INFANT HEALTH CARE AND LONG-TERM OUTCOMES

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Abstract—This paper studies the long-term and life cycle consequences of increasing access to mother and child health care centers in the first year of life. Access to these centers increased completed years of schooling by 0.15 years and earnings by 2%. These effects were stronger for children from a low socioeconomic background and contribute to a 10% reduction in the intergenerational persistence in educational attainment. Better nutrition within the first year of life is a likely mechanism. In particular, we find positive effects on adult height, fewer health risks at age 40, and decreased infant mortality from diarrhea.

I. Introduction

A large body of evidence shows that early-life exposure to disease and malnutrition has long-term consequences for adult health, education, and labor market outcomes (see Barker, 1992; Almond & Currie, 2011). As documented in the neuroscience literature, the first three years of life are the most critical period of human brain development, and therefore a child’s health during these early years matters in terms of later human capital investments (Johnson, 2001). Moreover, a growing body of literature documents that policy-induced improvements in early-life health and nutrition have positive long-term effects. For instance, Hoynes, Schanzenbach, and Almond (2016) present evidence that access to the food stamp program during early childhood improved adult health as well as self-sufficiency for women. In addition, the provision of breastfeeding advice is shown to improve children’s cognitive development in a large, randomized experiment (Kramer et al., 2008) and in quasi-experimental settings (Fitzsimons & Vera-Hernandez, 2013). Furthermore, several papers show that hospital-provided care to specific groups of infants has long-run benefits. Examples include Bharadwaj, Loeken, and Neilson (2013), who focus on extra medical care given to very low birthweight children; Chay, Guryan, and Mazumder (2009), who study the racial integration of hospitals in the U.S. South; and Bhalotra and Venkataramani (2013), who analyze the introduction of the first antibiotics. This evidence demonstrates that the provision of appropriate health care services to infants and improved nutrition have the potential to mitigate the negative effects of disease exposure, poverty, or low birthweight.

While the existing literature often focuses on hospital-provided care or programs directed at specific groups, we advance the literature by studying the long-term consequences over the whole life cycle of the provision of universal well-child visits. This is a more basic (and often cheaper) form of infant health care, which may be relevant for a large share of the population. In this paper, we use unique historical data to investigate the life cycle consequences of an expansion of health care infrastructure directed at infants. In particular, we exploit the national rollout of mother and child health care centers in Norway, which began in the 1930s. Analyzing this rollout provides the first evidence that there can be positive long-term economic effects of such health care centers.

From the 1930s on, mother and child health care centers were established by local initiatives by a philanthropic women’s institution all over Norway. By 1946, about 26% of Norway’s municipalities had a functioning center for mother and child health care (see Schiøtz, 2003). These centers reduced the cost to the public of infant health care, as the service was free of charge, and increased its availability and convenience because the centers were established in multiple neighborhoods within cities, as well as in small villages, to minimize travel expenses for mothers. The well-child visits to mother and child health centers included a physical examination and provided information about normal development, sleep, safety, disease, and most important, nutrition. Although it was a universal and free program, a key goal was to reach out to poor families. Hence, this program may have been important in reducing inequality and improving social mobility. An additional contribution of this paper is to study the effect of the program on the intergenerational persistence in educational attainment across generations.

Our analysis is based on historical data from different archives documenting the exact timing of the rollout of mother and child health care centers. Then, these data are linked to Norwegian register data, allowing us to follow all births in Norway and outcomes later in life. This historical aspect allows us to evaluate the impact of well-child visits over an individual’s life cycle, ranging from infant mortality to education, labor market, and adult health outcomes. Our estimation strategy is a differences-in-differences approach, comparing cohorts that were older than 1 year at the time a center opened in their municipality of birth (control infants) to cohorts born in or after the year a center opened in their municipality of birth (treated infants). The key identification assumption is that the timing of the center openings is not correlated with differential trends in education, earnings, or health across municipalities. For this reason, we include municipality-specific time trends, and, in a further specification, we compare siblings born before and after the health rollout provides the first evidence that there can be positive long-term economic effects of such health care centers.

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care centers opened. Our results are robust to adding a set of municipality control variables, and event-study models support the validity of the research design.

Our first finding is that access to well-child visits led to a statistically significant increase in school attainment of 0.15 years and lifetime earnings of 2%. Our second set of results reveals that the effects are stronger for children from lower socioeconomic backgrounds, and the program reduced the intergenerational persistence in educational attainment across generations by 10%. Our third set of findings looks into mechanisms by combining the data on education and labor market outcomes with health outcomes at age 40. In particular, we find a reduction in incidences of metabolic syndrome such as obesity, hypertension, and cardiac risk. In addition, we have information on adult height, an outcome that is likely to be affected by nutrition in the first years of life (Deaton, 2007; Rivera et al., 1995). Therefore, positive effects on height at age 40 suggest that better nutrition within the first years of life is a likely mechanism behind our findings. This mechanism is supported by our finding that access to well-child visits decreases infant mortality from diarrhea by 50%, whereas infant mortality from pneumonia, tuberculosis, or congenital malformations is not affected. Finally, the costs of the program were relatively low, and we add a simple cost–benefit analysis, which shows that the program’s benefits outweigh its costs in the context that we study.

Our paper builds on and finds similar effects as earlier studies relating well-child visits to infant health, which indicate a positive first-stage effect from these visits. Wüst (2012) shows that infant care provided by home-visiting nurses has positive short-term impacts on infant mortality and maternal health after pregnancy. Bhalotra, Karlsson, and Nilsson (2017) find that an infant care program in Sweden in the 1930s led to a substantial decline in the risk of infant death. Moehling and Thomasson (2014) show that infant mortality decreased in areas with more intense exposure to policies related to the Sheppard–Towner Act, which provided federal funding for maternal and infant health care between 1922 and 1929. In addition, Chen, Oster, and Williams (2016) provide evidence that pediatric well-child visits are likely to be a very important factor explaining the gap in infant mortality rates between Europe and the United States. In developing countries, randomized control trials on neonatal care in the form of home visits by community health workers are associated with reduced neonatal mortality (Gogia & Sachdev, 2010). In addition, our work fits into the growing literature on the importance of information about health. In a recent review, Dupas (2011) suggests that the provision of information about health and health care may significantly affect health behavior. In the context of information on infant nutrition, Fitzsimons et al. (2016) present experimental evidence that the provision of such information to poor families may result in large increases in household consumption of protein-rich food by children. However, it is still not well known whether well-child visits and information given to mothers about infant care improve children’s outcomes in the long run. Two notable exceptions parallel to our paper, Bhalotra et al. (2017) and Hjort, Sølvsten, and Wüst (2017), analyze the long-term effects of a Swedish infant care program and a Danish home-visiting program rolled out in the 1930s. We differentiate our works from their studies by focusing on education (including intergenerational mobility in education) and labor market outcomes and by providing novel empirical evidence on the mechanisms driving our findings. Moreover, our health measures (data from health examinations such as adult height, BMI, blood pressure, and cholesterol level in the blood) complement the health measures used by Hjort et al. (2017: survival beyond given ages; number of hospital nights; and medically diagnosed heart disease, cardiovascular disease, and diabetes). Furthermore, we add a cost-benefit analysis. As Chetty et al. (2011) discussed in the context of Project STAR, short-term and long-term outcomes may not necessarily be the same. Therefore, it is important to analyze whether the impact of well-child visits and early-life nutritional interventions goes beyond immediate outcomes and has benefits for children’s health that can spill over to long-term educational, labor market, and adult health outcomes.

