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ABSTRACT

Healthy(?), Wealthy, and Wise: Birth Order and Adult Health*

While recent research finds strong evidence that birth order affects children's outcomes such as education, IQ scores, and earnings, the evidence for effects on health is more limited. This paper uses a large dataset on the population of Norway and focuses on the effect of birth order on a range of health and health-related behaviors, outcomes not previously available in datasets of this magnitude. Interestingly, we find complicated effects of birth order. First-borns are more likely to be overweight, to be obese, and to have high blood pressure and high triglycerides. So, unlike education or earnings, there is no clear first-born advantage in health. However, later-borns are more likely to smoke and have poorer self-reported physical and mental health. They are also less likely to report that they are happy. We find that these effects are largely unaffected by conditioning on education and earnings, suggesting that these are not the only important pathways to health differentials by birth order. When we explore possible mechanisms, we find that smoking early in pregnancy is more prevalent for first pregnancies than for later ones. However, women are more likely to quit smoking during their first pregnancy than during later ones, and first-borns are more likely to be breast-fed. These findings suggest a role for early maternal investment in determining birth order effects on health.

JEL Classification: I1, J1

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Newspapers and magazines are replete with articles describing how you can predict your future based on your birth order - what job you are likely to do, what personality characteristics you exhibit, even so far as to predict how you will raise your children.[1] Though these articles often seem more circus show than academic, there is substantial research across a variety of fields examining the relationship between birth order and individual outcomes. Although early work was limited in its ability to distinguish birth order from other confounding characteristics such as family size (for example, third born children on average come from larger families than first born children), recent work has taken advantage of large survey and administrative datasets to consistently find that, in developed countries, first-borns have higher IQ scores, educational attainment, and earnings than later-borns.[2]

There is a sizeable literature about the relationship between birth order and adult health. However, individual studies have typically examined only one or a small number of health outcomes and, in many cases, have used relatively small samples. In this paper, we use large nationally representative data from Norway to identify the relationship between birth order and health, where health is measured along a number of dimensions, including medical indicators, health behaviors, and overall life satisfaction. In light of existing work documenting that firstborns have greater education and earnings, studying a range of health outcomes provides a more complete picture of the role of birth order on child success.

Until recently, the identification of birth order effects has been limited due to the rigorous data demands required for credible estimation. Later-born children are only observed in larger families (by definition), and the characteristics of individuals who choose to have larger families are observably quite different from those of individuals who choose to have smaller families. To

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[1] http://www.huffingtonpost.com/dr-gail-gross/how-birth-order-affects-personality_b_4494385.html
http://www.huffingtonpost.com/2014/04/29/firstborns-educational-success_n_5228493.html
http://www.nytimes.com/2009/09/08/health/08klas.html

[2] See, for example, Black *et al.*, 2005, 2011; Bjerkedal *et al.*, 2007; Kantarevic and Mechoulan, 2006; Booth and Kee, 2008; Bu, 2014)

circumvent these issues, we use a large dataset from Norway and estimate the effects of birth order on health using a family fixed effects specification. In this case, we are identifying the effects of birth order by comparing siblings within the same family, thereby eliminating concerns that birth order is picking up omitted family characteristics such as family size. We are also able to control for mother's and children's birth cohorts—in this case, birth order effects are identified off the differential timing of births within the same family. We find effects of health on birth order that are complicated. First-borns are more likely to be overweight and have high blood pressure and high triglycerides. However, later-borns are more likely to smoke and have poorer self-reported physical and mental health. These results are found in both between-family (cross-sectional) and within-family analysis. So, unlike education or earnings, there is no clear first-born advantage in health. Also, we find that these effects are largely unaffected by conditioning on education and earnings, suggesting that these are not the only important pathways to health differentials by birth order.

There are many mechanisms that could generate a relationship between birth order and health, including differences in biological endowments, early parental investment, and later parental or environmental factors. While we cannot examine all possible mechanisms, we focus on the role of early parental investment behavior, as much recent research has highlighted the importance of early investments (both in utero and in the first years of life) for the long-run outcomes of children (see Aizer and Currie 2014 for a summary). In particular, using a variety of data sources, we examine the effects of a child's birth order on maternal smoking during pregnancy and the probability that he/she is breastfed as both these parental behaviors are likely to have long-term implications for the health of the child.

We find that smoking early in pregnancy is more prevalent for first pregnancies than for later ones. However, women are more likely to quit smoking during their first pregnancy than during later ones, and first borns are more likely to be breast-fed. These findings suggest a role for early maternal investment in determining birth order effects on health.

The paper unfolds as follows. Section 2 discusses the related literature. Section 3 discusses the data we use and Section 4 presents the results. Section 5 discusses possible mechanisms, and Section 6 concludes.

2. Related Literature

A number of literatures have examined the relationship between birth order and health or health behaviors, ranging from the medical literature to sociology to psychology to economics (for instance Richiardi *et al.*, 2004, Sulloway, 1996, and Argys *et al.*, 2006). While much of the research has used relatively small samples, there are several papers that have utilized population registers like the Norwegian data we use.

Recent work by Lundborg, Ralsmark, and Olof-Rooth (2014) examines the relationship between family size, birth order, and height, where height is used as a proxy for health. Using military enlistment data from Sweden covering the population of males at approximately 18 years of age, the authors show that there are large and statistically significant negative effects of birth order on height. However, while height is often used as a proxy for health in developing countries, it is a more limited measure in a developed country such as Sweden.[3]

Barclay and Kolk (2013) and Modin (2002) also use register data from Sweden but focus on the relationship between birth order and mortality. They find that mortality risk increases with birth order, and this pattern is stronger for women than for men. Additionally, a few papers have examined the relationship between birth order and suicide and found a positive relationship (see

[3] Hatton and Martin (2010) also find negative effects of higher birth order on height of children in Britain in the 1930s.

Rostila et al, 2014 and references therein).[4] While these studies represent an important contribution to our understanding, mortality is clearly an extreme measure of health. In addition, the authors lack more nuanced information on health behaviors and on mental health. Our findings of birth order differences in smoking behavior suggest a plausible contributor to mortality differences and our mental health findings provide context to the findings about suicide in the literature.

Using register data on Swedish conscripts aged about 19, Jelenkovic *et al*. (2013) find no evidence that birth order affects blood pressure but find that it negatively affects BMI. We build on this research by examining blood pressure, BMI, and obesity in addition to health behavior and mental health indicators, in a sample of prime age adults.

