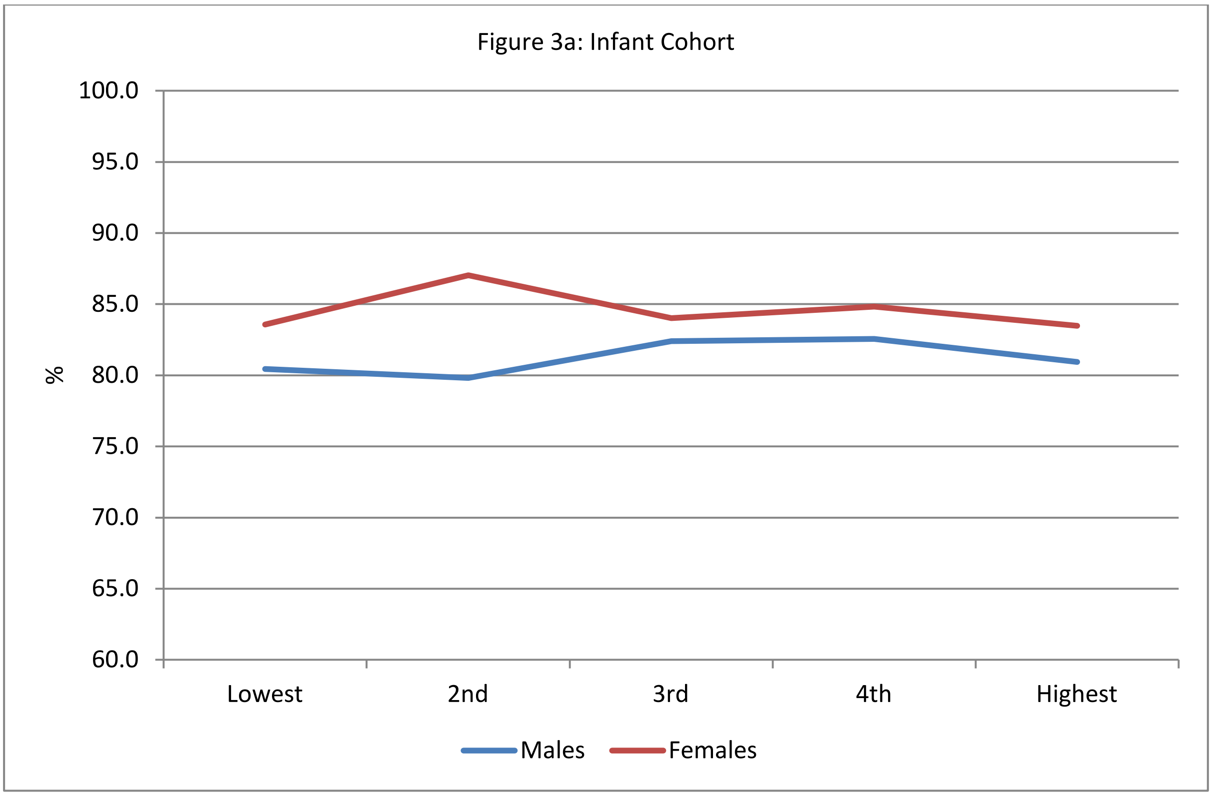


Figure 3 Child General Health (% 'very healthy') by Equivalised