The remainder of the paper is structured as follows. Section II provides some historic background on the mother and child health care centers in Norway. Section III describes the data. Section IV describes the identification strategy, and section V presents the empirical findings and robustness checks, which corroborate the main results. Section VI explores mechanisms behind the results. Section VII links our results to the previous literature and presents a simple cost–benefit analysis. Section VIII concludes.

II. Historical Background

In the late nineteenth century, public concern over children’s health increased in Europe and the United States. In particular, the high infant mortality rate intensified the public debate. The public concern, referred to as the infant welfare movement, led governments to invest in social and population policies to improve infants’ health conditions. As a result, information centers for mothers of newborns were established in birth clinics in many European countries in the late nineteenth and early twentieth centuries. In Norway, mother and child health care centers were established as a result of local initiatives by philanthropic institutions. Most influential was the Norwegian Women’s Public Health Association (NKS), which opened the first center in 1914 in

1The Norwegian welfare state with its universal social safety net was established only in 1967.

2NKS is the largest women’s organization in Norway and is involved largely in humanitarian work. The association has about 750 local chapters, and after World War II, it had about 250,000 members (out of a total of 3 million inhabitants). Besides the mother and child health care centers, NKS established tuberculosis sanatoriums, nursing schools, and orphanages. During World War II, it distributed food and established military hospitals.
Oslo and ran about 400 centers by 1946. Centers led by NKS were opened through local initiatives and run by local NKS chapters, according to guidelines provided by the national NKS governing body. This national body provided local chapters with financial support. In addition, the NKS undertook intense outreach activities to inform women about their services. Although the centers were mainly targeted at poor families, they were open to everyone. In cities, NKS centers were providing care in both neighborhoods where predominantly poor families lived and the cities’ richest neighborhoods. In the beginning, the centers served coffee and pastries in an effort to encourage mothers to have their infants examined. However, the mother and child health care centers quickly became widely popular. By 1930, the take-up rate in Oslo was 60% of all live births, and in 1939 the take-up was 80% (Schistø, 2003). The centers had two main goals. First, they provided free medical checkups by doctors and nurses for the infants. Infants were measured and examined during each visit, and doctors and nurses at the centers kept records of infants’ health status on standard forms. Ill infants were referred to doctors or hospitals. On average, a child would visit a mother and child health care center three to four times during his or her first year of life. Second, the centers provided mothers with advice on adequate infant nutrition and tools to decrease infant mortality, such as infant hygiene measures and adequate infant clothing. Breastfeeding rates between 1920 and the late 1960s were relatively low and declining in Norway (Liestøl, Rosenberg, & Walloe, 1988) as milk formulas, a mix of cows’ milk, water, cream, and sugar or honey, became more and more popular and evaporated milk began to be widely available at low prices. However, formula-fed babies exhibited vitamin C and D deficiencies and bacterial infections, resulting from polluted water. As a result of the increased risk of gastrointestinal diseases for formula-fed babies, breastfeeding was promoted, particularly among poor women and single mothers. In addition, mothers were taught to make adequate milk formulas, and some of the centers supplied them with evaporated milk and with cod liver oil to reduce diseases related to vitamin D deficiencies. Theodore Frølich, the first Norwegian professor of pediatrics, was interested in the research on child nutrition and, in particular, research on vitamins. He was actively involved in the initiative to establish the first mother and child health care center in Norway. As Frølich comments, proper nutrition was an important focus of the health care centers: “The cause behind the high mortality rate is almost solely inappropriate nutrition, leading to intestinal sickness, rickets, skin diseases and cramps. Children raised with milk formulas have little resistance against children’s diseases and, horrifyingly, many children die every year because of their mother’s illness or ignorance. The mother and child health care centers shall first and foremost give young and inexperienced mothers competent guidance and then, also, through encouragement and reward, give the women inspiration to breastfeed their own children.” Very few centers provided pregnant women with advice on nutrition and a code of conduct during pregnancy. In addition, some centers provided smallpox vaccinations and, later, diphtheria vaccinations for infants and small children.

Doctors and nurses were paid an annual salary, and their traveling expenses were reimbursed. Moreover, a substantial share of the centers’ yearly budgets was spent on printing information materials for mothers. As well as philanthropic contributions, the health care centers were financed largely by funds from the state lottery, with some centers receiving additional financial support from local governments, counties, and the state. In 1972, municipalities were given the obligation to run these health care centers. The services provided by the centers were regulated by the Health Directorate through official guidelines and handbooks. Thus, the municipalities gradually took over the fourteen hundred centers that had mostly been privately run in the late 1960s. The goal was to reach out to everyone and to establish a unified primary health care system for infants and small children. Although the centers have changed over time, they remain in place today as a free and universal service on offer to all infants and small children during their first six years of life and to their mothers. The centers offer health controls, vaccinations, and health education. An average child visits the center about ten to fifteen times during the first six years of life (most of the visits occur in the first year of life). The municipalities are responsible for the services. Centers are staffed by medical doctors, nurses, midwives, physiotherapists, and psychologists.

### III. Data

This paper links unique historical data on the rollout of mother and child health care centers in Norway with individual administrative data from various sources. Our primary data source is the Norwegian Registry Data, a linked administrative data set that covers the population of Norwegians up to 2012. These data, maintained by Statistics Norway, are a compilation of different administrative registers: the central population register, the family register, the education register, and the tax and earnings register. The data provide information about place of birth and residence, educational attainment, labor market status, and earnings, as well as a set of demographic variables and information on families. The historical data on the mother and child health care centers are collected from public and private archives. We describe

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3Historical documents show a handful of mother and child health care centers run by the Red Cross and other philanthropic organizations. NKS, however, provided the large majority of the centers.

4Milk formulas often included honey, which increases the risk of infant botulism (Arnon et al., 1979).