Moving beyond register data, researchers have used smaller cross-sectional and cohort datasets to study various health outcomes. For example, Howe *et al.* (2014) use cohort data from Brazil and the UK and find no consistent evidence for any relationship between birth order and blood pressure or obesity. However, a key limitation of much of this research is the absence of large-scale data sources required to sufficiently control for across-family differences (in particular, family size and its correlates) and the failure of many studies to control for confounders such as cohort effects and mothers age at the birth of the child. Our main contribution is to examine a wide range of health outcomes on a large common sample and using appropriate sets of control variables.

We also study an area about which little is known -- the relationship between birth order and adult health behavior. Much more is known about the relationship between birth order and health-related behaviors of children and teenagers. Argys *et al*. (2006) use the NLSY to show that, among adolescents, later-borns are more likely than first-borns to use alcohol and drugs and

[4] Swedish register data have also been used to study the relationship between birth order and cancer (Bevier et al. 2011; Hemminki and Mutanen 2001) with findings of positive birth order effects on some cancers (such as lung cancer) and negative birth order effects for others (such as endometrial cancer).

engage in risky sexual behaviour. In related work, Rees *et al.* (2008) showed that later-born boys were more likely to participate in sports in 10th grade but the opposite was true for later-born girls.[5] Our analysis shows that some of these behavioral differences persist well into adulthood and so are likely to have important consequences for health.

In terms of mechanisms underlying observed differences in outcomes by birth order, there are a number of papers examining variation in parental investment behavior. Work by Price (2008) and Monfardini and See (2012) examine parental time spent with children and find differences by birth order. Lehmann *et al.* (2014), among others, show that birth order differences in cognitive achievement appear early in life (as early as age 2), suggesting the importance of early parental investments. Using the Children of the National Longitudinal Survey of Youth dataset (CNLSY), they show that later-borns experience a lower reduction in cigarette usage during pregnancy, are breastfed less often, and experience less cognitive stimulation and emotional support at ages 0 to 1. Buckles and Kolka (2014) show similar patterns in breastfeeding by birth order using the National Longitudinal Survey of Youth (NLSY). We show similar results for Norway using larger sample sizes. An advantage of the Norwegian Birth Registers is that they have information on smoking in both early and late pregnancy and so enable us to study changes in smoking behavior over the course of pregnancy. Also, the smoking data are probably more reliable than the retrospective self-reports in the CNLSY.

3. Data

Data are compiled from a number of different sources. Our primary data source is the Norwegian Registry Data, a linked administrative dataset that covers the population of Norwegians from 1986 to 2010. These data are maintained by Statistics Norway and provide

[5] In addition, two interesting papers provide evidence that parents may strategically be stricter to first-borns than later-borns (Hao *et al.*, 2008; Hotz and Pantano, 2013).

information about labor market status, earnings, and a set of demographic variables (age, gender) as well as information on families.

We measure family size in the register by using personal identifiers matched between parents and children to count the children of each mother, and we use information on year and month of birth to assign birth order. We drop twins from our estimating samples because of the ambiguities involved in calculating birth order for twins. We also drop only children and families with 6 or more children from the sample so family sizes range from 2 to 5.[6] Appendix Table 1 presents summary statistics for our sample. Most families in our sample (75%) have two or three children. In our sample, 44% of children are first-borns, 38% are second-borns, 14% are third-borns and 5% are fourth- or fifth-borns.

These data are merged to health survey data using personal identification numbers. The health data come from two population-based surveys carried out between 1988 and 2003 and covering all counties in Norway: the Cohort of Norway (CONOR) and the National Health Screening Service's Age 40 Program. Both surveys were conducted by the National Institute of Public Health, and for the most part, the same information was collected in both surveys. Both consist of two components: the survey and the health examination. The survey includes questions about specific diseases, general questions about health, medicine use, family disease history, physical activity, and smoking and drinking habits. The health examination includes blood pressure measurement and blood tests for cholesterol and blood sugar.

Most of the health data come from the Age 40 Program, which covers all counties in Norway except Oslo and includes men and women aged 40-42 who were surveyed sometime between 1988-1999.[7] The survey was conducted county by county and all of the inhabitants in each county aged 40-42 were surveyed. Because of the scope of the project, it took a number of

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[6] Fewer than 4% of families have 6 or more children. We also drop women whose age at first birth is less than 16 or greater than 45 (only 9 observations are dropped as a result). The results are robust to these choices.

[7] The Age 40 Program dataset is described at http://www.fhi.no and in studies such as Jacobsen, Stensvold, Fylkesnes, Kristiansen and Thelle (1992) and Nystad, Meyer, Nafstad, Tverdal and Engeland (2004).

years to cover all counties; as a result, different counties were surveyed in different years. Each county was surveyed only once. All 40-42 year olds were asked to participate, and the response rate is about 70 percent, yielding 374,090 observations.

To this, we add the smaller CONOR dataset.[8] The main advantage of the CONOR dataset is that it includes Oslo, which was omitted from the Age 40 data. The CONOR dataset has 56,863 respondents from a wider set of age groups and collected between 1994 and 2003. It consists of 10 different surveys across different age groups and counties. The response rate is similar but a little lower (60 percent) compared to that of the Age 40 Program. The Oslo survey was conducted in 2000 and 2001, where they sampled all 40, 45 and 46 year olds, in addition to 30/31 and 59/60 year olds. Because the surveys were mostly conducted in the 1990s and early 2000s and were focused on persons in their early 40s, we restrict the sample to cohorts born between 1940 and 1960 who are aged between 35 and 60 at the time of the survey.[9]

Because of non-response and the fact that different cohorts were sampled in different municipalities, we observe only 41% of the complete 1940-1960 cohorts in the health surveys. A concern is that selection into our sample may be related to individual health, and to the extent that it is also correlated with birth order, this may introduce bias into our analysis. While we think this is unlikely to be a problem, we use the population of these cohorts and regress an indicator of whether one has health information on birth order and on the other control variables described in the next section along with mother fixed effects. Although we find statistically significant effects-- first-borns are 0.6% less likely to participate than second-borns and 1% less likely to

[8] The CONOR data set is described on the web page www.fhi.no/conor/index.html or in Søgaard (2006), and several studies have used parts or the total sample including Søgaard, Bjelland, Telle and Røysamb (2003).

[9] 86% of survey respondents were born between 1940 and 1960 so this cohort restriction allows us to keep most people while still having a relatively homogenous sample. We lose an additional 660 observations by restricting to persons aged between 35 and 60. Our results are similar when these sample restrictions are not imposed.

participate than third borns--these differences are sufficiently small that they are unlikely to lead to large biases in estimation.[10]

4. Birth Order Analysis

Credible identification of birth order effects has stringent data requirements; the fact that later born children are more likely to come from larger families, be born to older parents, and be born later chronologically highlights the importance of controlling for family size, parental age, and child cohort effects when using cross-family variation. With sufficient sample sizes and appropriate controls, however, the cross-sectional evidence can be quite compelling.