Income Quintile



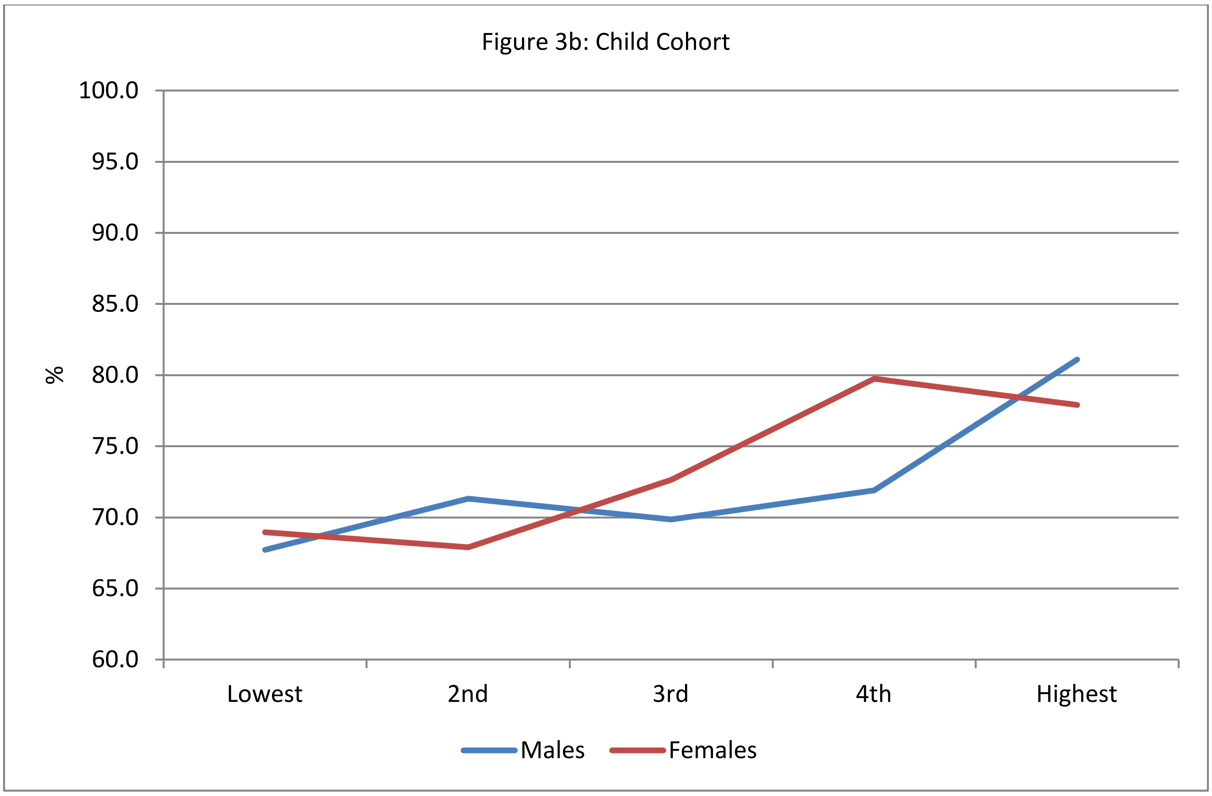
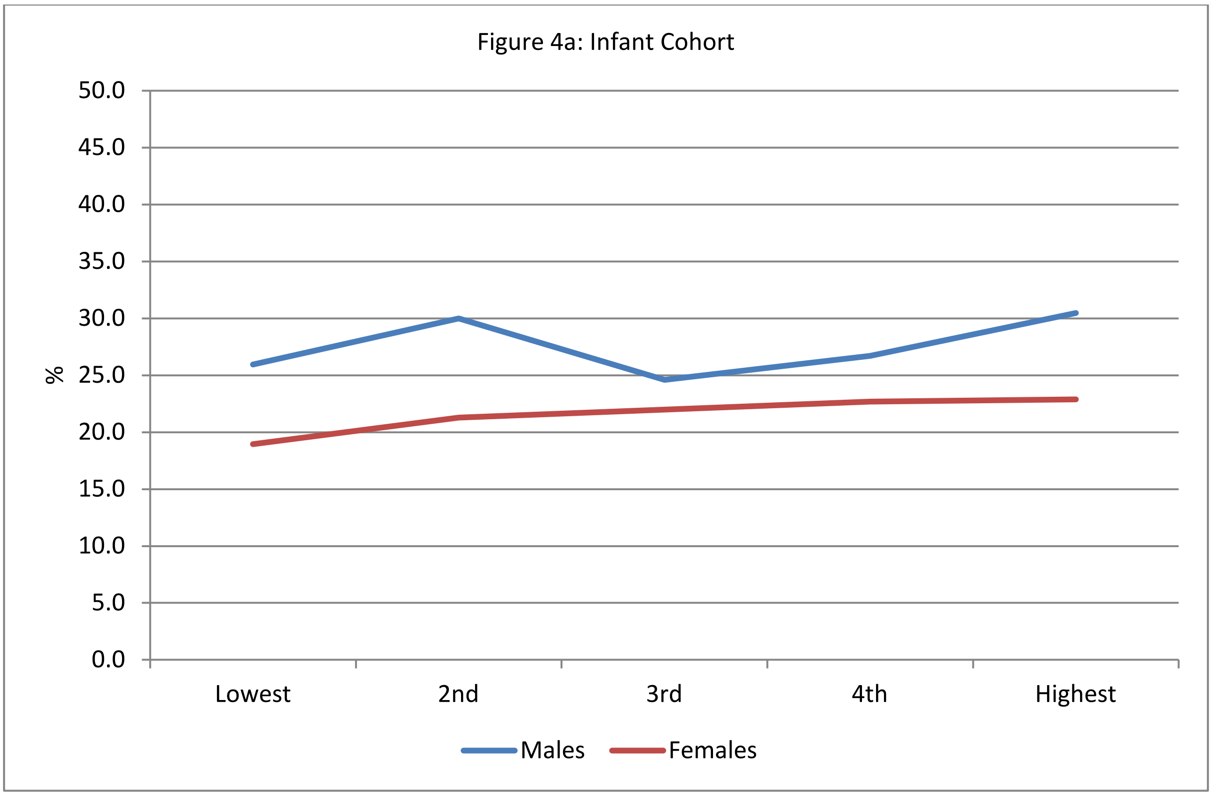