5The situation of children born to single mothers and children born out of wedlock was of special concern, as these children had 70% to 100% higher mortality rates than children born to married mothers in the 1930s.

6Similar types of mother and child health care centers with universal access exist in other European countries.
the historical data collected for this paper next. All other data sets we used are described in online appendix A.

A. Historical Data

We use a variety of data sources to document the rollout of mother and child health care centers from 1936 to 1955. We collected all available records from the NKS health care centers for this period. Our efforts have yielded records from approximately 400 different centers established between 1936 and 1955. The year in which each center was established is obtained from two surveys that the NKS sent out to all mother and child health care centers in 1939 and 1955. The surveys included a question on the date of establishment, the exact address of the center, the community it served, the founder of the center, the number and qualifications of employees, and the approximate budget of the center. Furthermore, we collected data on the centers’ yearly expenses and the types of services provided. All centers provided well-child visits for infants and some also provided immunizations. In addition, the data are verified using other primary sources, including local NKS sections’ yearly budgets. Our final database on the health care centers’ operation contains information on the year in which the municipality mother and child health care centers were established and in which years they were actively providing services, and more detailed information on the types of services the centers provided in 1941, 1943, 1947, 1948, and 1951. Figure A1 in online appendix A shows the rollout of the mother and child health care centers between 1935 and 1955. For presentational purposes, the dates of the openings are grouped into four periods: municipalities with centers established before 1935, municipalities with centers established between 1936 and 1945, municipalities with centers established between 1946 and 1955, and municipalities without centers in 1955. The first center was opened in Oslo in 1914. As the NKS expanded its number of service providers, well-child visits achieved broad geographic coverage. There is considerable within-region variation in establishment dates. Figure A2 in online appendix A shows in how many municipalities a center was opened in each year between 1910 and 1955. Mother and child health care centers that were established in municipalities with an already operating health care center are not included. A large portion of the health care centers were opened in the years 1937 to 1939, 1941, and 1945 to 1947. Comparing the size of a birth cohort in a municipality with the number of children checked at a health care center in each year, we find that the uptake rate was about 40% in the year of the center opening (see figure A3 in online appendix A). Two to four years after the opening of a health care center, the uptake rate was about 60%.

B. Sample Selection

For our analysis, we include data for cohorts born between 1936 and 1960 in Norway who were still alive in 1967. Individuals born outside Norway are excluded because our identification strategy relies on knowing the municipality of birth. We do not impose any further sample restrictions, although some individuals with missing information on outcome variables naturally drop out. For lifetime earnings (the average of earnings between 1967 and 2010), we have observations for all individuals, whereas for years of education, we are missing information for 12.8% of the sample. For missing observations on background characteristics, we include a dummy variable indicating that the variable is missing to keep the sample constant across the specification with and without control variables. Table A1 in online appendix A contains the summary statistics of the outcomes and control variables.

IV. Identification Strategy

Our identification strategy aims at overcoming the inherent endogeneity between health care access, health, and adult outcomes. We use the variation in exposure to infant health care services driven by mother and child health care center openings and the scope of the services provided. We use a difference-in-differences setup, exploiting the rollout of newly established mother and child health care centers across municipalities over time. In particular, we estimate the following reduced-form model:

\[ y_{ict} = \alpha + \gamma D_{ct} + \beta X_{ict} + \lambda_c + \theta_t + \rho_c t + \varepsilon_{ict}, \]  

where \( y_{ict} \) are the outcomes of interest for individual \( i \) born in municipality \( c \) at time \( t \). \( D_{ct} \) is an indicator variable equal to 1 if an individual is born in the year of, or after, the center opening in their municipality of birth, and 0 otherwise. \( X_{ict} \) is a set of individual characteristics including gender and birth order, parental background characteristics (mother’s education, age, and marital status and father’s education and age), and municipality-specific characteristics (inhabitants per doctor at year of birth, student–teacher ratio at the time of school enrollment, and population size at year of birth). \( \lambda \) is a set of municipality fixed effects and \( \theta \) a set of cohort fixed effects. Hence, common time shocks are controlled for by the year fixed effects, and unobservable determinants of the long-term outcomes, which are fixed at the municipality level, are absorbed by the municipality fixed effects. To distinguish the effect of an opening from differential secular trends, we allow for linear municipality-specific time trends. \( \rho_c \) is the coefficient of a municipality-specific time trend multiplied with a linear time trend variable, \( t \). The variable of interest is \( y \), which shows the effect of the access to well-child visits on various outcomes, including schooling, earnings, and health. Because we are including municipality-specific time trends, the identification of \( y \) is determined by whether a center opening led to deviations from a preexisting linear
TABLE 1.—LONG-TERM EFFECTS OF ACCESS TO A MOTHER AND CHILD HEALTH CARE CENTER ON EDUCATION AND EARNINGS

<table>
<thead>
<tr>
<th></th>
<th>Mean (1)</th>
<th>Baseline (2)</th>
<th>No Control Variables (3)</th>
<th>All Municipalities (4)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Years of education</td>
<td>10.53</td>
<td>0.149**</td>
<td>0.173***</td>
<td>0.158***</td>
</tr>
<tr>
<td>Observations</td>
<td>310,516</td>
<td>(0.035)</td>
<td>(0.040)</td>
<td>(0.033)</td>
</tr>
<tr>
<td>Observations</td>
<td>310,930</td>
<td>(1.189)</td>
<td>(1.628)</td>
<td>(1.172)</td>
</tr>
<tr>
<td>Earnings, ages 31–50</td>
<td>168,684</td>
<td>2.644***</td>
<td>3.888***</td>
<td>2.721**</td>
</tr>
<tr>
<td>Observations</td>
<td>310,930</td>
<td>(1.204)</td>
<td>(1.883)</td>
<td>(1.207)</td>
</tr>
</tbody>
</table>

Significance levels: **1%, ***5%, and **10%. Each parameter is from a separate regression of the outcome variable on access to a mother and child health care center. Robust standard errors adjusted for clustering at the level of the municipality of birth are shown in parentheses. We include birth cohorts from 1936 to 1960. Health care centers opened from 1937 to 1955. Earnings presented are average discounted earnings from 1967 to 2010. All specifications include a full set of cohort and municipality fixed effects, as well as municipality-specific time trends. Additional control variables in columns 2 and 4 are mother’s education, age, and marital status; father’s education and age; number of inhabitants per doctor; student-teacher ratio; and population size. Columns 2 and 3 include individuals born in municipalities that eventually received an NKS mother and child health care center; Column (4) includes all municipalities.

municipality-specific time trend. In online appendix B, we test empirically for the key identifying assumption and discuss further identification strategies such as specifications including sibling fixed effects and event-study specifications.