To estimate the relationship between birth order and health, we regress health on birth order indicators along with a variety of other controls. To avoid any confounding family size effects, we include indicator variables for each possible family size. In addition to family size, the control variables include gender, indicator variables for cohort (year of birth), indicator variables for year of health exam, and indicator variables for age of mother at birth, and for age of mother at first birth. We also include survey dummies in case measurement differed in any way across surveys.

An additional advantage of our dataset is that we can test the sensitivity of our results to within-family comparisons. We do the within-family comparison by estimating specifications using mother fixed effects. We include the same control variables as in OLS, except that now family size and mother's age at first birth drop out as they are the same for all children in the same family.[11] In this case, we are estimating the relative performance of different children (with different birth orders) within the same family.

[10] Previous studies have found little indication of self-selection on observable family background variables in CONOR when compared to the whole population (Søgaard, Selmer, Bjertnes, Thelle, 2003).

[11] Even when looking within family, we still face the issue that parents of later-born children are older, and later born children belong to different cohorts, suggesting the need to also include indicators for mother's age at birth and

The mother fixed effects specifications are our preferred estimates as they are robust to any family-specific unobservable characteristics. However, because this strategy is identified from families with at least 2 children, the OLS estimates (without mother fixed effects) are for a less-selected sample. Therefore, for completeness, we report both sets of results and, importantly, they provide similar estimates.[12]

We split our health outcomes into three groups—health measures, health behaviors, and overall life satisfaction.

Health Measures

We first examine the effect of birth order on a variety of health variables. From blood samples, we have indicators for high blood pressure, high cholesterol, and high triglycerides. Following the National Institute of Health (NIH - http://www.nhlbi.nih.gov/health/health-topics/topics/hbp/), we define a person as having high blood pressure if the systolic number is greater than or equal to 140mmHg or the diastolic number is greater than or equal to 90mmHg.[13]

For cholesterol, we once again follow the NIH in defining high cholesterol as total serum cholesterol greater than or equal to 240 mg/dL (6.2mmol/l). Finally, triglycerides are a type of fat found in blood. Following the classification by the American Heart Association, we define high triglycerides as having a level higher than 2.25mmol/l. High blood pressure, high cholesterol, and high triglycerides are all considered by the American Heart Association to be major risk factors for heart disease.

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child's cohort of birth. In practice, only cohort controls are required as, conditional on the mother fixed effects, mother's age at birth is perfectly correlated with child's birth cohort.

[12] We have also verified that OLS estimates on a sample of families with at least 2 participating children are quite similar to the OLS estimates reported.

[13] "Blood pressure" is the force of blood pushing against the walls of the arteries as the heart pumps blood. "Systolic" refers to blood pressure when the heart beats while pumping blood. "Diastolic" refers to blood pressure when the heart is at rest between beats.

We also have data on physical measurements taken during the examination -- height, weight, and indicators for whether an individual is overweight or obese. Height is measured in centimeters and weight is reported in kilograms; from these we construct Body Mass Index (BMI) as weight divided by height (in meters) squared. As is standard, we define a person as being overweight if their BMI is greater than or equal to 25 and as being obese if their BMI is greater than or equal to 30.[14]

The results for these outcomes are presented in Table 1.[15] Because we have many outcome variables, we report our main estimates pooling both across family sizes and by gender. However, these estimates are quite representative, as we find that birth order effects generally do not differ significantly by gender or across family size.[16] The omitted birth order category is first-born so all birth order coefficients are the effects relative to first-borns. Importantly, the results show that the estimates are not very sensitive to specification choice; the within-family estimates are generally similar to those using cross-sectional variation, suggesting that the estimated birth order effects do not reflect omitted family characteristics. However, given our greater faith in the fixed effects estimates, we focus on these when reporting coefficient values.

We find that the probability of having high blood pressure declines with birth order, and the largest gap is between first- and second-borns. Second-borns are about 3% less likely to have high blood pressure than first-borns; fifth-borns are about 7% less likely to have high blood pressure than first-borns. Given the proportion with high blood pressure is 24%, this is quite a large difference. In contrast, there is little evidence of birth order effects on cholesterol in either specification. However, there is strong evidence that the probability of having high triglycerides

[14] These are the definitions of overweight and obesity used by the World Health Organization (WHO): http://www.who.int/mediacentre/factsheets/fs311/en/.

[15] When we study binary dependent variables, such as whether the person has high blood pressure, we estimate linear probability models. We estimate the standard errors using the Huber/White heteroskedasticity-robust estimator clustered at the level of the person's mother. This allows for arbitrary correlation of errors within sibling groups.

[16] Results available upon request.

is greater for first-borns than for second- or third-borns with the difference between first- and second-borns being about 2%. This compares to a baseline of 22% with high triglycerides.

The estimates for height show that height is decreasing with birth order. First-borns are, on average, about 0.2 of a centimeter taller than second-borns. The effect seems monotonic, with fifth-borns being--depending on specification--between .4 and .8 of a centimeter shorter than first-borns on average.[17] While first-borns are taller, they are also more likely to be overweight and obese. Compared to second-borns, first-borns are 4% more likely to be overweight, and 2% more likely to be obese. The equivalent differences between fifth-borns and first-borns are 10% and 5%. For context, the proportions in the population that are overweight and obese are 47% and 10% respectively. So, once again, these magnitudes are quite large. Overall, we find that first-borns are less healthy in terms of physical markers such as blood pressure, triglycerides, and indicators of overweight and obesity.[18]

Health-Related Behaviors

We also study several health-related behaviors. The first set is whether the individual is a daily smoker and the number of cigarettes smoked daily. Smoking is an important risk factor for heart disease, lung cancer, and many other ailments. Another variable is the number of alcoholic drinks consumed in the two weeks prior to the survey. This is the sum of beer, wine, and hard liquor consumption. While moderate drinking may not have adverse health effects, heavy drinking is known to have negative consequences for health (see for example Corder *et al.*, 2006). For men, heavy drinking is typically defined as consuming 15 drinks or more per week,

[17] These findings for height are similar to those reported for Sweden by Lundborg *et al.* (2014).
[18] Another health-related outcome is receiving disability benefit. Given that only 4% of our sample are in receipt of this benefit and it is contingent on labor-market factors (and so affected by factors other than health), we do not report estimates for it. However, analogous estimation shows that first-borns are less likely to receive disability benefits.