Figure 4 Child Chronic Illness (% 'yes') by Equivalised Income Quintile



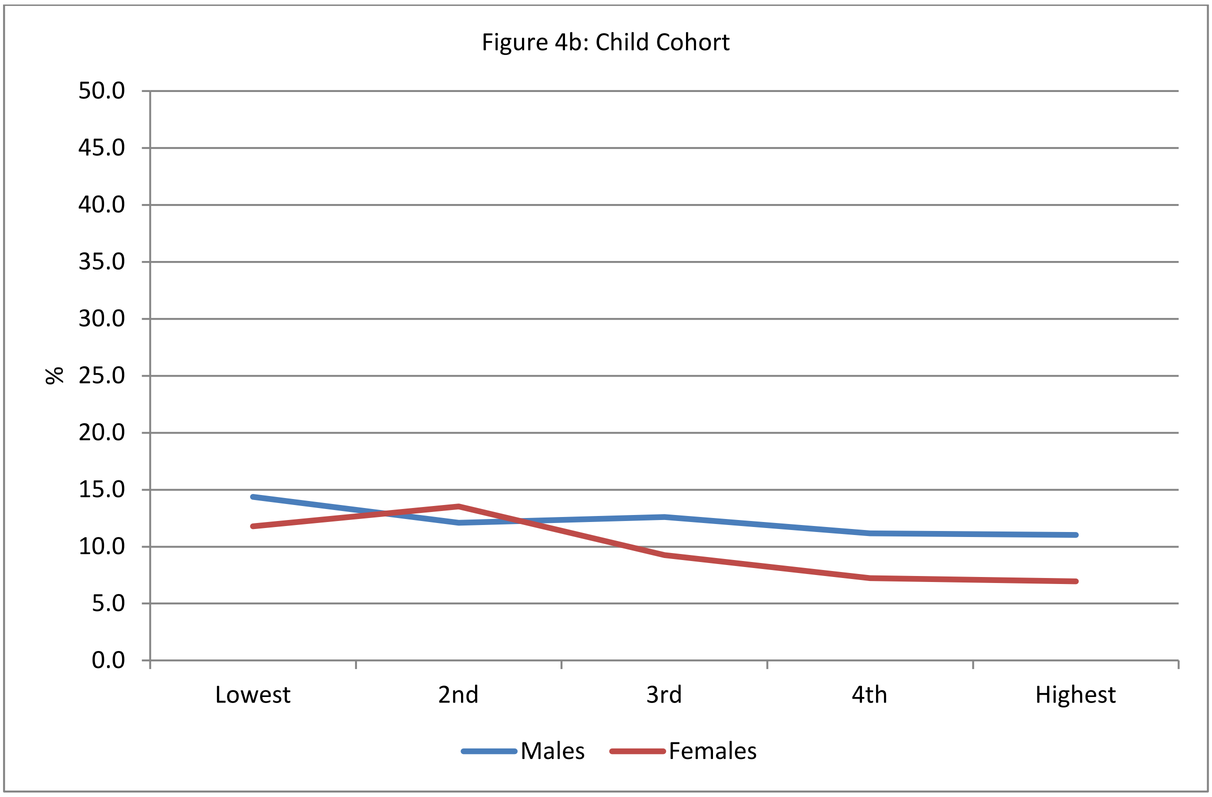


Table 4 OLS Models of LFAZ/HFAZ scores

	Infant Cohort (Average Age 9 Months)				Child Cohort (Average Age 9 Years)			
	(1)	(2)	(3)	(4)	(1)	(2)	(3)	(4)
SES								
Equivalised income	0.085 (0.024)***	0.052 (0.027)**	-0.008 (0.029)	-0.008 (0.029)	0.112 (0.024)***	0.053 (0.026)**	0.035 (0.028)	0.063 (0.030)**
Primary		-0.204 (0.093)**	0.144 (0.095)	0.154 (0.097)		-0.225 (0.086)***	0.093 (0.089)	0.078 (0.098)
Upper secondary		-0.186 (0.065)***	0.055 (0.068)	0.043 (0.068)		-0.234 (0.053)***	-0.036 (0.054)	-0.027 (0.057)
Upper secondary		-0.069 (0.048)	0.029 (0.049)	0.020 (0.049)		-0.095 (0.045)**	-0.002 (0.045)	0.006 (0.047)
Non degree		-0.062 (0.053)	0.037 (0.052)	0.038 (0.053)		-0.017 (0.045)	0.034 (0.044)	0.029 (0.046)
Degree		-0.045 (0.049)	0.011 (0.047)	0.007 (0.047)		-0.007 (0.050)	0.005 (0.049)	0.016 (0.051)
Postgraduate		ref	ref	ref		ref	ref	ref
Child Characteristics								
Birth order			-0.075 (0.016)***	-0.075 (0.017)***			-0.057 (0.013)***	-0.057 (0.014)***
Care at home		ref	Ref	ref		ref	ref	ref
Care by au pair/relative			0.080 (0.033)**	0.084 (0.034)**			0.036 (0.029)	0.027 (0.030)
Centre-based care			-0.106 (0.046)**	-0.107 (0.046)**			-0.005 (0.059)	-0.012 (0.063)
Pregnancy/early life characteristics								
Birth weight			0.732 (0.033)***	0.731 (0.034)***			0.342 (0.023)***	0.305 (0.024)***
Early			0.117 (0.077)	0.105 (0.079)			0.153 (0.041)***	0.141 (0.043)***
On time		ref	ref	ref		ref	ref	ref
Late			0.046 (0.044)	0.046 (0.044)			-0.066 (0.027)**	-0.070 (0.029)**
No breastfeeding			0.053 (0.033)	0.058 (0.033)*			0.039 (0.026)	0.025 (0.027)
Breastfeeding		ref	ref	ref		ref	ref	ref
Smoking			-0.085 (0.041)**	-0.095 (0.042)**			0.014 (0.032)	0.008 (0.034)
No smoking		ref	ref	ref		ref	ref	ref
Drinking			-0.058 (0.035)*	-0.062 (0.036)*			-0.029 (0.023)	-0.024 (0.025)
No drinking		ref	ref	ref		ref	ref	ref
Mother characteristics								
Age			-0.002 (0.003)	-0.002 (0.003)			0.010 (0.003)***	0.011 (0.003)***
Lone parent			-0.144 (0.053)***	-0.155 (0.054)***			0.088 (0.040)**	0.106 (0.044)**
Two parent		ref	ref	ref		ref	ref	ref

Notes:
(i) Standard errors, which are adjusted for clustering on the primary sampling unit for the Child Cohort, are presented in parentheses
(ii) * significant at 10%; ** significant at 5%; *** significant at 1%
(iii) The restricted results (in column 1) include controls for household income only. Column (2) adds controls for mother's education. Column (3) adds controls for child and mother characteristics. Column (4) adds controls for the full set of mother's health variables.

Table 4 continued

	Infant Cohort (Average Age 9 Months)				Child Cohort (Average Age 9 Years)			
	(1)	(2)	(3)	(4)	(1)	(2)	(3)	(4)
White		ref	ref	ref		ref	ref	ref
Black			0.319 (0.098)***	0.302 (0.099)***			0.529 (0.122)***	0.351 (0.134)***
Asian			0.088 (0.082)	0.088 (0.083)			0.387 (0.097)***	0.399 (0.106)***
Other			0.208 (0.169)	0.216 (0.174)			-0.111 (0.304)	-0.186 (0.344)
Height			0.046 (0.003)***	0.046 (0.003)***			0.056 (0.002)***	0.059 (0.002)***
BMI				0.001 (0.003)				0.019 (0.003)***
Depression score				0.005 (0.004)				0.001 (0.004)
Excellent		ref	ref	ref		ref	ref	ref
Very good				0.019 (0.035)				0.010 (0.027)
Good				-0.007 (0.043)				0.025 (0.036)
Fair/poor				0.064 (0.064)				0.119 (0.061)*
Chronic illness		ref	ref	ref		ref	ref	ref
No chronic illness				-0.029 (0.044)				-0.054 (0.040)
N	9,779	9,777	9,137	8,986	7,373	7,373	6,946	6,271
R^2	0.001	0.002	0.145	0.145	0.003	0.008	0.166	0.171