V. Empirical Results

A. Long-Term Effects on Education and Earnings

The first set of results in this paper, presented in this section, suggest that the access to mother and child health care centers had substantial long-term consequences. Table 1 presents the baseline estimates of the effect of access to a mother and child health care center on education and earnings using equation (1). The main sample includes only individuals born in municipalities where an NKS-run center was opened between 1936 and 1955. In column 1, we show the average prereform values. In column 2, we present the estimates for the effect on completed years of education and average discounted earnings from 1967 to 2010 and for individuals between ages 31 and 50. The specification includes a dummy variable indicating the gender of the individual, an individual’s birth order, and background characteristics of the parents, such as the mother’s education, age and marital status, and the father’s education and age. Moreover, we include a full set of municipality and cohort fixed effects, municipality-specific time trends, as well as the municipality-specific variables (number of inhabitants per doctor in the municipality of birth in the year of birth, student-teacher ratio in the municipality of birth in the year of school enrollment, and number of inhabitants in the municipality of birth in the year of birth). The specification in column 3 does not include any individual or municipality-specific control variables, whereas the sample in column 4 includes individuals born in municipalities where no NKS-run center was opened between 1936 and 1955. Each cell in table 1 comes from a separate regression. Because education and earnings are likely to be serially correlated within municipalities over time, all standard errors are clustered at the municipality level.

The first row of table 1 shows estimates of $\gamma$ in equation (1) for the completed years of education. Across different specifications and samples, the estimated coefficients show a consistent positive effect of the access to a mother and child health care center on the completed years of education. More specifically, having access to well-child visits in the first year of life increases education by 0.15 years. The estimates are all statistically significantly different from 0 at the 1% level, and they are sizable in magnitude. As the average years of education for the cohorts born before the opening of a center was 10.5 years, the effect of access to well-child visits amounts to an increase in education of about 1.4%. Mother and child health care centers could lead to increased educational attainment for several reasons. First, there could be a direct biological effect of health on cognitive ability. Second, children may miss less school due to poor health. Third, there could be a parental response to the improved infant health. That is, parents may reinforce the positive health shock by investing more in their children. We investigate these channels more in section VI. The subsequent rows of table 1 show estimates of $\gamma$ in equation (1) for average discounted earnings from 1967 to 2010 and earnings between ages 31 and 50. The first measure uses all years of earnings from the data, whereas the last measure involves a constant measure across the age range. We find a significantly positive effect of the access to centers on earnings. More specifically, having access to well-child visits in the first year of life increases adult earnings by about 2% compared with the prereform cohorts.

When dropping the control variables in column 3, the estimated effects are slightly higher for all outcome measures. However, they are never statistically different from the baseline effect. The estimated effects in column 4, where we also include individuals born in municipalities where the NKS did not open a center until 1960, are similar to the baseline in column 2.

It is important to note that the estimates in table 1 are intention-to-treat estimates. That is, these estimates average across individuals with a higher and lower likelihood of receiving care at a center. Not all mothers took their newborns to a center. The uptake two to three years after a center opening was about 60% on average. Hence, to convert our estimates to the treatment on the treated, one should divide the estimated effects by 0.6.9

B. Sensitivity Analysis

We present a variety of sensitivity analyses. First, we use methods to control for differences in preprogram time trends in municipalities that received or did not receive a center.

9This estimate is the local average treatment effect if there are always-takers and the always-takers differ from the compliers.
We test for the existence of preopening trends with an event-study framework and use quadratic and cubic municipality-specific time trends. Second, we exclude the birth cohorts born during World War II. Third, we control for a country-wide school reform affecting cohorts born between 1946 and 1961. Last, we use infant mortality to compute a lower bound for our estimates on education. All the results are presented and discussed in online appendix C. In summary, our results are robust to all these sensitivity tests.

C. Mother-Specific Fixed Effects

Table 2 displays the results for equation (B1) in online appendix B, which includes mother-specific fixed effects. That is, our effect is identified by comparing infants exposed to mother and child health care centers with their older siblings who had no center access.\(^\text{10}\) The estimates of \(\gamma\) from equation (B1) are smaller than the estimates from equation (1) for the education outcome, but they remain significant. More specifically, access to well-child visits increased the years of education by 0.9%. The estimates are larger for the earnings outcomes and indicate that access to well-child visits increased the earnings by 2% to 3%. There are several possible reasons that the estimates from the mother-specific fixed effects estimation could be different. First, families with more than one child might differ from families with only one child. When limiting the sample to the individuals who had at least one sibling in the sample and estimating equation (1) (see column 3), the estimates of \(\gamma\) are slightly smaller for the education outcome than for the baseline specification in table 1. Second, positive spillovers from the center visit by the youngest sibling to the older siblings might attenuate the estimated effects. These spillovers might differ by family size and sibling spacing. Finally, if positive health shocks are reinforced by parental investment, the estimated coefficients might be larger when family fixed effects are included. We discuss this further when we consider likely mechanisms in section VI.

D. Heterogeneity by Gender, Family Background, Urbanity, and Municipality Health Status

The second set of results in this paper focuses on heterogeneity of effects. As labor market chances for men and women in the cohorts under consideration were different, we consider heterogeneous effects by gender. In panel A of table 3, we present the main results by gender. In the baseline specification, we find that the effects on education are statistically significant for both genders but larger for men. Again, the effects on lifetime earnings are mostly statistically significant for men and women and larger for men. However, the differences in effects for men and women are not significant. Therefore, we conclude that the program of center openings was important for both men and women.

As mentioned in section II, these centers were mainly targeted at poor families. We have information on the fathers’ education and use this as a proxy for socioeconomic background.\(^\text{11}\) To analyze whether children with a low socioeconomic background benefited more from access to these centers, we present the baseline results separately for individuals whose fathers had some high school education and for individuals whose fathers had no high school education. The results are displayed in panel B of table 3. For years of education and earnings from 1967 to 2010, the effects are significantly larger, at the 5% and 1% significance levels, for the subsample for which the father had not completed high school.

In panel C of table 3, we split the sample by whether the municipality is classified as urban or rural, using Statistics Norway’s definition of urbanity from 1930. We find that the effects are somewhat more pronounced in rural areas. However, the estimated effects are not significantly different. These results support our interpretation that the impact of the mother and child health care centers is not driven by some earlier center openings in cities.

The benefits from health care centers might also differ by the health status of each municipality. Unfortunately, health indicators at the municipality level are very scarce for the 1930s. The two available health indicators at the municipality level are the proportion of inhabitants infected with tuberculosis and the infant mortality rate. In panel D of table 3, we split our sample into individuals born in municipalities with above- and below-median infant mortality rates. The results show that the effects are about twice as large in municipalities with above-median mortality rates, but they are not significantly different from the effects on individuals

\(^{10}\)We observe no municipalities where all mother and child health care centers were closed in the period of interest. However, some municipalities merged their centers when traveling time and costs decreased.