and for women, heavy drinking is typically defined as consuming 8 drinks or more per week.[19] Therefore, we also create a binary indicator for whether the man (woman) was a heavy drinker based on these definitions. Questions about drinking were not asked in all of the health surveys so our sample sizes for these variables are much lower than for smoking.[20] The survey also contains a question about frequency of exercise. We create a binary variable that is one if the person exercises at least one hour per week and zero otherwise.[21]

Table 2 presents the estimated effects of birth order on these health-related behaviors. We can see that the number of cigarettes smoked daily increases monotonically with birth order – first-borns smoke about 0.5 fewer cigarettes per day than second-borns and about 1 to 1.5 fewer cigarettes than fifth-borns. The mean number of cigarettes smoked per day is only 5 so again these birth order effects are quite large. The findings for whether the person smokes daily are qualitatively similar, with first-borns 5% less likely to smoke than second-borns and about 13% less likely to smoke than 5th-borns (38% of our sample smoke daily). Our smoking findings suggest that the higher prevalence of smoking by later-borns found among adolescents in the U.S. by Argys *et al*. (2006) may persist throughout adulthood and, hence, have important effects on health outcomes.[22]

In contrast, there is no evidence to suggest that later-borns drink more alcohol than first-borns or that birth order is related to exercise. As mentioned earlier, our sample sizes are lower for these variables but the standard errors are still low enough to rule out large effects.[23]

[19] http://www.cdc.gov/alcohol/faqs.htm#excessivealcohol
[20] We face the same issue with several other variables including exercise, self-reported health, reported happiness, and questions about mental health.
[21] The question for weekly exercise is coded as "nothing", "<1 hour", "1-2 hours", and "3+ hours". We create a binary variable that is one for either of the latter two categories and zero for the first two. Our results are not sensitive to how we code the exercise variable.
[22] Since smoking tends to reduce BMI, we have examined whether controlling for cigarettes smoked affects the birth order effects for obesity. We found that it made very little difference to the coefficients.
[23] One concern might be that there are very few families who have multiple children in these smaller samples, leading to the fixed effects specifications being identified from very few children. For the drinking variables, there are 18805 mothers who have multiple children with non-missing data in the sample (they have 39252 children in the

Self-Reported Physical and Mental Health

Finally, we also study a set of self-reported health measures. The first is an indicator variable for whether the person considered himself to be in good or very good health, while the other three variables proxy for mental health. The first two mental health variables are created from answers to a series of questions about whether the person was irritable, lonely, nervous, anxious, calm, or depressed during the last two weeks. We have used these answers to create an index for mental ill-health.[24] This variable takes values between 1 and 4 (with higher numbers indicating worse mental health) and has a standard deviation of .42. We have also taken a simpler approach of creating a binary variable that is 1 if a person felt more than a little nervous, anxious, irritated or depressed or if they didn't feel calm or felt only a little calm. Only 21% of people are allocated a one for this variable.[25] Our final measure is not really a health measure at all--it is a measure of whether the individual is happy—but may serve as a proxy for good physical and mental health.

Table 3 shows estimates for these health measures. The first one is an indicator variable for whether the person considered himself to be in good or very good health. Later-borns are less likely to consider themselves to be in good health. The difference between a first- and second-born is about 1.5% from a base of 85%.

When we turn to mental health, we see that mental health generally declines with birth order. When we examine the mental health index, where higher values suggest worse mental

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sample). While this is substantially fewer than for the smoking variables (69480 mothers), it is still a large sample size.

[24] Respondents are asked separate questions about how irritable, lonely, nervous, anxious, calm, or depressed they were during the last two weeks. They were asked "Did you feel #### during the last two weeks?" and the possible answers were {no, a little, a lot, very much}. For irritable, lonely, nervous, anxious, and depressed, we code the answers as {1, 2, 3, 4} respectively. For calm, we code the answers as {4, 3, 2, 1}. Then we construct the index by taking the average of the six numbers for each person. Therefore, the index has a minimum of 1 and a maximum of 4 and higher values of the index imply poorer mental health.

[25] We have tried other ways of aggregating the answers from these questions to create an index of mental wellbeing and found similar birth order patterns.

health, we see that, although not all estimates are statistically significant, the coefficients generally suggest that mental health declines with birth order. We get qualitatively similar estimates when we use the binary measure of mental illness. Finally, we find that later-borns are less happy, with second-borns being about 2% and fifth-borns being about 8% less likely to say that they are happy than first-borns. These are relative to a mean of 77% for our sample.[26]

Possible Mechanisms

What can explain the birth order effects we find? One possibility is that health is affected by education and earnings and these are a pathway through which birth order influences health. It is well established that health tends to improve with education and earnings (See, for example, Cutler and Lleras-Muney, 2010). We have verified that the effects of birth order on education and earnings in our sample are consistent with what prior research has found – first-borns have higher average education and earnings than later-borns – so this is a plausible explanation for poorer health outcomes of later-borns. However, it cannot explain the fact that later-borns have better health along some dimensions such as having lower risk of high blood pressure and obesity. We have re-estimated the birth order regressions adding controls for education and earnings in order to get a sense of how important they might be in determining the birth order effects.[27] As expected, we find that including these controls has the effect of improving the relative health of

[26] All family size estimates in the tables are the effects relative to 2-child families. Although we would not want to push for a causal interpretation of the family size coefficients (due to likely omitted variable bias), it is interesting to note the patterns we observe. Because poorer people tend to have larger families, we expect that true causal effects of family size to be no more negative than OLS estimates. This is consistent with most family size findings from the developed world including our own findings on the effects of family size on education using twin births and sex composition as instruments (Black, Devereux and Salvanes, 2005). Therefore, it is interesting that the estimated family size effects in Tables 1-3 do not consistently demonstrate that bigger families have worse health – in fact, people from larger families are less likely to have high blood pressure, less likely to have high triglycerides, and less likely to be overweight or obese. They also smoke fewer cigarettes and drink less alcohol. The only variable that points to positive health benefits of coming from a smaller family is height – persons from four and five child families are shorter than those from 2-child families.

[27] We include dummy variables for each education level (completed years of schooling), plus a dummy for having positive earnings in 1995 (when sample members are aged between 35 and 55) and a control for earnings in 1995. We have tried alternative specifications for these variables and found similar results.

later-borns relative to first-borns. However, the changes are not very large. For example, the blood pressure advantage of 5th borns over 1st borns increases from 0.07 to 0.08, the analogous obesity advantage increases from 0.05 to 0.054, the smoking difference falls from 1.58 to 1.24, and the difference in value of the mental illness index falls from 0.074 to 0.067. So, while education and earnings appear to be part of the story here, the birth order patterns are largely unchanged when they are added as control variables.

