Long-Term Consequences of Access to Well-child Visits*

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Abstract

This paper uses the rollout of mother and child health care centers starting in the 1930s to study the long-term consequences of increasing access to well-child visits. These well-child visits included a physical examination and the provision of information about adequate infant nutrition. Our results indicate that access to mother and child health care centers has a positive effect on education and earnings: access to well-child visits in the first year of life increases the completed years of schooling by 0.14 years and earnings by two percent. In addition, we analyze potential mechanisms and find that both nutrition and health examinations were important. In particular, we present evidence that individuals suffer from fewer health risks at age 40 when they had access to mother and child health care centers and centers, which offered extra health care services, affected infants to a significantly larger extend.

1 Introduction

There is substantial evidence showing that early-life exposure to disease and malnutrition has long-term consequences on adult health, education and labor market outcomes (see Barker, 1992; Currie and Almond, 2011, for an overview). As documented in the neuroscience literature, the three first years of life are the most critical period of human brain development (see, e.g., Johnson, 2001) and therefore a child's health during these early years of life matter for later human capital investments. Moreover, a growing literature documents that policy-induced improvements in early-life health and

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nutrition have positive long-term effects: Hoynes, Schanzenbach, and Almond (2012), for example, present evidence that access to the food stamp program during early childhood improved adult health as well as self-sufficiency for women. In addition, breastfeeding advices are shown to improve children's cognitive development in a large randomized experiment (Kramer, Aboud, Mironova, and et al, 2008) and in quasi-experimental settings (Fitzsimons and Vera-Hernandez, 2013). Bharadwaj, Løken, and Neilson (2013) show that extra medical care given to very low birth-weight children in Chile and Norway decrease mortality rates and increase schooling performance. Chay, Guryan, and Mazumder (2009) find that the racial integration of hospitals in the U.S. South during the 1960s and thereby increased access to health care for black infants affected the test performance of black teenagers in the 1980s. Bhalotra and Venkataramani (2012) provide empirical evidence that cohorts born after the introduction of the first antibiotics were less exposed to pneumonia in the first year of their life and experienced increases in schooling and income. This evidence demonstrates that appropriate health care services to infants and nutrition have the potential to mitigate the negative effects of disease exposure, poverty or low birth weight.

While the literature often focuses on hospital provided care or programs directed to specific groups, we advance the literature by studying the long-term consequences of the provision of universal well-child visits–a more basic (and often cheaper) form of infant health care–, which may be relevant for a large share of the population. We use unique historical data to examine the long-term consequences of an expansion of health care infrastructure directed to infants. In particular, we focus on the national rollout of mother and child health care centers in Norway starting in the 1930s. Analyzing this rollout provides the first evidence on the long-term economic effects of such centers and, more generally, the impact of increasing the availability of well-child visits for the poor. From 1930 and onwards centers were established on local initiatives by philanthropic institutions all over the country (see Schiøtz, 2003) and in 1946 about 26 percent of the municipalities had a functioning mother and child health care center.[1] The mother and child health care centers increase the availability and convenience of infant health care while reducing its costs as the service was free of charge and the centers were established in different neighborhoods in cities and in small villages to minimize travel expenses for young mothers. The well-child visits at mother and child health care centers include a physical examination, but they were also a mean to provide information about normal development, sleep, safety, diseases, and most importantly nutrition.

Our paper builds on earlier studies relating child-well visits to infant health and thereby providing a positive 'first stage' effect. Wüst (2012) shows that infant care provided by home visiting nurses has an impact on short-term effects as infant mortality and maternal health after pregnancy. Bhalotra, Karlsson, and Nilsson (2015) estimate that an infant care program in Sweden in the 1930s led to a substantial decline in the risk of infant death. In addition, Chen, Oster, and Williams (2013) provide evidence that pediatric well-child visits are likely to be a very important factor explaining

[1]This initiative run by a philanthropic women's organization represents a typical scenario how common health threats were improved in Western Europe and the U.S. in the early 20th century.

the gap in infant mortality rates between Europe and the United States. In developing countries, randomized control trials on neonatal care in form of home visits by community health workers are associated with reduced neonatal mortality (see, e.g., Gogia and 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 affect health behavior significantly. In the context of information on infant nutrition, Fitzsimons, Malde, Mesnard, and Vera-Hernandez (2012) present experimental evidence that such information for poor families may result in large increases in household consumption of protein-rich foods by children. It is, however, still not known whether well-child visits and information given to mothers about infant care improve children's outcomes in the long-run.[2] As discussed by Chetty, Friedman, Hilger, Saez, Schanzenbach, and Yagan (2011) in the context of Project STAR, short-term and long-term outcomes may not necessarily be the same. It is therefore important to analyze whether the impact of well-child visits goes far beyond immediate outcomes and has benefits for children's health that can spillover to educational and long-term labor market outcomes. In addition, we are able to study the mechanisms through which this program could affect education and labour market outcomes: we first analyze the program's effects on health at the age of 40 and in particular on the incidence of 'metabolic syndrome' such as obesity, hypertension, cardiac risk, and diabetes. Second, we study whether centers, which offered extended care such as vaccination programs had a larger effect.

Our analysis is based on historical data from different archives documenting the exact timing of the rollout of mother and child health care centers. These data are then linked to Norwegian register data allowing us to follow all births in Norway and outcomes later in life. The historical aspect allows us to evaluate the impact of well-child visits 30 or more years after the first centers were established. Our estimation strategy is a differences-in-differences approach using the timing of a rollout across municipalities over time. This allows us to compare outcomes for children born in municipalities receiving a center early in the period with children born in municipalities where a center was introduced later in the period. In order to handle the endogeneity of the rollout, we include municipality-specific time trends and also compare siblings born pre and post health care centers. This estimation strategy will enable us to study the effect of well-child visits on long-term outcomes such as educational and labor market outcomes, as well as health outcomes.[3]

We find evidence that access to well-child visits lead to a statistically significant increase in

[2] Parallel with our work Hjort, Sølvsten, and Wüst (2014) analyse long-term health effects of a Danish home visiting program program rolled out in the late 1930s.

[3] The empirical strategy of exploiting a program rollout links our paper to a brother literature analyzing the introduction of U.S. programs targeted to poverty reduction. Examples here are Bailey (2012) who analyzes the county-level rollout of family planning programs from 1964 to 1973 and its effects on U.S. fertility rates, Hoynes, Page, and Stevens (2011) who study the county-level rollout of the Supplemental Program for Women Infants and Children (WIC) to estimate the impact of the program on infant health, Hoynes, Schanzenbach, and Almond (2012) who exploit the county-level rollout of the food stamp program, and Bailey and Goodman-Bacon (2014) who analyze the the rollout of community health centers and its effect on mortality of older Americans.

school attainment, lifetime earnings and health at age 40. Our results are robust to adding a set of municipality control variables. In addition, event study models support the validity of the research design. Our findings contribute to the literature by establishing a link between access to well-child visits and long-term economic outcomes and shows that policies targeting infant health may have long-lasting effects. Compared to many previous studies focusing on extreme events such as diseases and natural disasters or policies targeted specifically to underprivileged families, the policy analyzed in this paper is particularly interesting as it may be relevant for a larger population.