Notes:
(i) Standard errors, which are adjusted for clustering on the primary sampling unit for the Child Cohort, are presented in parentheses
(ii) * significant at 10%; ** significant at 5%; *** significant at 1%
(iii) The restricted results (in column 1) include controls for household income only. Column (2) adds controls for mother's education. Column (3) adds controls for child and mother characteristics. Column (4) adds controls for the full set of mother's health variables.

Table 5 OLS Models of WFLZ/BMIFAZ scores

	Infant Cohort (Average Age 9 Months)				Child Cohort (Average Age 9 Years)			
	(1)	(2)	(3)	(4)		(2)	(3)	(4)
SES								
Equivalised income	-0.035 (0.021)*	-0.018 (0.023)	0.019 (0.027)	0.017 (0.028)	-0.107 (0.028)***	-0.022 (0.033)	0.050 (0.034)	0.056 (0.036)
Primary		0.025 (0.084)	-0.004 (0.093)	-0.016 (0.094)		0.343 (0.106)***	0.258 (0.114)**	0.297 (0.123)**
Upper secondary		0.111 (0.054)**	0.018 (0.062)	0.022 (0.063)		0.400 (0.067)***	0.325 (0.070)***	0.347 (0.073)***
Upper secondary		0.112 (0.040)***	0.055 (0.044)	0.059 (0.045)		0.224 (0.053)***	0.204 (0.056)***	0.202 (0.058)***
Non degree		0.093 (0.046)**	0.058 (0.050)	0.060 (0.050)		0.213 (0.056)***	0.198 (0.057)***	0.205 (0.059)***
Degree		0.093 (0.048)*	0.116 (0.050)**	0.119 (0.050)**		0.096 (0.055)*	0.120 (0.056)**	0.116 (0.058)**
Postgraduate		ref	ref	ref		ref	ref	ref
Child Characteristics								
Birth order			-0.002 (0.016)	-0.002 (0.016)			-0.042 (0.017)**	-0.038 (0.018)**
Care at home		ref	ref	ref		ref	ref	ref
Care by au pair/relative			0.080 (0.039)**	0.078 (0.039)**			0.078 (0.037)**	0.073 (0.038)*
Centre-based care			-0.078 (0.041)*	-0.079 (0.041)*			0.164 (0.070)**	0.144 (0.0702)**
Pregnancy/early life characteristics								
Birth weight			0.396 (0.031)***	0.399 (0.031)***			0.254 (0.028)***	0.249 (0.029)***
Early			0.139 (0.083)*	0.151 (0.084)*			0.047 (0.049)	0.021 (0.051)
On time		ref	ref	ref		ref	ref	ref
Late			-0.065 (0.056)	-0.061 (0.056)			-0.035 (0.034)	-0.051 (0.035)
No breastfeeding			0.053 (0.033)	0.053 (0.033)			0.102 (0.032)***	0.099 (0.034)***
Breastfeeding		ref	ref	ref		ref	ref	ref
Smoking			0.247 (0.048)***	0.254 (0.048)***			0.050 (0.041)	0.043 (0.044)
No smoking		ref	ref	ref		ref	ref	ref
Drinking			-0.068 (0.037)*	-0.065 (0.037)*			-0.011 (0.030)	0.006 (0.031)
No drinking		ref	ref	ref		ref	ref	ref
Mother characteristics								
Age			-0.001 (0.003)	-0.001 (0.003)			-0.003 (0.003)	-0.004 (0.003)
Lone parent			0.117 (0.056)**	0.120 (0.056)**			0.135 (0.050)***	0.155 (0.053)***
Two parent		ref	ref	ref		ref	ref	ref

Notes:
(i) Standard errors, which are adjusted for clustering on the primary sampling unit for the Child Cohort, are presented in parentheses
(ii) * significant at 10%; ** significant at 5%; *** significant at 1%
(iii) The restricted results (in column 1) include controls for household income only. Column (2) adds controls for mother's education. Column (3) adds controls for child and mother characteristics. Column (4) adds controls for the full set of mother's health variables.

Table 5 continued

	Infant Cohort (Average Age 9 Months)				Child Cohort (Average Age 9 Years)			
	(1)	(2)	(3)	(4)	(1)	(2)	(3)	(4)
White		ref	ref	ref		ref	ref	ref
Black			0.244 (0.107)**	0.245 (0.108)**			0.071 (0.151)	0.060 (0.175)
Asian			-0.362 (0.067)***	-0.367 (0.068)***			0.232 (0.143)	0.246 (0.158)
Other			-0.266 (0.151)*	-0.255 (0.156)			-0.121 (0.235)	-0.270 (0.200)
Height				-0.001 (0.002)				0.002 (0.003)
BMI			0.008 (0.003)***	0.008 (0.003)***			0.061 (0.003)***	0.062 (0.003)***
Depression score				-0.002 (0.005)				-0.005 (0.005)
Excellent		ref	ref	ref		ref	ref	ref
Very good				-0.066 (0.040)*				0.003 (0.034)
Good				-0.050 (0.045)				0.079 (0.044)*
Fair/poor				-0.062 (0.065)				0.119 (0.076)*
No chronic illness		ref	ref	ref		ref	ref	ref
Chronic illness				-0.058 (0.063)				-0.038 (0.053)
N	9,765	9,763	9,005	8,975	7,352	7,352	6,730	6,260
R^2	0.000	0.001	0.031	0.031	0.002	0.009	0.092	0.096

Notes:
(i) Standard errors, which are adjusted for clustering on the primary sampling unit for the Child Cohort, are presented in parentheses
(ii) * significant at 10%; ** significant at 5%; *** significant at 1%
(iii) The restricted results (in column 1) include controls for household income only. Column (2) adds controls for mother's education. Column (3) adds controls for child and mother characteristics. Column (4) adds controls for the full set of mother's health variables.