Birth order effects could also have biological origins. For example, the in-utero programming hypothesis suggests that the maternal immune system changes with the number of births and that this affects the child in utero and subsequently (Ohfuji *et al.*, 2009). Also, it is well established that birth weight tends to increase with parity so first-borns are, on average, lighter at birth than their siblings. (See, for example, Juntunen, Läärä & Kauppila, 1997 and Wilcox, Chang & Johnson, 1996.) While the long-term consequences of this are unclear, it may be part of the explanation of the greater propensity of first-borns to be obese (Wells et al. 2011). Additionally, the higher-blood pressure of first-borns may be related to their greater BMI.

Another potential mechanism is personality. While the empirical evidence is not particularly strong, there is an established set of theories about birth order and personality. First-borns are often perceived to be intense and career-orientated while later-borns are considered to be more laid back and creative (Sulloway, 1996, Zweigenhaf and von Ammen, 2000).[28] This provides a possible set of explanations for these findings. High blood pressure and triglycerides may be caused by the stress that results from this driven, competitive personality type. However, we do not have any data that allow us to examine this possibility further.

Given the recent attention to the role of early parental investments on long-run children's outcomes, we will focus our attention here on two health-related decisions made by the mother while pregnant or soon after the birth of her child. To do so, we introduce a variety of new

[28] Recent work using administrative data from Sweden suggests that first-borns are more likely to be managers. See Black, Gronqvist and Ockert (2015).

datasets. Note, however, that this new information is unavailable for the cohorts for whom we have health information, so we cannot evaluate the role of these factors in determining the health effects we have found thus far.

Parental Investments in Utero

One potential explanation for health differences by birth order is that parents invest differentially during pregnancy. For example, smoking during pregnancy has been shown to be extremely harmful to the fetus (Rubin *et al.*, 1986, Bernstein *et al.*, 2005). Although we have no information on maternal behavior during pregnancy for the individuals sampled in the health survey, there is information in the Birth Register on smoking behavior of mothers who give birth between 1999 and 2009. Women are asked whether and how much they smoked both at the beginning and at the end of pregnancy. Women report smoking status at the start of the pregnancy to doctors at a free, recommended consultation around gestational week 8-12 (some women report it slightly later because their first consultation is after week 12). They are asked not only about smoking status (yes/no) but also how many cigarettes per day they smoke. The birth register also contains information on smoking behavior at the end of pregnancy collected during a pre-birth hospital visit around gestational week 36. The response rate in our data for this smoking question is 83% at the beginning of pregnancy and 79% at the end.[29]

Table 4 presents the estimates when we examine whether smoking behavior depends on the birth order of the in-utero child. We use the same control variables as in the previous estimation of health effects.[30] The OLS and FE estimates are similar and, as before, we will focus on the FE ones. These estimates imply that mothers are about 4% more likely to smoke at the beginning of their first pregnancy than for their second or third birth. Given the mean value of the

[29] We have created a variable for whether smoking information is missing and used it as a dependent variable to see whether reporting is related to birth order. We found no evidence for any relationship.
[30] Note that our family size measure here is family size in 2009 and, unlike in the previous regressions, may not represent completed family size for these women.

dependent variable is 14%, this is a sizeable effect. However, the pattern is actually *reversed* by the end of the pregnancy, with mothers now *less* likely to smoke on their first pregnancy. These patterns for smoking incidence are also found when we study the number of cigarettes smoked in columns 3 and 4.

We next take the sample of mothers who smoked at the beginning of pregnancy and examine whether their decision to quit during pregnancy is related to the birth order of the child (37% of smokers at the beginning of pregnancy no longer smoke at the end). Column 5 shows these results; we find that mothers are much less likely to quit smoking during later pregnancies than during their first pregnancy. Finally, in column 6, we find the same pattern when we include all women and study the change in the number of cigarettes smoked between the beginning and end of pregnancy.

Taken together, our smoking findings paint a complicated picture. First-borns are more likely to be exposed to smoke during early pregnancy than later-borns but less likely to be exposed later in pregnancy. Thus, the health effects are not clear-cut. However, what is clear is that behavioral responses by mothers differ by birth order in a way that is favorable to first-borns -- parents are more likely to quit smoking during pregnancy for first-born children than for subsequent ones.[31]

Parental Investments in Childhood

Birth order effects could also be the result of differential parental behaviors post-birth. Again, although we do not have data on early parental investments for our health sample, we do observe information on breast feeding behavior for later cohorts and can examine whether mothers breastfeed first-borns for longer than later-borns. Although there are some recent papers

[31] This is consistent with the work by Lehmann *et al.* (2014). Using the CNLSY, they find no statistically significant effects of the child's birth order on number of cigarettes smoked but, like us, they find evidence that mothers of later-borns are less likely to reduce their smoking during pregnancy.

examining the relationship between birth order and breastfeeding in the US and Ecuador (Lehmann *et al*, 2014; Buckles and Kolka, 2014; De Haan et al.,2014), it is useful to examine in the context of Norway, where rates of breastfeeding are very high.[32]

In the CONOR dataset, we can observe the breastfeeding decisions, including incidence and duration for each child of the surveyed women. We merge the information for each child with birth registers that are available for children born from 1967 onwards. This gives us information on 42425 children born to 17554 mothers. Descriptive statistics for this sample are in Appendix Table 3.

The estimates are presented in Table 5. The dependent variable in the first column is duration of breastfeeding (in months); the second column adds a control for birth weight, as this may have an independent effect on breastfeeding and also has been shown to affect later outcomes (Black *et al.*, 2007). Columns 3 and 4 have the equivalent estimates where the dependent variable is whether breastfeeding lasts at least 6 months. Both OLS and mother fixed effects estimates show that later-borns are breastfed for less time than first-borns.[33] The effect sizes get slightly bigger once birth weight is controlled for, as heavier babies are more likely to be breastfed and first-borns are, on average, lighter than later-borns.[34]

5. Conclusions

In this paper, we have used large health surveys linked to population registers to study the relationship between birth order and health and health behaviors. Unlike findings in the literature for education and cognitive skills in developed countries, we do not find a clear first-

[32] Breastfeeding is very common in Norway with the average duration of breastfeeding being 7 months and only about 7% of mothers do not breastfeed at all.
[33] Lehmann *et al.* (2014) find a similar pattern using the CNLSY as do Buckles and Kolka (2014) using the NLSY (they also find mothers are more likely to receive first trimester care and take pre-natal vitamins during their first pregnancy). De Haan et al. (2014) find the opposite -- first borns are breastfed for less time -- in their study of Ecuador.
[34] Table 5 also includes family size estimates. These show that children from larger families are more likely to be breastfed, suggesting that coming from a larger family has no adverse effects on parental investments.

born advantage in health. On average, later-borns have lower blood pressure, triglycerides, and BMI than first-borns.