The remainder of the paper is structured as follows. Section 2 provides some historic background on the mother and child health care centers. Section 3 describes the data. Section 4 describes the identification strategy and Section 5 presents the empirical findings. Section 6 presents robustness checks, which corroborate the main results. Section 7 explores potential mechanisms and Section 8 links our results to the previous literature. Section 9 concludes.

2 Historical Background

In the late 19th 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.[4] This so-called infant welfare movement led governments to invest more into social and population policies improving infant's health conditions. Therefore, information centers for mothers of newborns were established in connection to birth clinics in many European countries in the late 19th and early 20th century. In Norway, mother and child health care centers were established on local initiatives by philanthropic institutions. Most influential was the Norwegian Women's Public Health Association (NKS),[5] which opened the first center in 1914 in Oslo and ran the majority of the 400 center existing in 1946. Centers led by NKS were opened on local initiatives and ran by local NKS chapters. The national NKS governing body provided local chapters with financial support. NKS ran also intense outreach activities to inform women about the services. Although the centers were mainly targeted at poor families, the centers were open to everyone. In the beginning, the uptake was rather low and centers tried to encourage mothers to have her infant examined by serving

[4]Infant mortality was very high in the beginning of the 20th century all over Europe and the United States. In Norway, more than 80 out of 1000 children would not survive their first year of life in 1900. Increased hygiene and living standards let the infant mortality rate decrease steadily. The decrease was however much slower during World War I and the economic crises in the 1920s and picked up again in the 1930s where 45 out of 1000 died within a year (Backer, 1963).

[5]The Norwegian Women's Public Health Association (NKS) is the largest women's organization in Norway. Established in 1896, it is mostly involved in humanitarian work. The association has about 750 local chapters and after World War II about 250,000 members (of a total of 3 million inhabitants). The mother and child health care centers were not the only way the NKS tried to improve living conditions in Norway: as tuberculosis was a very large heath threat in Norway during the early 20th century, the NKS involved in infection control by strengthening hygiene measures and opened the first tuberculosis sanatoria in 1903. In 1919, the NKS also started establishing nursing schools and later also orphanages. During World War II, the NKS distributed food and established military hospitals.

coffee and pastry. The mother and child health care centers became fast widely popular and by 1930, the take-up rate was 60 percent of all babies born in Oslo (Schiøtz, 2003). The centers had two main goals: first, they provided medical check-ups for the infants by doctors and nurses free of charge. Infants were measured and examined during each visit and doctors and nurses at the centers were keeping 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 first years of life. Some center even provided services of medical specialist as pediatricians, gynecologists and home visits. Second, the centers provided mothers with advice on adequate infant nutrition and tools to decrease the infant mortality such as infant hygiene and adequate infant clothing. Breastfeeding rates between 1920 and the late 1960s were relatively low and declining in Norway (Liestøl, Rosenberg, and Walløe, 1988) as milk formulas, a mix of cow's 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 due to diluted water. Due to the increased risk of gastrointestinal diseases for formula-fed babies, breastfeeding was promoted in particular among poor women and single mothers (Styr, 1937).[6] 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. Fröhlich, the first Norwegian professor of pediatrics, was interested in the research on child nutrition, and in particular research on vitamins. He was also actively involved in the initiative to establish the first mother and child health care center in Norway (Toverud, 1945). Frøhlich describes that 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 horrifying 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." The mother and child health care center also focused on pregnancy hygiene for mothers. The centers provided pregnant women with advice on nutrition and code of conduct during pregnancy. In addition, the centers also provided smallpox and later diphtheria vaccination for infants and small children.

Doctors and nurses were paid on an annual salary and their traveling expenses were reimbursed. Besides philanthropic contributions, the health care centers were mostly financed by funds from the state lottery and some centers received additional financial support from the local governments, counties and the state. In 1972, municipalities were given the obligation to run mother and child health care centers. The service of the centers was regulated by the Health Directorate through official guidelines and handbooks. The municipalities therefore gradually took over the 1400 mostly

[6] The situation of children born to single mothers and children born out of wedlock was of special concern as these children had 70 to 100 percent higher mortality rates than children born in marriage in the 1930s.

privately run centers in the late 1960s (Ludvigsen and Elvbakken, 2005). The goal was to reach out to everyone and to establish a unitary primary health care system for infants and small children. Although the mother and child health care centers have changed considerably over time, they are still in place today as a universal offer to all infants and their mothers. The services from the centers are free of charge and targeted to all infants and small children during the first six years of life. The centers offer health controls, vaccination and health education. A child visits the center about 10 to 15 times during the first six years of life. The municipalities are responsible for the services. Centers are mainly staffed with medical doctors, nurses and midwives, but also physiotherapists and psychologists.[7]

3 Data

This paper links unique historical data on the rollout of mother and child health care centers 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 are maintained by Statistics Norway and are a compilation of different administrative registers as 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, earnings, a set of demographic variables as well as information on families. The historical data on the mother and child health care centers is collected from public and private archives. The following sections describe our data.

3.1 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 during this period. Our efforts have yielded records from approximately 400 different centers from 1939 to 1955. The year each center is established is collected from two surveys the Norwegian Women's Public Health Association (NKS) sent out the all mother and child health care centers in 1939 and in 1955. The surveys included a question on the date of establishment of the center. In addition, the survey also provides information and the exact address of the center and the community it served, the founder of the center, the number and qualification of employees and the approximate budget of the center. Not all centers were operating continuously. We wherefore use yearly reports from the centers on how many infants, small children and pregnant mothers visited the center in order to exclude not operating centers. We also collected data on the centers' yearly expenses and on what type of service they provide. All centers provide well-child visits for infants, but some centers also provide check-ups for small children and for pregnant women as well as dental appointments.

[7]Similar types of mother and child health care centers with universal access exist also in other European countries.

In addition, the data are verified using other primary sources as local NKS sections yearly budget. Our final database on the health care center's operation contains information on (1) the year and the municipality mother and child health care centers were established and in what years they were actively providing services, and (2) more detailed information on the type of service the centers provided in 1941, 1943, 1947, 1948, and 1951. Figure 1 shows the rollout of the mother and child health care centers between 1935 and 1955 by the year and the municipality of establishment. For presentational purposes, the openings dates 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. In 1927, the city of Kristiansand in southern Norway established a center and in 1933, a center was established in Lillehammer what was a small town by then. As the NKS expanded its numbers of service providers, well-child visits achieved broad geographic coverage. The first center in the most northern county was for example established in 1936 in Hammerfest. Note that there is considerable within-state variation in establishment dates. Anecdotal evidence shows that it took few years after the opening of a center until the majority of the infants were checked: in the 1930s the take-up rate was very low in the year of establishment and about 60 percent two to three years after an opening of a center.