\(^{11}\)As there is little variation in mothers’ education, we focus on fathers’ education.
living in municipalities with below-median infant mortality rates.\textsuperscript{12}

In a further step, we aim to examine the role of the mother and child health care centers in shaping intergenerational mobility. We follow Pekkarinen, Uusitalo, and Kerr (2009) and estimate the effect of the health care center openings on the persistence of educational attainment across generations. We use a specification relating the completed years of education of the son or the daughter to the completed years of education of the father \( EDU_{ict} \), interacted with \( D_{ct} \), an indicator variable equal to 1 if an individual is born in or after the year of a center opening in the municipality of birth, and 0 otherwise, and a full set of interactions between municipality and cohort dummies and the father’s years of education \( EDU_{ict} \):

\[
Y_{ict} = \alpha + \mu EDU_{ict} + \eta EDU_{ict} D_{ct} + \beta X_{ict} + \phi EDU_{ict} X_{ict} + \tau_{c} EDU_{ict} + \delta_{i} EDU_{ict} + \epsilon_{ict}. \tag{2}
\]

We identify the effect of the health care center openings on the persistence of educational attainment across generations from the changes in the effect of the father’s education occurring at the time of the center opening. Table 4 shows how the intergenerational persistence in educational attainment varies with access to the health care centers. For men, the coefficient of the interaction term of interest is \(-0.044\), indicating that

\textsuperscript{12}Norway had one of Europe’s highest tuberculosis rates in the early twentieth century. Active tuberculosis is closely linked to overcrowding, malnutrition, and compromised immune systems. Hence, we use the tuberculosis infection rate as a proxy for the overall health status, as well as the poverty level in a municipality. We find that the effects are significantly larger (at the 5\% significance level) for individuals living in municipalities with above-median tuberculosis infection rates. Potential reasons for the different results when splitting the sample by either the tuberculosis infection rate or the infant mortality rate could be the fact that the tuberculosis infection rate is more strongly correlated with poverty and highest in coastal areas.
the intergenerational persistence of educational attainment is lower for individuals exposed to mother and child health care centers. The estimate is statistically significant at the 10% significance level. This represents a 10% reduction in the persistence of educational attainment across generations compared with the prereform level of 0.450. This finding suggests that access to mother and child health care centers significantly enhances intergenerational education mobility for boys. For women, the coefficient of the interaction term of interest is negative but not statistically significant at the 10% significance level.\footnote{As we observe only the educational attainment of the fathers of individuals born between 1936 and 1960 and not their income or occupation, our analysis of the intergenerational mobility is limited to education.}

\section*{VI. Mechanisms}

As described in section II, well-child visits at mother and child health care centers had two main components: medical checkups for infants and advice to mothers on adequate infant care and nutrition. This section presents evidence to support the latter channel. To obtain an idea of the importance of better health during the first year of life, we study whether effects are larger for individuals in municipalities with centers that provided a larger variety of health care services. Moreover, we analyze how access to mother and child health care centers affected specific infant mortality. In addition, we examine whether there are effects on different health outcomes that are potentially caused by malnutrition early in life. In particular, effects on height are important, as height is likely to be determined early in life (Case & Paxson, 2010). We cannot rule out that other health effects at age 40 can be explained by more education and higher labor market incomes. However, studies causally estimating the effects of education on health find that education has little or no effect on health (Clark & Royer, 2013).

The Norwegian mother and child health care centers varied in terms of the health services they offered. From the yearly reports, we are able to evaluate two forms of extra health care services offered by some centers: testing for tuberculosis and immunization. Early detection of tuberculosis is instrumental in successful treatment and helps hinder the spread of the disease. Hence, testing infants for tuberculosis could have important long-term consequences. Vaccinations offered by the health care centers included smallpox vaccines and, in some centers, diphtheria and pertussis vaccines. The previous literature presents evidence that protecting children from infectious diseases potentially has positive effects on cognitive ability.\footnote{For instance, Bloom, Canning, and Shenoy (2012) use data from vaccination programs in the Philippines and show that childhood vaccinations for measles, polio, tuberculosis, diphtheria, and pertussis significantly increase cognitive test scores.} Therefore, access to immunization may be an important contribution of the mother and child health care centers. Hence, we expect that the centers offering the extended health care services would have a larger positive health impact.\footnote{We apply the same empirical test as in section IV for the key identifying assumption, and in a joint $F$-test, we cannot reject the null hypothesis that the levels or changes in characteristics do not predict the year of a center opening.} Table D2 analyzes the effect of the opening of a center offering extended health care services. We find that such centers had larger effects on education and earnings. However, the differences are not significant. Several vaccines were introduced before 1960 in Norway at a national level: smallpox in 1810; tuberculosis in 1947; diphtheria, tetanus, and pertussis in 1952; and polio in 1956. Hence, the smallpox vaccine was the only vaccine available before World War II; it had been well established for more than 100 years when the first mother and child health care centers were opened. Moreover, historical data on the county level show small local differences in the percentage of children vaccinated with the smallpox vaccine. Focusing only on prewar openings, we still find significant and slightly larger effects of access to well-child visits on education and earnings that are unlikely to be driven by access to vaccines. When analyzing postwar openings, we cannot rule out that the effects of access to health care centers are partly driven by access to vaccines. However, most of the vaccines relevant for infants were introduced in the 1950s when only a few centers were open. Focusing only on postwar openings, we do not find effects of access to mother and child health care centers on education or earnings.\footnote{The results for the pre- and postwar center openings are available on request.} Hence, there is little scope that our main results are purely due to interactions of center openings and vaccine introductions. Nevertheless, the results presented in table D2 indicate that the extra services of tuberculosis testing and vaccination, provided in addition to the nutritional advice, may have contributed to the positive long-term effects on economic outcomes arising from access to well-child visits.