Table 6a Ordered Logit Models of Parental-Assessed Child Health Status (Infant Cohort)

	Infant Cohort (Average Age 9 Months)											
	(1)			(2)			(3)			(4)		
	Prob (very healthy)	Prob (healthy)	Prob (ill)	Prob (very healthy)	Prob (healthy)	Prob (ill)	Prob (very healthy)	Prob (healthy)	Prob (ill)	Prob (very healthy)	Prob (healthy)	Prob (ill)
SES												
Equivalised income	-0.002 (0.006)	0.002 (0.006)	0.000 (0.000)	0.001 (0.007)	-0.001 (0.006)	-0.000 (0.001)	0.001 (0.008)	-0.001 (0.007)	-0.000 (0.001)	0.000 (0.001)	-0.000 (0.008)	-0.000 (0.001)
Primary				-0.002 (0.026)	0.001 (0.023)	0.000 (0.002)	0.026 (0.028)	-0.024 (0.026)	-0.002 (0.002)	0.037 (0.029)	-0.035 (0.027)	-0.003 (0.002)
Upper secondary				0.031 (0.017)*	-0.028 (0.016)*	-0.002 (0.001)*	0.065 (0.018)***	-0.060 (0.017)***	-0.005 (0.001)***	0.073 (0.019)***	-0.068 (0.017)***	-0.006 (0.001)***
Upper secondary				0.038 (0.012)***	-0.035 (0.011)***	-0.003 (0.001)***	0.050 (0.013)***	-0.046 (0.012)***	-0.004 (0.001)***	0.057 (0.013)***	-0.052 (0.012)***	-0.004 (0.001)***
Non degree				0.021 (0.013)*	-0.020 (0.012)*	-0.002 (0.001)*	0.025 (0.013)*	-0.023 (0.012)*	-0.002 (0.001)*	0.030 (0.013)**	-0.028 (0.012)**	-0.002 (0.001)**
Degree				0.039 (0.012)***	-0.036 (0.011)***	-0.003 (0.001)***	0.040 (0.012)**	-0.037 (0.011)***	-0.003 (0.001)***	0.044 (0.012)***	-0.041 (0.012)***	-0.003 (0.001)***
Postgraduate				ref	ref	ref	ref	ref	ref	ref	ref	ref
Child Characteristics												
Age							n/a	n/a	n/a	n/a	n/a	n/a
Male							ref	ref	ref	ref	ref	ref
Female							0.036 (0.008)***	-0.033 (0.007)***	-0.003 (0.001)***	0.035 (0.008)***	-0.032 (0.007)***	-0.003 (0.001)***
Birth order							-0.011 (0.004)***	0.010 (0.004)***	0.001 (0.000)***	-0.012 (0.004)***	0.011 (0.004)***	0.001 (0.000)***
Care at home							ref	ref	ref	ref	ref	ref
Care by au pair/relative							-0.006 (0.009)	0.005 (0.008)	0.000 (0.001)	-0.010 (0.009)	0.009 (0.009)	0.001 (0.001)
Centre-based care							-0.115 (0.011)***	0.106 (0.010)***	0.009 (0.001)***	-0.116 (0.011)***	0.107 (0.011)***	0.009 (0.001)***

Notes:
(i) Results are presented in the form of marginal effects
(ii) Standard errors, which are adjusted for clustering on the primary sampling unit for the Child Cohort, are presented in parentheses
(iii) * significant at 10%; ** significant at 5%; *** significant at 1%
(iv) The restricted results (in column 1) include controls for household income only. Column (2) adds controls for mother's education. Column (3) adds controls for child and mother characteristics. Column (4) adds controls for the full set of mother's health variables.

Table 6a continued

	Infant Cohort (Average Age 9 Months)											
	(1)			(2)			(3)			(4)		
	Prob (very healthy)	Prob (healthy)	Prob (ill)	Prob (very healthy)	Prob (healthy)	Prob (ill)	Prob (very healthy)	Prob (healthy)	Prob (ill)	Prob (very healthy)	Prob (healthy)	Prob (ill)
Pregnancy/early life characteristics												
Birth weight							0.012 (0.008)	-0.011 (0.007)	-0.001 (0.001)	0.014 (0.008)*	-0.013 (0.007)*	-0.001 (0.001)
Early							-0.050 (0.017)***	0.046 (0.016)***	0.004 (0.001)***	-0.048 (0.017)***	0.045 (0.016)***	0.004 (0.001)***
On time							ref	ref	ref	ref	ref	ref
Late							0.012 (0.012)	-0.011 (0.011)	-0.001 (0.001)	0.008 (0.012)	-0.007 (0.011)	-0.001 (0.001)
No breastfeeding							0.007 (0.008)	-0.006 (0.008)	-0.001 (0.001)	0.007 (0.009)	-0.007 (0.008)	-0.001 (0.001)
Breastfeeding							ref	ref	ref	ref	ref	ref
Smoking							-0.006 (0.011)	0.006 (0.010)	0.000 (0.001)	-0.006 (0.011)	0.006 (0.010)	0.000 (0.001)
No smoking							ref	ref	ref	ref	ref	ref
Drinking							-0.010 (0.009)	0.009 (0.009)	0.001 (0.001)	-0.008 (0.010)	0.007 (0.009)	0.001 (0.001)
No drinking							ref	ref	ref	ref	ref	ref
Mother characteristics												
Age							0.003 (0.001)***	-0.002 (0.001)***	-0.000 (0.000)***	0.003 (0.001)***	-0.002 (0.001)***	-0.000 (0.000)***
Lone parent							-0.014 (0.013)	0.013 (0.012)	0.001 (0.001)	-0.007 (0.013)	0.006 (0.012)	0.001 (0.001)
Two parent							ref	ref	ref	ref	ref	ref