3.2 Administrative Data

The central population register contains the municipality of birth. We allocate a municipality of residence during the first year of life to each individual by assuming that they are residing in the municipality of birth. The central population register includes identifiers for parents what enables us to identifying socioeconomic background and an individual's siblings. Educational attainment is taken from the educational database provided by Statistics Norway. Since 1979, educational attainment is reported annually by the educational institutions directly to Statistics Norway, thereby minimizing any measurement error due to misreporting. We consider the completed years of education as our measures of education achievement. Lifetime income is measured by average, discounted earnings from 1967 to 2010. The earnings measure is not top-coded and includes labor earnings, taxable sick benefits, unemployment benefits, parental leave payments, and pensions. The age at death occurring after 1968 is taken from the cause of death registry provided by the Norwegian Institute of Public Health. Note that this measure is contingent on having survived past 1967 and only capture older age mortality on top of any effects on infant and child mortality.

3.3 Municipality Level Data

Several specifications include municipality level data such as the numbers of inhabitants per doctors and per midwife in the municipality of birth in the year of birth. The data on the population size as well as the numbers of doctors and midwifes in each municipality are collected from Statistics

Norway's historical yearly health statistics. The number of inhabitants with a high school diploma and the average income per municipality are collected from the Census in 1930. The 1930 Census is the second Census in Norway after 1910 collecting data on income, wealth, tax and unemployment. A municipality is defined as an urban area if Statistics Norway classifies the municipality as a city in 1935.

3.4 Health Data

The data on an individual's health status comes from the Cohort of Norway (CONOR) data and the National Health Screening Service's Age 40 Program data. These are two population-based and nationwide surveys carried out from 1988 to 2003 by the National Institute of Public Health. The information contained in both surveys has been gathered through questionnaires and short health examinations. For the most part, the same information was collected in both surveys. In particular, questions are asked about general health and specific diseases. The unique aspect is that the examination component is conducted by medical professionals and provides detailed medical information including data from blood tests and medical exams. The goal of the Age 40 Program was to survey all men and women aged 40 to 42 between 1988 and 1999. It covers all counties in Norway except Oslo and the response rate is between 55 and 80 percent, yielding 374,090 observations. In addition, we use data from the CONOR dataset which includes Oslo, Norway's capital and largest city. CONOR is a research collaboration network that includes several large Norwegian health surveys, which were carried out by the National Health Screening Service between 1994 and 2003. This data source includes 56,863 respondents. Black, Devereux, and Salvanes (2012) provide a more detailed description of the dataset and of the representativeness of the sample of respondents. The oldest cohorts in the health data are born in 1942. We are therefore only able to look at center openings after 1942 when focusing on health outcomes.

From the health surveys, we observe an individual's health status when they are about 40 years old. Both health surveys include measures for height, weight and blood pressure and questions on whether respondents have diabetes. As previous research suggests that better nutrition early in life decreases the incidence of obesity, high blood pressure, diabetes and cardiac risk (see, e.g., Hoynes, Schanzenbach, and Almond, 2012), we include the following health measures: an individual is defined as obese by the age of 40 if its body mass index is higher than 30. Hypertension is a chronic medical condition in which the blood pressure in the arteries is elevated. High blood pressure is mostly defined as at or above 140mmHG systolic and 90 mmHg diastolic. We define an individual having hypertension if both the systolic and the diastolic blood pressure are above the threshold. High blood pressure is predictive of heart disease, heart failure, stroke, and kidney failure. Whether an individual has type II diabetes by the age of 40 is taken from the survey. Furthermore, adult height is also sensitive to nutrition and health in childhood. In particular, the period from birth to age three is critical to adult height (see Paxson, 2008). We therefore also include height in centimeters among our health measures. In addition, we use two measures for risky biomarkers: cholesterol risk and cardiac risk.

Because of large number of health outcome variables, we follow Kling, Liebman, and Katz (2007) and Anderson (2008) and aggregate the variables BMI, blood pressure, type II diabetes, and cardiac and cholesterol risk into summary standardized indices. As discussed by Kling et al. (2007), this improves statistical power. The summary health index is an average across standardized z-score measures of each health outcome. The z-score is calculated by subtracting the mean and dividing by the standard deviation. In particular, we follow Hoynes, Schanzenbach, and Almond (2012) and mimic Kling, Liebman, and Katz (2007)'s approach for a quasi-experimental setting by using the mean and standard deviation of the cohorts born before rollout of the mother and child health care stations began. All components of the health index are 'bads' (e.g. obesity, hypertension, cardiac risk). Hence, a decrease in health index indicates an increase in health.

3.5 Sample selection

For our analysis, we include data for cohorts born between 1936 and 1960 in Norway, who are still alive by 1967. Individuals born outside of Norway are excluded because our identification strategy relies on knowing the municipality of birth. We do not impose further sample restriction, however there are some individuals with missing information on outcome variables that naturally drop out. For life time earnings (average of earnings between 1967 and 2010) we have observations for all individuals while for years of education we have 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 specification with and without control variables. Table 1 contains summary statistics of the various outcomes and control variables prior to the opening of a mother and child health care center.

4 Identification Strategy

Our identification strategy aims to 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-difference set-up exploiting the rollout of new established mother and child health care center across municipalities over time. In particular, we estimate the following reduced form model:

$$y_{ict} = \alpha + \gamma D_{ct} + \beta X_{ict} + \lambda_c + \theta_t + \rho_c t + \varepsilon_{ict}, \tag{1}$$

where y_{ict} are the outcomes of interested for individual i born in municipality c in time t. D_{ct} is 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 zero otherwise. X_{ict} is a set of individual characteristics like gender and parental background such as the mother's education, age and marital status and the father's education and age. λ is a set of municipality fixed effects and θ is a set of cohort fixed effects. Hence, common time shocks are controlled 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 municipality-specific linear time trends. ρ_c is the coefficient of a municipality-specific time trend multiplied with a linear time trend variable, t. The variable of interest is γ, which shows the effect of the access to child-well visits on various outcomes such as schooling and earnings. As we are including municipality-specific time trends, the identification of γ comes from whether an opening lead to deviations from pre-existing linear municipality-specific time trend.