Despite these findings, first-borns appear to have better health in other dimensions. They have better self-reported physical and mental health, and they are more likely to report being happy. They are also much less likely to smoke. The smoking finding is consistent with a continuation of a pattern of poorer health behaviors by later-borns identified by previous research on adolescents. Given the negative long-term health effects of smoking, it is also consistent with the higher mortality rates found for later-borns in the previous literature. Additionally, our finding that first-borns have better mental health may provide a partial explanation for the lower suicide rates found in the prior literature for this group.

Because of the likely importance of early investments in determining adult health, we have also examined how smoking during pregnancy and breastfeeding depend on the birth order of the child. Our findings generally corroborate ongoing research in this area that suggests greater parental investment in first-borns. While this analysis is suggestive, further research will be required to further untangle the various mechanisms underlying the complicated relationship between birth order and adult health.

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Table 1: Birth Order and Health Outcomes

OLS

	(1) High Blood Pressure	(2) High Cholesterol	(3) High Triglycerides	(4) Height	(5) High BMI	(6) Obese
2nd Child	-0.033***	-0.003	-0.017***	-0.118***	-0.044***	-0.022***
	(0.002)	(0.002)	(0.002)	(0.033)	(0.003)	(0.002)
3rd Child	-0.048***	-0.005	-0.020***	-0.214***	-0.063***	-0.031***
	(0.004)	(0.004)	(0.004)	(0.057)	(0.005)	(0.003)
4th Child	-0.055***	-0.015**	-0.024***	-0.263***	-0.064***	-0.034***
	(0.006)	(0.006)	(0.006)	(0.088)	(0.007)	(0.004)
5th Child	-0.069***	-0.018	-0.040***	-0.366**	-0.091***	-0.040***
	(0.010)	(0.011)	(0.010)	(0.154)	(0.012)	(0.008)
2 siblings	-0.010***	0.001	-0.004**	-0.053	-0.007***	-0.006***
	(0.002)	(0.002)	(0.002)	(0.033)	(0.002)	(0.001)
3 siblings	-0.017***	0.002	-0.009***	-0.251***	-0.009***	-0.005***
	(0.003)	(0.003)	(0.002)	(0.041)	(0.003)	(0.002)
4 siblings	-0.017***	0.007**	-0.010***	-0.524***	0.001	-0.007***
	(0.003)	(0.004)	(0.003)	(0.056)	(0.004)	(0.002)
N	279624	278918	278911	279840	279706	279706

Mother Fixed Effects

	(1) High Blood Pressure	(2) High Cholesterol	(3) High Triglycerides	(4) Height	(5) High BMI	(6) Obese
2nd Child	-0.030***	-0.002	-0.016***	-0.198***	-0.038***	-0.023***
	(0.004)	(0.004)	(0.004)	(0.042)	(0.004)	(0.003)
3rd Child	-0.046***	-0.000	-0.018***	-0.385***	-0.061***	-0.034***
	(0.007)	(0.007)	(0.006)	(0.075)	(0.008)	(0.005)
4th Child	-0.054***	-0.013	-0.018*	-0.535***	-0.064***	-0.041***
	(0.010)	(0.010)	(0.010)	(0.114)	(0.012)	(0.007)
5th Child	-0.072***	-0.021	-0.011	-0.769***	-0.100***	-0.050***
	(0.016)	(0.017)	(0.016)	(0.183)	(0.019)	(0.011)
N	279624	278918	278911	279840	279706	279706

Standard errors in parentheses allow for correlation of errors within family. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

Each column represents a separate regression. The OLS control variables include indicators for gender, year-of-birth, test year, survey, age of mother at birth, and age of mother at first birth. The FE control variables include indicators for gender, year-of-birth, test year, and survey. The omitted birth category is first child. In the OLS regressions, the omitted family size category is one sibling.

Table 2: Birth Order and Health Behaviors

OLS

	(1) Number Cigarettes Daily	(2) Daily Smoker	(3) Number of drinks in 2 weeks	(4) Heavy Drinker	(5) Weekly Exercise
2nd Child	0.516***	0.038***	-0.084*	-0.001	0.001
	(0.042)	(0.003)	(0.050)	(0.001)	(0.004)
3rd Child	0.711***	0.053***	-0.069	-0.000	-0.004
	(0.070)	(0.005)	(0.077)	(0.002)	(0.006)
4th Child	0.788***	0.054***	-0.116	0.000	-0.008
	(0.107)	(0.007)	(0.112)	(0.002)	(0.009)
5th Child	0.910***	0.071***	0.077	0.009**	-0.002
	(0.186)	(0.012)	(0.190)	(0.005)	(0.016)
2 siblings	-0.163***	-0.010***	-0.279***	-0.003***	0.005
	(0.038)	(0.002)	(0.044)	(0.001)	(0.003)
3 siblings	-0.169***	-0.010***	-0.576***	-0.006***	-0.006
	(0.047)	(0.003)	(0.052)	(0.001)	(0.004)
4 siblings	-0.071	-0.001	-0.940***	-0.010***	-0.002
	(0.063)	(0.004)	(0.063)	(0.001)	(0.005)
N	277706	278764	129353	129353	144444

Mother Fixed Effects

	(1) Number Cigarettes Daily	(2) Daily Smoker	(3) Number of drinks in 2 weeks	(4) Heavy Drinker	(5) Weekly Exercise
2nd Child	0.560***	0.049***	-0.207*	-0.002	0.012
	(0.065)	(0.004)	(0.113)	(0.003)	(0.009)
3rd Child	0.976***	0.084***	-0.224	-0.005	0.026
	(0.116)	(0.008)	(0.208)	(0.005)	(0.017)
4th Child	1.177***	0.100***	-0.180	-0.001	0.021
	(0.177)	(0.012)	(0.321)	(0.007)	(0.025)
5th Child	1.585***	0.134***	0.104	0.001	0.043
	(0.284)	(0.019)	(0.505)	(0.012)	(0.040)
N	277706	278764	129353	129353	144444

Standard errors in parentheses allow for correlation of errors within family. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$
Each column represents a separate regression. The OLS control variables include indicators for gender, year-of-birth, test year, survey, age of mother at birth, and age of mother at first birth. The FE control variables include indicators for gender, year-of-birth, test year, and survey. The omitted birth category is first child. In the OLS regressions, the omitted family size category is one sibling.