The mother and child health care centers may have contributed to a decrease in diarrhea morbidity and malnutrition by providing mothers with nutritional advice and by promoting breastfeeding. Preventing malnutrition and diarrhea incidences through breastfeeding may have short-term and long-term consequences. In the short run, breastfeeding has protective effects against diarrhea prevalence, infant diarrhea mortality, and all-cause infant mortality (see Lamberti et al., 2011, for a literature review). We therefore use municipality-level data on cause-specific infant mortality and analyze whether access to mother and child health care centers affected infant mortality rates between 1936 and 1945. Figure 1 shows cause specific infant mortality per 1,000 live births relative to the opening year of the health care center and table 5 displays the estimates of $\gamma$ in equation (C1) in online appendix C. The results show the effect of a center opening on infant mortality per 1,000 live births and five predominant cause-specific infant mortality rates in 1935.\footnote{Backer (1963) lists congenital malformations and diseases of early infancy, pneumonia (including influenza-related pneumonia), diarrhea,
We find that infant mortality per 1,000 live births is significantly reduced by 0.8 percentage points once a municipality gains access to a mother and child health care center. This corresponds to an 18% decrease in the infant mortality rate compared to preopening levels. Infant mortality from pneumonia, tuberculosis, or congenital malformations (including diseases of early infancy) is not altered by access to mother and child health care centers. As antibiotics such as...
penicillin and streptomycin were introduced in Norway after the end of World War II, doctors had only a limited possibility to treat pneumonia and tuberculosis. The absent effect on congenital malformations may indicate that health care centers focused on postnatal instead of prenatal care. Moreover, we find that access to a mother and child health care center led to a reduction in pertussis-related infant mortality (significant at a 10% significance level). Pertussis is a highly contagious bacterial disease causing weeks of severe coughing fits or periods when infants stop breathing. The disease can be treated with antibiotics, and the pertussis vaccine was included in the national vaccination program in 1952 (Folkehelseinstitutet, 2015). Hence, the decrease in pertussis-related mortality could result from the fact that some mother and child health care centers administered vaccines.

A stronger and more direct finding related to nutritional advice is a significant and large reduction of diarrhea-related infant death. In particular, access to a mother and child health care center reduces diarrhea-related infant mortality by almost 50% compared to preopening levels. This result indicates that the nutritional advice had significant short-term effects on infants’ gastrointestinal health and infant nutrition.

There are specific mechanisms by which childhood nutrition affects long-term health outcomes. For example, malnutrition among children may lead to diseases such as anemia and may change the developmental trajectory of a child’s body. Based on early-life periods of malnutrition, an infant’s body may predict future malnutrition episodes and adapt its development to better handle these expected episodes even if they do not arise (Gluckman & Hanson, 2004). Even if there are no hunger episodes later in life, health problems may arise. For example, Barker (1992) shows that poor nutrition in utero may impair development and that it increases the incidence of so-called metabolic disorders, such as high blood pressure, type II diabetes, obesity, and cardiovascular diseases. Furthermore, adult height is a marker of early-life health and nutrition. Case and Paxson (2010) state that adult height depends on a combination of factors, including genes, environmental conditions (particularly malnutrition and illness), and gene–environment interactions. Nutrition in the period from birth to age 3 is an important determinant of adult height. Growth is most rapid during the first three years, and nutritional needs are greatest during this period. Gastrointestinal infections during this period may substantially impair growth (Crimmins & Finch, 2006).

Therefore, we examine the effect on adult health and height of the establishment of mother and child health care centers, which may have improved nutrition for infants and lowered their probability of suffering gastrointestinal diseases. If the nutrition channel is an important mechanism, we expect that infants who were exposed to a center after birth would be less likely to have maladapted to future expected episodes of malnutrition. Thus, we presume that these individuals would experience a lower incidence of obesity, high blood pressure, and cardiac events by the age of 40. While the age of 40 may be rather early to measure cardiac events or hypertension, obesity serves as a good indicator of an increased risk of health problems related to the metabolic syndrome. In addition, we expect that infants who were exposed to a center after birth will be taller on average.

Table 6 displays the effect of a center opening on the bad health index described in section A.1.3 in online appendix A and a set of different health outcomes. We find a significant effect on the bad health index and several health outcomes for men and women. The effect of access to a center is −0.286 for men and −0.188 for women and is statistically significant at the 1% level for men and the 5% level for women. The magnitude of the coefficient implies that health care center access reduces the index for poor health by almost 0.19 to 0.29 standard deviations. In addition, men exposed to a mother and

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18 Vaccinations in Norway before 1960 were introduced at a national level in the following years: smallpox in 1810; tuberculosis in 1947; diphtheria, tetanus, and pertussis in 1952; and polio in 1956.

19 As the vaccine was not widely used before it was included in the national vaccination program in 1952, it is unlikely to be the main mechanism for our finding on long-term education and earnings.

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Table 5.—Short-Term Effects of Access to a Mother and Child Health Care Center on Infant Mortality

<table>
<thead>
<tr>
<th>Mean</th>
<th>Prenormal</th>
<th>Baseline</th>
<th>All Municipalities</th>
</tr>
</thead>
<tbody>
<tr>
<td>Infant mortality (0–11 months) per 1,000 live births</td>
<td>44.9</td>
<td>−8.200***</td>
<td>−8.686***</td>
</tr>
<tr>
<td>Infant mortality from congenital malformations per 1,000 live births</td>
<td>16.6</td>
<td>−0.679</td>
<td>−2.604</td>
</tr>
<tr>
<td>Infant mortality from pneumonia per 1,000 live births</td>
<td>16.1</td>
<td>−0.169</td>
<td>−2.120</td>
</tr>
<tr>
<td>Infant mortality from pertussis per 1,000 live births</td>
<td>5.2</td>
<td>−2.536***</td>
<td>−2.663***</td>
</tr>
<tr>
<td>Infant mortality from tuberculosis per 1,000 live births</td>
<td>0.4</td>
<td>−0.081</td>
<td>−0.074</td>
</tr>
<tr>
<td>Observations all specifications</td>
<td>1,689</td>
<td>2,921</td>
<td></td>
</tr>
</tbody>
</table>

Significance levels: ***, **, *, and *10%. Each parameter is from a separate regression of the outcome variable on access to a mother and child health care center. Robust standard errors adjusted for clustering at the level of the municipality are shown in parentheses. We include data from 1936 to 1945. Health care centers opened from 1937 onward. All specifications include a full set of municipality and year fixed effects.
The results, that completed years of education and the incomes of older men and women, that child health care center as an infant have significantly lower BMIs and blood pressure, a significantly lower probability of being obese or having hypertension, a significantly lower cholesterol risk at the age of 40, and are taller. For women, we find a significant health improvement in terms of height.