Our empirical strategy uses variation in when and where mother and child health care centers were established to evaluate their effects on long-term economics outcomes. Hence, we assume that the timing of an opening of the mother and child health care center is uncorrelated with other determinants of changes in long-term economic outcomes. As an empirical test for the key identifying assumption, we analyze whether 1930 demographics of municipalities receiving a center may predict when a center was established. Table 2 shows that most of the municipality characteristics fail to predict the opening date. Exceptions are an indicator variable for urban areas, a municipality's population, and the number of doctors per municipality population. Hence, more densely populated places and municipalities with more doctors per inhabitants were more likely to establish mother and child health care centers very early. These are classical supply side driven factors. We therefore include the number of doctors per inhabitants in the year of birth in the municipality of birth in our specification and exclude individuals born in the two largest cities (Oslo and Bergen) from our sample in our baseline specifications. In addition, we analyze whether chances in demographics of municipalities from 1930 to 1946 may predict when a center was established. The results are presented in Table 3.[8] There appears not to be a significant correlation between the timing of the openings of the centers and changes in municipality demographics from 1930 to 1946. Importantly, the rollout of infant health care centers does not seem to be significantly correlated with background variables such as average schooling and income in a municipality which could be important predictors of our main outcome. Although imprecisely estimated, the coefficients in Tables 2 and 3 are relatively large. Hence, one might still worry that non-random migration might change the composition of people in the municipality over time or that the location choice might be endogenous. We therefore include the municipality-specific time trends in Equation 1 and estimate specifications including sibling fixed effects:

$$y_{ict} = \alpha + \gamma D_{ct} + \beta X_{ict} + \lambda_c + \theta_t + \eta_f + \varepsilon_{ict}, \tag{2}$$

[8] As income is not included in the questionnaire of the Census in 1946, changes in the average income in a municipality cannot be considered.

where η is a set of family fixed effects. Variation is then based on differences in access within families across children, thereby differentiating out any factors, which are constant within families such as socio-economic status or parenting behaviour.

As we are not able to observe the factors that influence opening decisions and the exact location of a new mother and child health care center, it is of particular concern whether mother and child health care centers are established in municipalities where for example the education level is increasing. We therefore test for the existence of pre-opening trends as a function of a future opening of a center. We use an event study specification (see, e.g., Jacobson, LaLonde, and Sullivan, 1993; Autor, 2003; Bailey and Goodman-Bacon, 2014):[9]

$$y_{ict} = \alpha + \sum_{\tau=0}^{m} \delta_{-\tau} D_{c,t-\tau} + \sum_{\pi=1}^{q} \delta_{+\tau} D_{c,t+\tau} + \beta X_{ict} + \lambda_c + \theta_t + \varepsilon_{ict}, \tag{3}$$

The specification allows for m post-treatment effects ($\delta_{-1}, \delta_{-2}, ..., \delta_{-m}$) and q anticipatory effects ($\delta_{+1}, \delta_{+2}, ..., \delta_{+q}$) and enables us to test whether contemporaneous and lagged values of the center openings predict the outcome variables, while lead values do not. In addition, the pattern of lagged effects is of interest as it shows whether the causal effects grow or fade over time.

A further potential methodological issue is the presence of measurement error in our treatment measure. We consider centers operated by the Norwegian Women's Public Health Association (NKS). Although this includes the majority of centers in Norway in the period of interest, it might not be a complete coverage in every year as similar centers might be built up by other private or philanthropic initiatives. Thus, it is possible that there are health care centers providing well-child visits, which we do not observe in our data. The fact that some municipalities are more heavily treated than our data show should attenuate our results. In our main sample we therefore only include municipalities that eventually open a NKS-run mother and child health care center and provide some additional analysis including also municipalities, which did not have a NKS health care center by 1960.

5 Empirical Results

5.1 Descriptive Evidence

We start this section by presenting descriptive evidence on how center openings affected the average education and earnings of each cohort. The left panel of Figure 2 plots the time trend in education before and after the opening of a center. Figure 2 includes the average education in municipalities who eventually open a mother and child health care center. The data is re-centered such that the opening happens at time zero. The plotted values are residuals from a regression on time and

[9]The specification is also known as a Granger causality test.

municipality fixed effects. Figure 2 includes also the average uptake rate. That is, the average number of infants visiting the health care station within a year divided by the number of children born in the municipality the health care center was operating. The figure provides no evidence of a positive trend in education in treated locations before the opening of a center. Following the establishment of a mother and child health care center, average education increases. The steady increase after the reform correlates well with evidence on gradually increasing take-up rates over time. A further explanation for the increasing trend in average education after the opening might be that centers get better in providing appropriate care over time. The lower panel of Figure 2 plots the time trend for average earnings. Again, the figure provides no evidence of an increasing trend in earnings in treated locations before the opening of a center. As for education, the average earnings increase after the center was established.

5.2 Long-term Effects on Education and Earnings

The results presented in this section suggest that the access to mother and child health care centers had substantial long-term consequences. Table 4 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 a NKS-run center was opened between 1936 and 1955. In Column (i), we show the average pre-reform values. In Column (ii), we present the estimates for the effect on completed years of education and average, discounted earnings from 1967-2010. 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, a full set of municipality and cohort fixed effects are included as well as municipality specific variables such as the number of doctors per inhabitants in the municipality of birth in the year of birth. The specification in Column (iii) includes no individual control variables and the sample in Column (iv) includes also individuals born in municipalities where no NKS-run center was opened between 1936 and 1955. Each cell in the Table 4 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 4 shows estimates of γ 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. Thus, 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 zero at a 1% level and they are sizable in magnitude. As the average years of education for the cohorts born before the opening of a center were 10.5, the effect of access to well-child visits amounts to an increase in education of about 1.4 percent. There are several reasons why mother and child health care centers could lead to increased educational attainment. 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. The four proceeding rows of Table 4 show estimates of γ in Equation (1) for different earning variables and samples. First, we consider average, discounted earnings from 1967 to 2010. We also analyze wages individuals earn between age 31 and 50 and the natural logarithm of all positive earnings from 1967 to 2010. We find a significantly positive effect of the access to mother and child health care centers on earnings in most cases. Thus, having access to well-child visits in the first year of life increases adult earnings by about two percent compared to the pre-reform cohorts.

When dropping control the control variables in Column (iii), the estimated effects are slightly higher for all outcome measures and mostly statistically significant on a 1 percent significance level. The estimated effects in Column (iv), where we also include individuals born in municipalities, where the NKS does not open a center until 1960, are similar to Column (ii). As discussed in Section 4, the difference might be explained by the presence of measurement error in our treatment measure. Our collected data focuses on centers operated by NKS, which is the majority of centers in Norway in the period of interest. It is however possible there are health care centers providing well-child visits, which we do not observe in our data.[10] The fact that some municipalities are more heavily treated than our data show, should attenuate the results in Column (iv). Consequently, when including the municipalities where we do not observe an opening in Column (iv), the estimated effects of access to well-child visits on education and earnings change.