Table 3: Birth Order and Self-reported Physical and Mental Health

OLS

	(1) Good Health	(2) Mental Illness Index	(3) Bad Mental Health	(4) Happy
2nd Child	-0.013***	0.012***	0.010***	-0.014***
	(0.003)	(0.003)	(0.003)	(0.003)
3rd Child	-0.021***	0.019***	0.017***	-0.017***
	(0.004)	(0.005)	(0.005)	(0.005)
4th Child	-0.025***	0.025***	0.021***	-0.036***
	(0.007)	(0.008)	(0.008)	(0.008)
5th Child	-0.033***	0.020	0.020	-0.042***
	(0.012)	(0.014)	(0.014)	(0.014)
2 siblings	0.008***	-0.005	-0.005	0.004
	(0.002)	(0.003)	(0.003)	(0.003)
3 siblings	0.003	-0.002	-0.003	0.006
	(0.003)	(0.004)	(0.003)	(0.004)
4 siblings	0.001	-0.006	-0.002	0.006
	(0.004)	(0.005)	(0.005)	(0.005)
N	151247	147296	140957	142160

Mother Fixed Effects

	(1) Good Health	(2) Mental Illness Index	(3) Bad Mental Health	(4) Happy
2nd Child	-0.014**	0.019**	0.013*	-0.022***
	(0.006)	(0.007)	(0.007)	(0.008)
3rd Child	-0.018	0.028**	0.024*	-0.028**
	(0.011)	(0.013)	(0.014)	(0.014)
4th Child	-0.010	0.050**	0.028	-0.056***
	(0.017)	(0.020)	(0.021)	(0.021)
5th Child	-0.029	0.074**	0.076**	-0.076**
	(0.026)	(0.031)	(0.032)	(0.033)
N	151247	147296	140957	142160

Standard errors in parentheses allow for correlation of errors within family. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

Each column represents a separate regression. The OLS control variables include indicators for gender, year-of-birth, test year, survey, age of mother at birth, and age of mother at first birth. The FE control variables include indicators for gender, year-of-birth, test year, and survey. The omitted birth category is first child. In the OLS regressions, the omitted family size category is one sibling.

Mental Health Index: Respondents are asked separate questions about how irritable, lonely, nervous, anxious, calm, or depressed they were during the last two weeks. They were asked “Did you feel #### during the last two weeks?” and the possible answers were {no, a little, a lot, very much}. For irritable, lonely, nervous, anxious, and depressed, we code the answers as {1, 2, 3, 4} respectively. For calm, we code the answers as {4, 3, 2, 1}. Then we construct the index by taking the average of the six numbers for each person.

Table 4: Birth Order of Child and Smoking during Pregnancy

OLS

	(1) **Smoke at start**	(2) **Smoke at end**	(3) **Number of Cigarettes at start**	(4) **Number of Cigarettes at end**	(5) **Stop during Pregnancy**	(6) **Change in number of cigarettes**
2nd Child	-0.030***	0.006***	-0.373***	0.039***	-0.133***	0.389***
	(0.001)	(0.001)	(0.015)	(0.010)	(0.006)	(0.013)
3rd Child	-0.029***	0.021***	-0.365***	0.143***	-0.222***	0.459***
	(0.002)	(0.002)	(0.029)	(0.019)	(0.011)	(0.023)
4th Child	-0.029***	0.034***	-0.371***	0.230***	-0.289***	0.522***
	(0.004)	(0.004)	(0.047)	(0.032)	(0.018)	(0.039)
5th Child	-0.018***	0.048***	-0.326***	0.283***	-0.332***	0.511***
	(0.007)	(0.007)	(0.084)	(0.060)	(0.032)	(0.067)
2 siblings	-0.037***	-0.031***	-0.340***	-0.200***	0.028***	0.158***
	(0.002)	(0.002)	(0.019)	(0.014)	(0.007)	(0.013)
3 siblings	-0.048***	-0.040***	-0.387***	-0.217***	0.028**	0.205***
	(0.004)	(0.003)	(0.039)	(0.029)	(0.013)	(0.026)
4 siblings	-0.057***	-0.049***	-0.382***	-0.169**	0.037	0.298***
	(0.007)	(0.006)	(0.075)	(0.064)	(0.024)	(0.040)
N	328399	312332	326100	310431	42069	306871

Mother Fixed Effects

	(1) Smoke at start	(2) Smoke at end	(3) Number of Cigarettes at start	(4) Number of Cigarettes at end	(5) Stop during Pregnancy	(6) Change in number of cigarettes
2nd Child	-0.035***	0.004***	-0.448***	0.020*	-0.034***	0.453***
	(0.002)	(0.001)	(0.019)	(0.011)	(0.010)	(0.019)
3rd Child	-0.041***	0.018***	-0.553***	0.090***	-0.075***	0.600***
	(0.003)	(0.003)	(0.037)	(0.022)	(0.018)	(0.037)
4th Child	-0.048***	0.027***	-0.654***	0.138***	-0.111***	0.711***
	(0.005)	(0.004)	(0.057)	(0.034)	(0.028)	(0.057)
5th Child	-0.046***	0.041***	-0.760***	0.159***	-0.162***	0.777***
	(0.009)	(0.007)	(0.096)	(0.057)	(0.046)	(0.095)
N	328399	312332	326100	310431	42069	306871

Standard errors in parentheses allow for correlation of errors within family. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$
Each column represents a separate regression. The OLS control variables include indicators for gender, year-of-birth, age of mother at birth, and age of mother at first birth. The FE control variables include indicators for gender and year-of-birth. The omitted birth category is first child. In the OLS regressions, the omitted family size category is one sibling.