In addition to the direct effects from better health care during the first year of life, indirect mechanisms may explain the effects of the centers on education and earnings. If children are healthier during adolescence, they might miss less school and therefore achieve better long-term school outcomes. A further indirect mechanism is change in parental behavior in response to access to the health care centers—for example, changes in relation to fertility choices and application of nutritional knowledge to other family members—with these changes either reinforcing or counteracting the direct effects of the program. We analyze some of these indirect mechanisms. First, we use data on missed school days at the municipality level for the years 1940 to 1950. The results, presented in table D3, show that access to health care centers did not significantly affect the number of missed school days owing to sickness. Testing the behavioral responses of parents is difficult (Almond & Mazumder, 2013), as a second source of exogenous variation is needed to identify the exact mechanisms. However, we can provide two tests for parental behavior. First, we test whether a mother’s completed fertility changes when her children have access to mother and child health care centers. The number of children a woman has is an important family choice and a determinant of children’s outcomes. Second, we study spillovers to older siblings to analyze whether mothers acquire general knowledge at a mother and child health care center that is not age specific but useful to all children in the family. The effect of access to a mother and child health care center on mothers’ fertility is shown in table D3. Mothers did not change their fertility when gaining access to mother and child health care centers for their children. In addition, column 4 of table 2 shows that any changes in parental behavior as a response to the health care center openings are child-age specific (including breastfeeding and nutrition within the first year of life). In particular, we find that completed years of education and the incomes of older children born in municipalities with better health care centers opened during the first year of life. Indirect mechanisms may explain the number of missed school days for children born in municipalities with better health care centers opened during the first year of life. Indirect mechanisms may explain the number of missed school days for children born in municipalities with better health care centers opened during the first year of life.

As the number of missing school days are no longer recorded in Statistics Norway’s yearly school statistics after 1950, this test includes only the birth cohorts from 1936 to 1944.

Table 6.—Long-Term Effects of Access to a Mother and Child Health Care Center on Health at Age 40

<table>
<thead>
<tr>
<th></th>
<th>Men and Women</th>
<th></th>
<th></th>
<th>Men and Women</th>
<th></th>
<th></th>
<th>Men and Women</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Mean</td>
<td>Prereform</td>
<td>(1)</td>
<td>Mean</td>
<td>Prereform</td>
<td>(2)</td>
<td>Mean</td>
<td>Prereform</td>
<td>(3)</td>
</tr>
<tr>
<td></td>
<td>Baseline</td>
<td>(2)</td>
<td></td>
<td>Baseline</td>
<td>(4)</td>
<td></td>
<td>Baseline</td>
<td>(5)</td>
<td></td>
</tr>
<tr>
<td>Index for poor health</td>
<td>0.00</td>
<td>−0.239***</td>
<td>(0.028)</td>
<td>0.00</td>
<td>−0.286***</td>
<td>(0.039)</td>
<td>0.00</td>
<td>−0.188***</td>
<td>(0.046)</td>
</tr>
<tr>
<td>BMI</td>
<td>25.05</td>
<td>−0.339***</td>
<td>(0.124)</td>
<td>25.72</td>
<td>−0.536***</td>
<td>(0.158)</td>
<td>24.21</td>
<td>−0.179***</td>
<td>(0.174)</td>
</tr>
<tr>
<td>Observations</td>
<td>0.093</td>
<td>−0.016***</td>
<td>(0.007)</td>
<td>0.100</td>
<td>−0.047***</td>
<td>(0.011)</td>
<td>0.087</td>
<td>0.015***</td>
<td>(0.012)</td>
</tr>
<tr>
<td>Obesity</td>
<td>137.121</td>
<td>68.450</td>
<td></td>
<td>137.121</td>
<td>68.450</td>
<td></td>
<td>137.121</td>
<td>68.671</td>
<td></td>
</tr>
<tr>
<td>Blood pressure</td>
<td>133.65</td>
<td>−1.022***</td>
<td>(0.423)</td>
<td>138.20</td>
<td>−0.898***</td>
<td>(0.755)</td>
<td>127.98</td>
<td>−1.210***</td>
<td></td>
</tr>
<tr>
<td>Hypertension</td>
<td>0.170</td>
<td>−0.018***</td>
<td>(0.010)</td>
<td>0.222</td>
<td>−0.027***</td>
<td>(0.015)</td>
<td>0.105</td>
<td>−0.008***</td>
<td>(0.018)</td>
</tr>
<tr>
<td>Observations</td>
<td>0.109</td>
<td>−0.010***</td>
<td>(0.008)</td>
<td>0.186</td>
<td>−0.027***</td>
<td>(0.002)</td>
<td>0.001</td>
<td>0.001***</td>
<td></td>
</tr>
<tr>
<td>Cardiac risk</td>
<td>0.072</td>
<td>−0.031***</td>
<td>(0.007)</td>
<td>0.096</td>
<td>−0.049***</td>
<td>(0.012)</td>
<td>0.042</td>
<td>−0.001***</td>
<td>(0.008)</td>
</tr>
<tr>
<td>Observations</td>
<td>0.170</td>
<td>1.870***</td>
<td>(0.183)</td>
<td>176.97</td>
<td>1.885***</td>
<td>(0.336)</td>
<td>163.18</td>
<td>1.830***</td>
<td></td>
</tr>
<tr>
<td>Height</td>
<td>170.84</td>
<td>1.870***</td>
<td>(136.428)</td>
<td>68.352</td>
<td>68.450</td>
<td></td>
<td>68.671</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Significance levels: \(* \leq 10\%\), \(* * \leq 5\%\), and \(* * * \leq 1\%\). Each parameter is from a separate regression of the outcome variable on access to a mother and child health care center. Robust standard errors adjusted for clustering at the level of the municipality of birth are shown in parentheses. We include birth cohorts from 1936 to 1960. Health care centers opened from 1937 to 1955. All specifications include a full set of cohort and municipality fixed effects, mother’s education, age, and marital status; father’s education and age; gender; birth order; the number of inhabitants per doctor; the student-teacher ratio; and population size.
siblings of infants exposed to mother and child health care centers are not affected by the health care center openings. These findings support the fact that the provision of information about proper infant nutrition is an important mechanism for our findings of the positive economic effects of the centers.

VII. Discussion

We next link our results to previous studies and provide a simple cost–benefit analysis.

A. Comparison with Previous Studies

As this is the first paper, to our knowledge, that measures the long-term consequences for infants of access to mother and child health care centers, it is not straightforward to compare our results to the existing literature. However, we can compare our results with other studies analyzing the long-term effects of various policy-induced variations in early-life health.

First, Chay et al. (2009) examine a somewhat related increase in infant health care by looking at the hospital integration that occurred in the U.S. South in the 1960s. They show that a black child who gained hospital admission as an infant experienced a 0.75 to 0.95 standard deviation increase in the Armed Forces Qualifying Test score. Our estimated effect on years of education is smaller, at about 0.2 standard deviations. Because IQ tests and education are not perfectly correlated, a direct comparison is difficult. Second, our results indicate that nutritional advice for mothers and promotion of breastfeeding may have played an important role in the positive economic effects of the centers. The estimates found in this paper are mostly smaller in magnitude but still comparable to those found in existing studies of policy changes and interventions that increased breastfeeding or improved early-life nutrition. In a randomized breastfeeding promotion intervention in Belarus, Kramer et al. (2008) find that cognitive ability at age 6.5 is increased by about 1 standard deviation if the infant was in the treatment group. As we look at outcomes more than twenty to forty years later in life, it is not surprising that our effects on education are substantially smaller. Paid maternity leave might also increase breastfeeding rates.