It is important to note that the estimates in Table 4 are intent-to-treat estimates. That is, these estimates average across individuals with a higher and lower likelihood of receiving care at a mother and child health care center. Not all mothers took their newborn to a mother and child health care center. The uptake two to three years after the center opening was on average about 60 percent in the late 1930s. Hence, to convert our estimates to the treatment on the treated, one should divide the estimated effects by 0.6.

5.3 Mother-specific Fixed Effects

Table 5 displays the results for Equation 2, 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.[11] The estimates of γ from Equation 2 are smaller than the estimates from Equation 1 for the education outcome but still significant. That is, access to well-child visits increased the years of education by 0.9 percent. On the other hand, the estimates are

[10] From historical documents we know that the Norwegian Red Cross ran a couple of health care centers in 1960. We do however not know when these centers were established.

[11] We observe only a couple of municipalities where all mother and child health care centers are closed in the period of interest. We however observe that some municipalities merge their centers when travelling time and costs decrease.

larger for the earnings outcomes and indicate that access to well-child visits increased the earnings by two to three percent. Note that these results do not rely on the assumption of an exogenous opening and location decision of health care centers as we are comparing the access to well-child visits within families. There are several possible reasons why the estimates from the mother fixed effects estimation could be different. First, when limiting the sample to the individuals which have at least one sibling in the sample and estimating Equation 1 (see Column (iii)), the estimates of γ are also slightly smaller than for the baseline specification in Table 4 for the education outcome. Second, positive spillovers from the center visit by the youngest sibling to the older siblings might attenuate the estimated effects. On the other hand, if positive health shocks are reinforced by parental investment, the estimated coefficients when including family fixed effects might be larger.

5.4 Heterogeneity by Gender

In Table 6 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 significantly larger for men. The effects on life-time earnings are also mostly statistically significant for men and women and larger for men. The differences in effects for men and women are however not significant.

6 Sensitivity Analysis

We present a variety of sensitivity analyses. First, we use methods to control for differences in pre-program time trends in municipalities who receive a center or do not receive a center. Second, we exclude the birth cohorts born during World War II. Third, we use infant mortality to compute a lower bound for our estimates on education.

As pointed out above, we try to distinguish the effect of an opening from differential secular trends by including municipality-specific time trends. In addition, we consider two alternative specifications: first, we test for the existence of pre-opening trends with an event study framework nd second, we use quadratic and cubic municipality-specific time trends.

Figure 3 plots event-study estimates from Equation 3 that includes municipality and cohort fixed effects and control variables such as gender, birth order, mother's education, age and marital status, and father's education and age. The results provide no evidence of a differential trend in either education or earnings in treated municipalities before the centers were opened. The estimates of the pre-opening effects are small in magnitude and not statistically different from zero. In the year following the opening of a mother and child health care center, education and earnings increase. The effect in the year of opening is not significant for both outcomes.

When adding quadratic and cubic municipality-specific time trends, the identification of the effects of access to well-child visits comes from whether such an opening lead to deviations from pre-existing quadratic or cubic municipality-specific time trends. Table 7 shows that the effect of the access to better infant care is still apparent and significant in most cases for both education and earnings when using quadratic or cubic municipality-specific time tends. The effects are however smaller for the quadratic time trends. When including cubic time trends, the effects are almost the same for the education outcome and slightly larger for the earnings outcomes. Thus, differences in time trends are not driving the full effect of the center opening on education and earnings.

The period we analyze in our baseline specification includes War War II. Norway was occupied by Nazi Germany from April 1940 until May 1945. Most affected from acts of war and the occupation were bigger cities such as Oslo, Bergen, Trondheim, Stavanger, and Kristiansand and points of strategic interest as Narvik. Norway suffered from comparably low number of fatalities; basic commodities, including food, were however scarce during the war.[12] Thus, cohorts born during the war might be different from pre- and post-war cohorts. As a robustness tests, we therefore exclude cohorts born in the years 1940 to 1944. The results are presented in Table 8. The estimated effects are slightly lager for the education outcome and smaller for the earnings outcomes when excluding the five cohorts born during the war.

We do not observe adult outcomes of individuals who do not survive until 1967. Thus, our sample of individuals might be altered due to reductions in infant mortality caused by the policy we analyze. As shown by Wüst (2012), infant mortality decreased as a result of a home visiting program in Denmark rolled out from 1937 to 1949. More precisely, she finds a positive effect on infant survival rates of almost 1 percent. In addition, Bhalotra, Karlsson, and Nilsson (2015) analyse an infant care program implemented in Sweden in the 1930s and find that the average duration of program exposure in infancy led to an almost seven percent decline in the risk of infant death. Moreover, when comparing the number of individuals born in each municipality from 1936 to 1960 and the number of individuals we observe in our education and earnings data, we find that the opening of a mother and child health station might have led to a four percent decrease in the number of individuals who do not reach the sample where we observe adult outcomes. These findings might have two implications for the long-term effects we observe: first, there might be a 'selection effect' as lower infant mortality may lead to less healthy survivors. On the other hand, when infant mortality is seen as a proxy for the general disease environment (see Bozzoli, Deaton, and Quintana-Domeque, 2009), lower infant mortality should be associated with better health. Hence, this 'scarring effect', indicates that the health of the survivors generally improved. As described by Hatton (2011), the scarring effect might be more important in the early 20th century in Europe. We therefore estimate lower bounds for the effect on education.

We assume that the short-term effect on infant mortality rates of the mother and child health care centers are comparable to the estimated reduction in infant mortality after the introduction of the Danish home visiting program (Wüst, 2012). We therefore drop one percent of the treatment group at different percentiles of the education distribution and re-estimate Equation 4. In addition,

[12] It is important to note that Norway did not suffer from hunger episodes during World War II and the Nazi occupation as for example the Netherlands or France did.

to account for mortality past the first year of life, we also drop four percent of the treatment group at different percentiles of the education distribution. As shown in Table 9, dropping one or four percent of the treatment group at the 60th, 70th, 80th, 90th, or the top percentile of the predicted education distribution, does not alter our findings substantially. The estimated effect is fairly stable and statistically significant in all subsamples.

7 Mechanisms

As described in Section 2, well-child visits at mother and child health care centers had two main components. First, medical check-ups for infants and second advice to mothers on adequate infant care and nutrition. To analyze which of the components might be more important, we study whether the effect is larger for individuals in municipalities with a center providing a larger variety of health care services and whether we find effects on different health outcomes that are potentially caused by malnutrition early in life.