Notes:
(i) Results are presented in the form of marginal effects
(ii) Standard errors, which are adjusted for clustering on the primary sampling unit for the Child Cohort, are presented in parentheses
(iii) * significant at 10%; ** significant at 5%; *** significant at 1%
(iv) The restricted results (in column 1) include controls for household income only. Column (2) adds controls for mother's education. Column (3) adds controls for child and mother characteristics. Column (4) adds controls for the full set of mother's health variables.

Table 6a continued

	Infant Cohort (Average Age 9 Months)											
	(1)			(2)			(3)			(4)		
	Prob (very healthy)	Prob (healthy)	Prob (ill)	Prob (very healthy)	Prob (healthy)	Prob (ill)	Prob (very healthy)	Prob (healthy)	Prob (ill)	Prob (very healthy)	Prob (healthy)	Prob (ill)
White							ref	ref	ref	ref	ref	ref
Black							0.076 (0.027)***	-0.070 (0.025)***	-0.006 (0.002)***	0.076 (0.029)***	-0.070 (0.026)***	-0.006 (0.002)***
Asian							-0.004 (0.024)	0.003 (0.022)	0.000 (0.002)	-0.014 (0.024)	0.012 (0.022)	0.001 (0.002)
Other							0.115 (0.083)	-0.106 (0.077)	-0.009 (0.006)	0.121 (0.083)	-0.112 (0.077)	-0.009 (0.006)
Height										0.000 (0.001)	-0.000 (0.001)	-0.000 (0.000)
BMI										-0.001 (0.001)	0.001 (0.001)	0.000 (0.000)
Depression score										-0.004 (0.001)***	0.004 (0.001)***	0.000 (0.000)***
Excellent							ref	ref	ref	ref	ref	ref
Very good							-0.075 (0.010)***	0.070 (0.009)***	0.006 (0.001)***	-0.070 (0.010)***	0.065 (0.009)***	0.005 (0.001)***
Good							-0.133 (0.011)***	0.122 (0.010)***	0.010 (0.001)***	-0.116 (0.011)***	0.107 (0.010)***	0.009 (0.001)***
Fair/poor							-0.177 (0.015)***	0.164 (0.014)***	0.014 (0.002)***	-0.136 (0.017)***	0.126 (0.014)***	0.010 (0.002)***
No chronic illness							ref	ref	ref	ref	ref	ref
Chronic illness										-0.044 (0.012)***	0.041 (0.011)***	0.003 (0.001)***
N	9,883			9,880			9,476			9,021		
Pseudo-R^2	0.000			0.001			0.042			0.044		

Notes:

(i) Results are presented in the form of marginal effects

(ii) Standard errors, which are adjusted for clustering on the primary sampling unit for the Child Cohort, are presented in parentheses

(iii) * significant at 10%; ** significant at 5%; *** significant at 1%

(iv) The restricted results (in column 1) include controls for household income only. Column (2) adds controls for mother's education. Column (3) adds controls for child and mother characteristics. Column (4) adds controls for the full set of mother's health variables.

Table 6b Ordered Logit Models of Parental-Assessed Child Health Status (Child Cohort)

	Child Cohort (Average Age 9 Years)											
	(1)			(2)			(3)			(4)		
	Prob (very healthy)	Prob (healthy)	Prob (ill)	Prob (very healthy)	Prob (healthy)	Prob (ill)	Prob (very healthy)	Prob (healthy)	Prob (ill)	Prob (very healthy)	Prob (healthy)	Prob (ill)
SES												
Equivalised income	0.071 (0.009)***	-0.066 (0.008)***	-0.005 (0.001)***	0.057 (0.011)***	-0.053 (0.010)***	-0.004 (0.001)***	0.045 (0.012)***	-0.042 (0.011)***	-0.003 (0.001)***	0.040 (0.012)***	-0.037 (0.011)***	-0.003 (0.001)***
Primary				-0.086 (0.032)***	0.080 (0.030)***	0.006 (0.002)**	-0.039 (0.033)	0.036 (0.031)	0.003 (0.002)	-0.007 (0.036)	0.006 (0.034)	0.000 (0.003)
Upper secondary				-0.066 (0.022)***	0.061 (0.021)***	0.005 (0.002)***	-0.039 (0.024)	0.036 (0.022)	0.003 (0.002)	-0.043 (0.026)	0.040 (0.024)	0.003 (0.002)
Upper secondary				-0.002 (0.019)	0.001 (0.018)	0.000 (0.001)	0.011 (0.020)	-0.011 (0.019)	-0.001 (0.001)	0.013 (0.022)	-0.012 (0.020)	-0.001 (0.001)
Non degree				-0.016 (0.020)	0.015 (0.018)	0.001 (0.001)	-0.006 (0.020)	0.006 (0.019)	0.000 (0.001)	-0.014 (0.021)	0.013 (0.020)	0.001 (0.001)
Degree				-0.017 (0.020)	0.016 (0.018)	0.001 (0.001)	-0.012 (0.020)	0.011 (0.019)	0.001 (0.001)	-0.012 (0.021)	0.011 (0.020)	0.001 (0.001)
Postgraduate				ref	ref	ref	ref	ref	ref	ref	ref	ref
Child Characteristics												
Age							-0.040 (0.041)	0.037 (0.038)	0.003 (0.003)	-0.057 (0.044)	0.053 (0.040)	0.004 (0.003)
Male							ref	ref	ref	ref	ref	ref
Female							0.010 (0.010)	-0.009 (0.010)	-0.001 (0.001)	0.010 (0.011)	-0.009 (0.010)	-0.001 (0.001)
Birth order							0.010 (0.006)*	-0.010 (0.005)*	-0.001 (0.000)*	0.015 (0.006)**	-0.014 (0.005)**	-0.001 (0.000)*
Care at home							ref	ref	ref	ref	ref	ref
Care by au pair/relative							-0.023 (0.012)*	0.021 (0.011)*	0.002 (0.001)*	-0.020 (0.013)	0.018 (0.012)	0.001 (0.001)
Centre-based care							-0.025 (0.029)	0.023 (0.026)	0.002 (0.002)	-0.036 (0.029)	0.034 (0.027)	0.003 (0.002)