In the context of Norway, Carneiro, Løken, and Salvanes (2015) examine the impact on children of the introduction of four months of paid maternity leave in 1977. They find that children’s educational attainment increases by 0.4 years and earnings at age 30 increase by 5%. Again, our effects are measures of risk, not actual exposure to the diseases. Finally, when analyzing the health effects of early access to food stamps, Hoynes et al. (2016) find an increase in the likelihood of metabolic syndrome. This finding matches well with our results for male health outcomes at age 40.

B. Cost–Benefit Analysis

In this section, we study whether the benefits of introducing universal well-child visits outweigh the costs of the program. The costs are incurred when the children are up to 1 year old, whereas the benefits in terms of earnings arise only when the children enter the labor market as adults. We have very direct measures of costs based on direct data collection on costs per child and per consultation from the NKS archives. These are available for all health care centers for the years 1938, 1941, and 1948. We assume that these reflect the costs for the whole period of study and calculate the average costs across the three years. Adjusting for inflation, the costs per child in 2014 are $22 per child ($6 per consultation). Note that this is the present value of costs because costs occur only at the start of the child’s life. To calculate benefits, we need to make some assumptions. We assume that people work from ages 21 to 65 and that average annual earnings from ages 31 to 50 reflect the average annual lifetime earnings. Then the present value of the benefits is given by $\sum_{t=21}^{65} \frac{0.027}{(1+r)^t}$, where 0.027 is the program effect on earnings of the treated group and $r$ is average annual earnings. Then the internal rate of return (IRR), which is the discount rate that equalizes the present values of costs and benefits, is 0.084. This exercise assumes that the supply of more skilled labor (a more highly educated labor force) does not affect the earnings return to the well-child program. The IRR will be lower if this assumption does not hold. Under the extreme assumptions that the costs are doubled and the benefits halved, the IRR would be 0.050, which is still a reasonably high return.

Finally, we have included only the returns related to higher wages in the long term to understand labor market effects. Similar to us, they also find positive effects on adult health. For example they find a reduction in cardiovascular disease and diabetes from age 45 to 57 of 4% and 12%, respectively. Our effects on cardiac risk and cholesterol risk are larger at age 40; however, they are measures of risk, not actual exposure to the diseases. Differences in the findings might also be explained by the age at which outcomes are measured. In particular, most of the variables used in this paper are measured up to fourteen years earlier during an individual’s life cycle. Moreover, the infant mortality rate in Norway in 1930 was 30% lower than in Denmark, the social transfers as percentage of the national product in the early twentieth century were much lower in Norway compared to Denmark, and the timing when most of the municipalities had access to well-child visits differs substantially (Hatton, O’Rourke, & Taylor, 2007). That is, while there were many mother and child health care centers opened in Norway between 1939 and 1945, very few municipalities in Denmark had program access during World War II.

We build on the assumptions made in Fredriksson, Öckert, and Oosterbeek (2013), who calculate the cost–benefit of reducing class size.

The current cost for health care centers and other health services for children in 2014 was $288 per child, substantially more than the costs of the health stations between 1936 and 1955. However, the services provided today include more visits, all childhood vaccines, and health care services...
labor market. There are likely additional benefits from the effects of the program on education and health and also effects on the next generation, which are excluded from this cost–benefit analysis. We conclude that given these conservative assumptions, this program passes a cost–benefit analysis in the context that we study. Note that the benefits from access to well-child visits outweigh the program costs more than another policy introduced in Norway in the same period. (See Büttikofer & Salvanes, 2015, for a cost–benefit analysis of a tuberculosis control program.)

VIII. Conclusion

In this paper, we present evidence that access to well-child visits for infants can significantly improve long-term economic outcomes over the life cycle. Our study analyzes the rollout of mother and child health care centers in Norway that began in the 1930s. We find that access to free well-child visits in the first year of life leads to a significant increase in education, lifetime earnings, and adult height and reduces health risks at the age of 40. The effects are stronger for children from low socioeconomic backgrounds, and we find a significant reduction in intergenerational persistence in educational attainment levels. In addition, we find that access to well-child visits substantially reduced infant mortality from diarrhea, whereas infant mortality from pneumonia, tuberculosis, or congenital malformations is not affected. The results pass several robustness tests, including controlling for municipality-specific time trends, mother-specific fixed effects, and event-study models. In general, the results imply that improved infant health has long-term effects on human capital accumulation, labor market success, and adult health. Better nutrition within the first years of life is likely to be the main mechanisms behind our findings.

A key limitation with our study is that we cannot measure intermediate outcomes—for example, health during childhood. Access to more health data for children could significantly increase the understanding of why these centers have long-term impacts on education and labor market outcomes. Another fruitful avenue for future research is to analyze more detail on how parents respond to public health investments based directly on data on parental investment. An important strength of our analysis is simultaneously a drawback: to study the long-term effects of well-child visits, we need to study reforms that happened a long time ago. That today’s health situation for infants in the developed world is dramatically different makes it difficult to generalize our results to current policies (see Ludwig & Miller, 2007). However, we note that the infant mortality rates in Norway in the 1930s and 1940s are comparable to the rates in developing countries today. That today’s health situation for infants in the developed world is dramatically different makes it difficult to generalize our results to current policies (see Ludwig & Miller, 2007). However, we note that the infant mortality rates in Norway in the 1930s and 1940s are comparable to the rates in developing countries today. Moreover, while infectious diseases and diarrhea are main causes of death in the first year of life in developing countries today, infants died at similar rates from the same types of diseases in Norway in the study period. An important difference, though, between health interventions in the 1930 and today is the availability of more modern medical technology, such as a large variety of vaccines and penicillin. Yet we show that a likely mechanism behind our finding is information about nutrition. Similar types of information campaigns about child nutrition, as well as community interventions that aim at improving maternal and newborn care, are still an important method to improve child outcomes in developing countries today (Fitzsimons et al., 2016). Hence, infants in both developing and developed countries might benefit in the long run from well-child visits and other types of programs improving nutrition in the first year of life.

27In 1930, 44.9 out of 1,000 infants born alive died within their first year of life in Norway (Backer, 1963). This number is comparable to the 2014 values from countries including Ghana, Malawi, and Timor-Leste (You, 2015).

REFERENCES