The mother and child health care centers might have contributed to a decrease in malnutrition through different channels. First, directly by providing mothers with nutritional advice and by promote breastfeeding. Moreover, some centers provided dentist services, which may reduce disparities in dental health and thereby improve the economic prospects of low-income individuals (see Glied and Neidell, 2010). Last, infections may generate an inflammatory immune response, which directs nutrition away from physical and mental development (see, e.g., Finch and Crimmins, 2004; Crimmins and Finch, 2006). There are specific mechanisms by which nutrition as a child may affect long-term health outcomes. Malnutrition among children may for example lead to diseases such as anemia. In addition, malnutrition as an infant may change the developmental trajectory of a child's body. Based on early-life periods with malnutrition, an infant's body may predict what type of situations it is expected to be confronted with later in life and adapts its development to handle future malnutrition episodes better (see Gluckman and Hanson, 2004). Are there no hunger episodes later in life, health problems may arise. Barker (1992), for example shows that the lack of nutrition in early life may impair development and increases the incident of so-called metabolic disorders such as high blood pressure, type II diabetes, obesity and cardiovascular diseases. In addition, adult height is a marker of early life health and nutrition. Case and Paxson (2010) state that adult height depend on a combination of factors, including genes, environmental conditions (particularly undernutrition and illness) and gene-environment interactions. Low birth weight a is significant predictor of lower adult height (Saenger, Czernichow, Hughes, and Reiter, 2007; Li, Manor, and Power, 2004). Moreover, nutrition in the period from birth to age three 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 impair growth substantially (Crimmins and Finch, 2006).

We therefore examine the effect on adult health and adult height of the establishment of mother and child health care centers, which may have improved the nutrition for infants and lowered the probability of gastrointestinal diseases among infants.[13] If the nutrition channel is an important mechanism, we expect that infants who were exposed to a center after birth will be less likely to have mis-adapted to future episodes of malnutrition. Thus, we presume that these experience lower incidence of obesity, high blood pressure, type II diabetes, and cardiac events by the age of 40. The age of 40 might be rather early to measure type II diabetes, cardiac events, or hypertension, obesity should however serve as a good indicator for 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 on average be taller.

Table 10 displays the effect of a center opening on the health index described in Section 3.4 and a set of different health outcomes. We find a significant effect on the health index and several health outcomes for men and women. The effect of access to a mother and child health care center is -0.188 for men and -0.172 for women and is statistically significant at the 1 percent level for men and 5 percent level for women. The magnitude of the coefficient implies that health care center access reduces the index for bad health by almost 0.17 to 0.19 standard deviations. In addition, men have significantly lower BMI and blood pressure, a significantly lower probability of having a being obese or having hypertension or type II diabetes, a significantly lower cardiac and cholesterol risk at the age of 40, and are higher when exposed to a mother and child health care center as an infant. For women, we find that a significant health improvements in terms of diabetes and height. Thus, we find some evidence that the mother and child health care centers increased the quality of nutrition for infants and thereby decreased the prevalence of obesity and diseases related to metabolic syndrome, and increased adult height. The somewhat larger effects for men are in line with the main results presented above and with previous evidence that boys are affected more by adverse events in utero and early life (see, e.g., Currie and Almond, 2011). In addition, our results correspond with Hjort, Sølvsten, and Wüst (2014) who show that postnatal care affects heart health positively. In particular, they find that infants which had access to an universal home visiting program in Denmark in the 1930s are less likely to be diagnosed with cardiovascular diseases in adulthood or die from cardiovascular or heart disease in middle age.

The mother and child health care centers varied in the health services they offered. From the yearly reports, the health care centers sent to the main organization we are able to evaluate two different forms of extra health care services. First, some centers reported that they tested infants for tuberculosis. Tuberculosis was still a large health threat during the period when the mother and child health care centers were built up. In 1945, the disease still caused 5 percent of all deaths in Norway. As early detection of tuberculosis is instrumental for successful treatment

[13] In the context of developing countries, there is evidence that information campaigns about oral rehydration therapy for infants suffering from diarrhea decreased infant diarrhea deaths dramatically (Levine, Group, and Kinder, 2004), and that campaigns promoting hand washing with soap lead to a sustained reduction in diarrhea episodes (Wilson and Chandler, 1993).

and for hindering the disease spread. Hence, testing infants for tuberculosis could have important long-term consequences. Second, some health care centers offered immunization. That is, children would return until they reached the age of seven to the center to be vaccinated. The offered vaccinations included small pox vaccines and later also diphtheria vaccines. Previous literature presents evidence that protecting children from infectious diseases potentially affects cognitive ability: Bloom, Canning, and Shenoy (2012), for example, use data from vaccination programs in the Philippines and show that childhood vaccination for measles, polio, tuberculosis, diphtheria, and pertussis significantly increases cognitive test scores. Moreover, Lee (2012) shows that mandatory school vaccination laws in the U.S. also affect adult outcomes such as educational attainment and the overall labor force participation positively. Access to immunization might therefore be an important contribution of the mother and child health care centers. Hence, we expect the centers, which offer more health care services to have a larger impact.[14]

Table 11 analyzes the effect of an opening of a center with a larger offer in health care services. We find bigger effects on education and earnings of centers which offer extra health care services. These results indicates that besides the nutrition advice, also tuberculosis testing and vaccination might have been important and may have contributed to the positive long-term effects of access to well-child visits on economic outcomes.

8 Discussion

As we are the first, to our knowledge, to measure the long-term economic consequences of access to mother and child health care centers for infants, comparing our results to the literature is not easy. We may however compare our results to other studies analyzing long-term effects of various policy-induced variations in early-life health.

Chay, Guryan, and Mazumder (2009) examine a somewhat related increase in infant health care by looking at the hospital integration in the U.S. South in the 1960s. They show that a black child who gained hospital admission as an infant faced a 0.75 to 0.95 standard deviation increase in Armed Forces Qualifying Test score. Our estimated effect on years of education is smaller and about 0.2 standard deviations. As IQ tests and education are not perfectly correlated, a direct comparison is difficult. Lee (2012) studies the long-term effects of the implementation of mandatory school vaccination laws in the U.S. in the 1970s on adult educational attainment and wages. She finds that the introduction of the mandatory school vaccination laws increased the years of schooling by

[14] As discussed in Section 4, we use the variation in when and where mother and child health care centers with extended medical services were established to identify the effects of interest. We apply the same empirical test as in Section 4 for the key identifying assumption and analyze whether 1930 demographics of municipalities receiving a center offing extra health care services may predict when such a center was established. We find very similar results as in Table 2. Importantly, we find that the rollout of infant health care centers with extra services does not seem to be correlated with background variables such as average schooling and income in a municipality. Results are available on request.

0.12 years. The estimates found in this paper are slightly larger in magnitude compared to the effects of the implementation of mandatory school vaccination laws in the 1970s.