Notes:

(i) Results are presented in the form of marginal effects

(ii) Standard errors, which are adjusted for clustering on the primary sampling unit for the Child Cohort, are presented in parentheses

(iii) * significant at 10%; ** significant at 5%; *** significant at 1%

(iv) The restricted results (in column 1) include controls for household income only. Column (2) adds controls for mother's education. Column (3) adds controls for child and mother characteristics. Column (4) adds controls for the full set of mother's health variables.

Table 6bcontinued

	Child Cohort (Average Age 9 Years)											
	(1)			(2)			(3)			(4)		
	Prob (very healthy)	Prob (healthy)	Prob (ill)	Prob (very healthy)	Prob (healthy)	Prob (ill)	Prob (very healthy)	Prob (healthy)	Prob (ill)	Prob (very healthy)	Prob (healthy)	Prob (ill)
Pregnancy/early life characteristics												
Birth weight							0.028 (0.010)***	-0.026 (0.009)***	-0.002 (0.001)***	0.032 (0.010)***	-0.030 (0.010)***	-0.002 (0.001)***
Early							0.015 (0.017)	-0.014 (0.016)	-0.001 (0.001)	0.015 (0.019)	-0.014 (0.017)	-0.001 (0.001)
On time							ref	ref	ref	ref	ref	ref
Late							-0.014 (0.012)	0.013 (0.011)	0.001 (0.001)	-0.014 (0.013)	0.013 (0.012)	0.001 (0.001)
No breastfeeding							0.001 (0.011)	-0.001 (0.010)	-0.000 (0.001)	-0.002 (0.012)	0.002 (0.011)	0.000 (0.001)
Breastfeeding							ref	ref	ref	ref	ref	ref
Smoking							-0.029 (0.013)**	0.027 (0.012)**	0.002 (0.001)**	-0.035 (0.014)**	0.033 (0.013)**	0.002 (0.001)**
No smoking							ref	ref	ref	ref	ref	ref
Drinking							-0.013 (0.010)	0.012 (0.009)	0.001 (0.001)	-0.005 (0.011)	0.004 (0.010)	0.000 (0.001)
No drinking							ref	ref	ref	ref	ref	ref
Mother characteristics												
Age							0.001 (0.001)	-0.001 (0.001)	-0.000 (0.000)	0.001 (0.001)	-0.001 (0.001)	-0.000 (0.000)
Lone parent							-0.026 (0.017)	0.024 (0.015)	0.002 (0.001)	-0.003 (0.018)	0.003 (0.017)	0.000 (0.001)
Two parent							ref	ref	ref	ref	ref	ref

Notes:
(i) Results are presented in the form of marginal effects
(ii) Standard errors, which are adjusted for clustering on the primary sampling unit for the Child Cohort, are presented in parentheses
(iii) * significant at 10%; ** significant at 5%; *** significant at 1%
(iv) The restricted results (in column 1) include controls for household income only. Column (2) adds controls for mother's education. Column (3) adds controls for child and mother characteristics. Column (4) adds controls for the full set of mother's health variables.

Table 6bcontinued

	Child Cohort (Average Age 9 Years)											
	(1)			(2)			(3)			(4)		
	Prob (very healthy)	Prob (healthy)	Prob (ill)	Prob (very healthy)	Prob (healthy)	Prob (ill)	Prob (very healthy)	Prob (healthy)	Prob (ill)	Prob (very healthy)	Prob (healthy)	Prob (ill)
White							ref	ref	ref	ref	ref	ref
Black										0.035 (0.056)	-0.033 (0.053)	-0.003 (0.004)
Asian										-0.058 (0.043)	0.054 (0.040)	0.004 (0.003)
Other										0.142 (0.136)	-0.132 (0.129)	-0.010 (0.001)
Height										0.000 (0.001)	-0.000 (0.001)	-0.000 (0.000)
BMI										-0.000 (0.001)	0.000 (0.001)	0.000 (0.000)
Depression score										-0.009 (0.001)***	0.008 (0.001)***	0.001 (0.000)***
Excellent										ref	ref	ref
Very good										-0.090 (0.014)***	0.083 (0.013)***	0.006 (0.001)***
Good										-0.147 (0.015)***	0.136 (0.014)***	0.010 (0.002)***
Fair/poor										-0.180 (0.023)***	0.169 (0.021)***	0.013 (0.002)***
No chronic illness							ref	ref	ref	ref	ref	ref
Chronic illness										-0.042 (0.016)**	0.039 (0.015)**	0.003 (0.001)***
N	7,694			7,694			7,375			6,330		
Pseudo-R^2	0.006			0.008			0.034			0.043		

Notes:

(i) Results are presented in the form of marginal effects

(ii) Standard errors, which are adjusted for clustering on the primary sampling unit for the Child Cohort, are presented in parentheses

(iii) * significant at 10%; ** significant at 5%; *** significant at 1%

(iv) The restricted results (in column 1) include controls for household income only. Column (2) adds controls for mother's education. Column (3) adds controls for child and mother characteristics. Column (4) adds controls for the full set of mother's health variables.