Table 5: Birth Order and Breastfeeding

OLS

	(1) Months Breastfed	(2) Months Breastfed	(3) Breastfed for 6+ months	(4) Breastfed for 6+ months
2^{nd} Child	-0.256***	-0.334***	-0.002	-0.010*
	(0.058)	(0.058)	(0.006)	(0.006)
3^{rd} Child	-0.241**	-0.344***	-0.013	-0.023**
	(0.114)	(0.114)	(0.010)	(0.010)
4^{th} Child	-0.538***	-0.660***	-0.048***	-0.060***
	(0.192)	(0.191)	(0.016)	(0.016)
5^{th} Child	-0.941**	-1.067***	-0.060**	-0.072**
	(0.374)	(0.372)	(0.028)	(0.028)
2 siblings	0.596***	0.587***	0.054***	0.053***
	(0.064)	(0.064)	(0.006)	(0.006)
3 siblings	1.147***	1.149***	0.090***	0.090***
	(0.109)	(0.109)	(0.010)	(0.010)
4 siblings	1.088***	1.091***	0.058***	0.058***
	(0.240)	(0.240)	(0.021)	(0.021)
Birth Weight		0.597***		0.060***
		(0.053)		(0.005)
N	42443	42443	42443	42443

Mother Fixed Effects

	(1) Months Breastfed	(2) Months Breastfed	(3) Breastfed for 6+ months	(4) Breastfed for 6+ months
2^{nd} Child	-0.255***	-0.335***	0.003	-0.005
	(0.053)	(0.054)	(0.005)	(0.005)
3^{rd} Child	-0.240**	-0.351***	-0.014	-0.026***
	(0.098)	(0.098)	(0.010)	(0.010)
4^{th} Child	-0.478***	-0.611***	-0.055***	-0.068***
	(0.155)	(0.155)	(0.015)	(0.015)
5^{th} Child	-1.068***	-1.217***	-0.100***	-0.115***
	(0.270)	(0.270)	(0.027)	(0.027)
Birth Weight		0.584***		0.060***
		(0.052)		(0.005)
N	42443	42443	42443	42443

Standard errors in parentheses allow for correlation of errors within family. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$
Each column represents a separate regression. The OLS control variables include indicators for gender, year-of-birth, test year, survey, age of mother at birth, and age of mother at first birth. The FE control variables include indicators for gender, year-of-birth, test year, and survey. The omitted birth category is first child. In the OLS regressions, the omitted family size category is one sibling.

Appendix Table 1
Summary Statistics for Health Sample

	No. of Observations	Mean	Standard Deviation	Min	Max
High Blood Pressure	279624	0.24	0.43	0.00	1.00
High Cholesterol	278918	0.26	0.44	0.00	1.00
High Triglycerides	278911	0.22	0.41	0.00	1.00
Height	279840	172.75	8.96	115.00	212.00
High BMI	279706	0.47	0.50	0.00	1.00
Obese	279706	0.10	0.30	0.00	1.00
Number of Cigarettes per day	277706	5.05	7.55	0.00	80.00
Daily Smoker	278764	0.38	0.49	0.00	1.00
Number of Alcoholic Drinks in last two weeks	129353	4.73	6.12	0.00	206.00
Heavy Drinker	129353	0.02	0.13	0.00	1.00
Exercise each week	144444	0.42	0.49	0.00	1.00
Good Health	151247	0.85	0.36	0.00	1.00
Happy	142160	0.77	0.42	0.00	1.00
Mental Illness Index	147296	1.41	0.42	1.00	4.00
Bad Mental Health	140957	0.21	0.41	0.00	1.00
Female	280245	0.50	0.50	0.00	1.00
Age	280245	41.72	2.43	35.00	60.00
Year of Birth	280245	1952.80	3.71	1940	1960
Mother's age at birth	280245	28.94	5.93	16.00	49.00
Mother's age at 1st birth	280245	25.98	4.75	16.00	45.00
Survey year	280245	1994.60	3.39	1988	2003
CONOR Sample	280245	0.17	0.38	0.00	1.00
1st child	280245	0.44	0.50	0.00	1.00
2nd child	280245	0.38	0.49	0.00	1.00
3rd child	280245	0.14	0.34	0.00	1.00
4th child	280245	0.04	0.19	0.00	1.00
5th child	280245	0.01	0.09	0.00	1.00
1 sibling	280245	0.37	0.48	0.00	1.00
2 siblings	280245	0.33	0.47	0.00	1.00
3 siblings	280245	0.20	0.40	0.00	1.00
4 siblings	280245	0.10	0.30	0.00	1.00

Appendix Table 2

Summary Statistics for Smoking Sample

	No. of Observations	Mean	Standard Deviation	Min	Max
Smoke at start of pregnancy	328399	0.14	0.34	0.00	1.00
Smoke at end of pregnancy	312332	0.09	0.29	0.00	1.00
Cigarettes per day at start of pregnancy	326100	1.21	3.68	0.00	83.00
Cigarettes per day at end of pregnancy	310431	0.62	2.40	0.00	75.00
Stop smoking during pregnancy	42069	0.37	0.48	0.00	1.00
Change in number of cigarettes per day during pregnancy	306871	-0.59	2.61	-51.00	65.00
Female	397295	0.49	0.50	0.00	1.00
Year of Birth	397295	2004.13	2.98	1999	2009
Mother's age at birth	397295	29.17	4.78	16.00	49.00
Mother's age at 1st birth	397295	26.60	4.60	16.00	45.00
1st child	397295	0.35	0.48	0.00	1.00
2nd child	397295	0.45	0.50	0.00	1.00
3rd child	397295	0.15	0.36	0.00	1.00
4th child	397295	0.04	0.19	0.00	1.00
5th child	397295	0.01	0.10	0.00	1.00
1 sibling	397295	0.62	0.49	0.00	1.00
2 siblings	397295	0.29	0.45	0.00	1.00
3 siblings	397295	0.07	0.26	0.00	1.00
4 siblings	397295	0.02	0.14	0.00	1.00

Appendix Table 3
Summary Statistics for Breastfeeding Sample

	No. of Observations	Mean	Standard Deviation	Min	Max
Months Breastfed	42425	7.27	5.10	0.00	30.00
Breastfed for 6 months or more	42425	0.61	0.49	0.00	1.00
Female	42425	0.49	0.50	0.00	1.00
Year of Birth	42425	1981.94	6.59	1967	2002
Mother's age at birth	42425	27.24	5.39	16.00	46.00
Mother's age at 1st birth	42425	23.78	4.31	16.00	45.00
Survey year	42425	1997.99	2.21	1994	2002
1st child	42425	0.39	0.49	0.00	1.00
2nd child	42425	0.39	0.49	0.00	1.00
3rd child	42425	0.17	0.38	0.00	1.00
4th child	42425	0.04	0.20	0.00	1.00
5th child	42425	0.01	0.08	0.00	1.00
1 sibling	42425	0.44	0.50	0.00	1.00
2 siblings	42425	0.40	0.49	0.00	1.00
3 siblings	42425	0.13	0.34	0.00	1.00
4 siblings	42425	0.03	0.18	0.00	1.00
Birth Weight (kilos)	42425	3.55	0.54	0.01	6.01