Our results indicate that nutrition advice for mothers and breastfeeding promotion may have played an important role. The estimates found in this paper are mostly smaller in magnitude but still comparable to policy changes and interventions increasing breastfeeding or improving the nutritional situation early in life. In a randomizing breastfeeding promotion intervention in Belarus, Kramer, Aboud, Mironova, and et al (2008) find that cognitive ability at age 6.5 years is increased by about one standard deviation if the infant was in the treatment group. As we look at outcomes more than 20 to 40 years later in life, it is not surprising that our effects on education are substantially smaller. Paid maternity leave might also increase the breastfeeding rates. In the context of Norway, Carneiro, Løken, and Salvanes (2015) examine the impact of the introduction of four months of paid maternity leave in 1977 on children. They find that children's educational attainment increases by 0.4 years and earnings at age 30 increase by 5 percent. Again, our effects are smaller. However, since the take-up rates in their paper is close to 100 percent, whereas the take-up rate for the health care centers is around 60 percent, the estimated treatment effects on the treated are more similar. When analyzing the health effects of early access to food stamps, Hoynes, Schanzenbach, and Almond (2012) find an increase in the likelihood for metabolic syndrome that is mostly driven by obesity. This finding matches well with our results for male health outcomes at age 40. Hoynes, Schanzenbach, and Almond (2012), however, estimate an effect that is larger in magnitude.

9 Conclusion

In this paper, we present evidence that access to well-child visits for infants can improve long-term economic outcomes significantly. In particular, we use the rollout of mother and child health care centers in Norway starting 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 and lifetime earnings and reduces health risks at the age of 40. These 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.

An important strength of our analysis is at the same time a drawback as well. To study long-term effects of well-child visits, we need to study reforms that happen a long time ago. Today's health situation for infants in the developed world is dramatically different. This makes it difficult to generalize our results to current policies (see Ludwig and Miller, 2007, for a discussion). We may however say that the infant mortality rates in Norway in the 1930s and 1940s was comparable to the rates in developing countries today and infectious diseases were a main cause of death in the first year of life. It is therefore likely that infants in developing countries would benefit from well-child visits also in the long run.

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10 Tables and Figures

Figure 1: Rollout of Mother and Child Health Care Centers

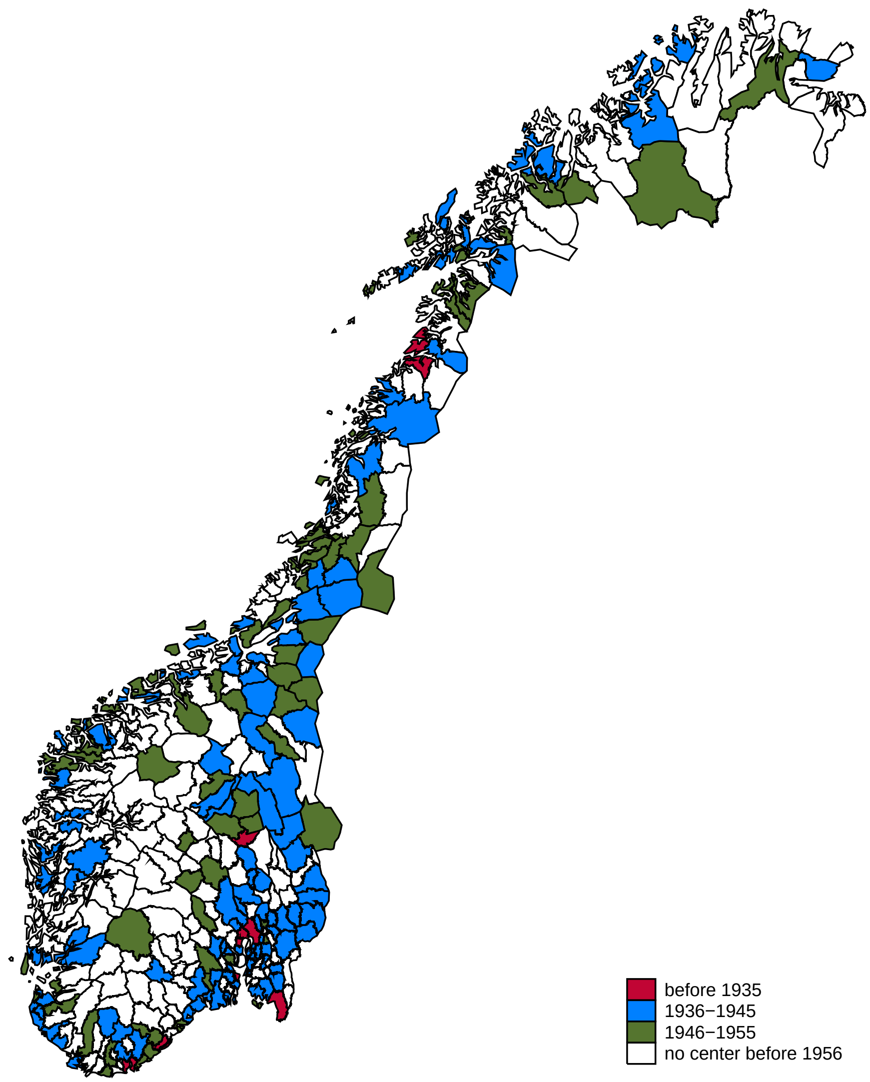
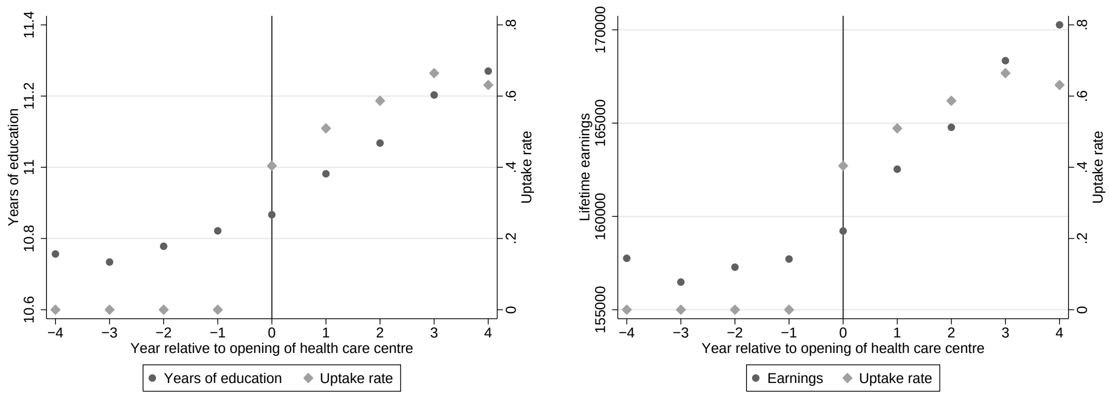
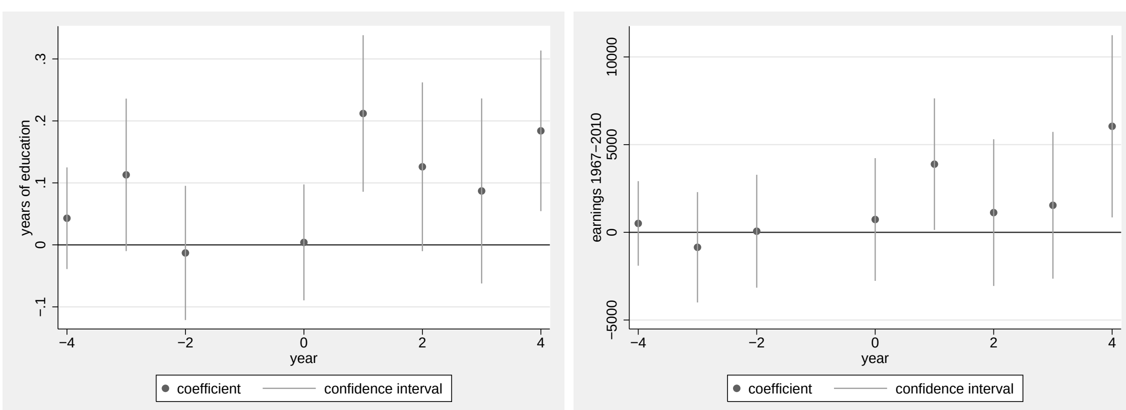