Table 7 Binary Probit Models of Chronic Illness Incidence

	Infant Cohort (Average Age 9 Months)				Child Cohort (Average Age 9 Years)			
	(1)	(2)	(3)	(4)	(1)	(2)	(3)	(4)
SES								
Equivalised income	0.015 (0.007)**	0.018 (0.008)**	0.017 (0.009)*	0.020 (0.010)**	-0.025 (0.006)***	-0.013 (0.007)*	-0.008 (0.008)	-0.001 (0.001)
Primary		-0.005 (0.030)	-0.002 (0.032)	0.002 (0.034)		0.060 (0.021)***	0.051 (0.022)**	0.027 (0.026)
Upper secondary		0.002 (0.019)	-0.017 (0.021)	-0.027 (0.022)		0.048 (0.014)***	0.046 (0.015)***	0.041 (0.016)**
Upper secondary		-0.024 (0.015)*	-0.035 (0.015)**	-0.036 (0.016)**		0.018 (0.013)	0.018 (0.013)	0.011 (0.014)
Non degree		-0.015 (0.015)	-0.021 (0.016)	-0.019 (0.016)		0.013 (0.013)	0.011 (0.013)	0.010 (0.014)
Degree		-0.038 (0.015)***	-0.037 (0.014)**	-0.031 (0.015)**		0.013 (0.014)	0.012 (0.015)	0.005 (0.016)
Postgraduate		ref	ref	ref		ref	ref	ref
Child Characteristics								
Age		n/a	n/a	n/a			0.049 (0.023)**	0.030 (0.024)
Female			-0.060 (0.009)***	-0.058 (0.009)***			-0.036 (0.007)***	-0.042 (0.008)***
Male		ref	ref	ref		ref	ref	ref
Birth order			-0.001 (0.005)	-0.001 (0.005)			-0.000 (0.004)	-0.00 (0.004)
Care at home		ref	ref	ref		ref	ref	ref
Care by au pair/relative			-0.007 (0.010)	-0.006 (0.011)			-0.014 (0.009)*	0.018 (0.009)*
Centre-based care			0.020 (0.015)	0.020 (0.015)			0.024 (0.017)	0.020 (0.019)
Pregnancy/early life characteristics								
Birth weight			0.001 (0.001)	0.003 (0.009)			-0.012 (0.007)*	-0.013 (0.007)*
Early			0.088 (0.020)***	0.086 (0.021)***			0.024 (0.010)**	0.025 (0.011)**
On time		ref	ref	ref		ref	ref	ref
Late			0.007 (0.014)	0.005 (0.014)			0.010 (0.009)	0.006 (0.009)
No breastfeeding			0.021 (0.010)**	0.018 (0.010)*			-0.008 (0.008)	-0.009 (0.008)
Breastfeeding		ref	ref	ref		ref	ref	ref
Smoking			-0.017 (0.013)	-0.020 (0.013)			0.003 (0.009)	0.009 (0.009)
No smoking		ref	ref	ref		ref	ref	ref
Drinking			0.003 (0.011)	0.000 (0.011)			-0.014 (0.008)*	-0.013 (0.008)
No drinking		ref	ref	ref		ref	ref	ref
Mother characteristics								
Age			-0.001 (0.001)	-0.001 (0.001)			0.000 (0.001)	-0.000 (0.001)

Notes:

(i) Results are presented in the form of marginal effects

(ii) Standard errors, which are adjusted for clustering on the primary sampling unit for the Child Cohort, are presented in parentheses

(iii) * significant at 10%; ** significant at 5%; *** significant at 1%

(iv) The restricted results (in column 1) include controls for household income only. Column (2) adds controls for mother's education. Column (3) adds controls for child and mother characteristics. Column (4) adds controls for the full set of mother's health variables.

Table 7 continued

	Infant Cohort (Average Age 9 Months)				Child Cohort (Average Age 9 Years)			
		(2)	(3)	(4)		(2)	(3)	(4)
Lone parent			0.007 (0.015)	0.007 (0.016)			0.028 (0.011)***	0.027 (0.012)**
Two parent		ref	ref	ref		ref	ref	ref
White		ref	ref	ref		ref	ref	ref
Black			-0.106 (0.030)***	-0.103 (0.032)***			-0.029 (0.031)	-0.016 (0.034)
Asian			-0.018 (0.028)	-0.037 (0.029)			-0.033 (0.030)	-0.037 (0.033)
Other			-0.019 (0.072)	-0.020 (0.072)			-0.053 (0.084)	n/a
Height				-0.001 (0.001)				-0.000 (0.001)
BMI				-0.000 (0.001)				0.002 (0.001)**
Depression score				0.003 (0.001)**				0.003 (0.001)**
Excellent		ref	ref	ref		ref	ref	ref
Very good				0.046 (0.011)***				0.016 (0.009)*
Good				0.058 (0.013)***				0.025 (0.012)**
Fair/poor				0.057 (0.021)***				0.044 (0.017)***
No chronic illness		ref	ref	ref		ref	ref	ref
Chronic illness			0.073 (0.013)***	0.047 (0.015)***			0.067 (0.010)***	0.056 (0.011)***
N	9,910	9,907	9,500	9,035	7,694	7,694	7,375	6,316
Pseudo-R^2	0.000	0.001	0.013	0.016	0.003	0.006	0.031	0.042

Notes:
(i) Results are presented in the form of marginal effects
(ii) Standard errors, which are adjusted for clustering on the primary sampling unit for the Child Cohort, are presented in parentheses
(iii) * significant at 10%; ** significant at 5%; *** significant at 1%
(iv) The restricted results (in column 1) include controls for household income only. Column (2) adds controls for mother's education. Column (3) adds controls for child and mother characteristics. Column (4) adds controls for the full set of mother's health variables.

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