Figure 2: Relationship between Mother and Child Health Care Center and Education and Earnings



Data Source:

Figure 3: Event Study Estimates of the Impact of Exposure to a Mother and Child Health Care Center on Education and Income



Note: Figures plot event-study estimates, which include municipality and cohort fixed effects and control variables such as mother's education, age and marital status, father's education and age and gender. Robust standard errors adjusted for clustering at the municipality of birth level in parentheses. We include birth cohorts 1936-1960. Health stations open from 1937-1955. Earnings are average, discounted earnings from 1967-2010.

Table 1: Descriptive Statistics

	Whole Sample	Men	Women
Outcomes			
Years of education	11.79	11.89	11.66
	(2.78)	(2.82)	(2.74)
Earnings 1967-2010	168,113	211,863	116,733
	(108,343)	(118,096)	(65,241)
Earnings age 31-50	213,652	269,213	148,402
	(156,055)	(178,119)	(91,781)
Municipality level controls			
Number of doctors per	3.29		
1000 inhabitants	(1.90)		
Percent with	0.022		
high school degree in 1930	(0.017)		
Percent of with	0.010		
some high school 1930	(0.042)		
Average income of men in 1930	1610		
(in 1930 NOK)	(751)		
Average income of women in 1930	688		
(in 1930 NOK)	(273)		
Urban area	0.118		
	(0.323)		
Population in 1000	7.15		
	(11.4)		
Number of observations	310,516	165,348	145,168

Table 2: Test of Identifying Assumption: Effect of 1930 Municipality Characteristics on the Timing of the Center Opening

	Opening before 1935 (i)	Opening between 1935 and 1940 (ii)	Opening between 1940 and 1945 (iii)
High school 1930	0.098	-0.563	-0.768
	(0.364)	(1.112)	(0.951)
Some high school 1930	-0.082	-0.086	0.523
	(0.147)	(0.448)	(0.383)
Income men 1930	0.022	0.055	-0.030
	(0.016)	(0.049)	(0.042)
Income women 1930	-0.012	0.050	0.077
	(0.044)	(0.135)	(0.116)
Doctors per inhabitants	-0.006**	-0.017**	0.003
	(0.002)	(0.007)	(0.006)
Midwifes per inhabitants	0.005	0.010	0.019
	(0.004)	(0.013)	(0.011)
Urban	0.0292	0.134***	-0.013
	(0.015)	(0.046)	(0.040)
Population	0.003***	-0.001	-0.000
	(0.000)	(0.001)	(0.001)
Constant	-0.020	0.051	-0.002
	(0.017)	(0.051)	(0.044)
Number of observations	617	617	617

Significance Levels: *** 1% level, ** 5% level, * 10% level

Note: Each column represents a separate linear probability model of the likelihood of an opening in a given period on chnaces in various municipality characteristics. Number of individuals with high school degree and some high school education are taken from the 1930 and 1946 census. Number of doctors and midwifes and population is collected from Statistics Norway's yearly health statistics.

Table 3: Test of Identifying Assumption: Effect of Changes in Municipality Characteristics from 1930 to 1946 on the Timing of the Center Opening

	Opening before 1935	Opening between 1935 and 1940	Opening between 1940 and 1945
Change in percent with high school degree	-0.212	-0.861	0.504
	(0.356)	(1.120)	(0.918)
Change in percent with some high school	0.172	-0.094	-0.485
	(0.147)	(0.470)	(0.385)
Change in doctors per inhabitants	0.001	-0.007	-0.001
	(0.003)	(0.007)	(0.006)
Change in midwifes per inhabitants	0.005	-0.003	0.003
	(0.004)	(0.007)	(0.006)
Population change	-0.000	0.001	0.002
	(0.001)	(0.002)	(0.002)
Change in urban status	-0.003	-0.008	0.033
	(0.008)	(0.002)	(0.020)
Constant	0.024**	0.118***	0.041
	(0.010)	(0.029)	(0.024)
Number of observations	617	617	617

Significance Levels: *** 1% level, ** 5% level, * 10% level

Note: Each column represents a separate linear probability model of the likelihood of an opening in a given period on various municipality characteristics. Number of individuals with high school degree and some high school education as well as the average income for men and women are taken from the 1930 census. Number of doctors and midwifes and population is collected from Statistics Norway's yearly health statistics.

Table 4: Long-term Effects of Access to a Mother and Child Health Care Center on Education and Earnings

	Mean pre-reform (i)	Baseline (ii)	No control variables (iii)	All municipalities (iv)
Years of education	10.53	0.149***	0.173***	0.158***
		(0.035)	(0.040)	(0.033)
Obs.		310,516	310,516	484,444
Earnings 1967-2010	155,408	3673***	4821***	3551***
		(1189)	(1628)	(1172)
Obs.		310,930	310,930	485,027
Earnings age 31-50	168,684	2644***	3888***	2721**
		(1204)	(1883)	(1207)
Obs.		310,930	310,930	485,027
Log Earnings 1967-2010	11.56	0.017	0.025*	0.017
		(0.011)	(0.013)	(0.010)
Obs.		310,462	310,462	484,288

Significance Levels: *** 1% level, ** 5% level, * 10% level

Note: 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 municipality of birth level in parentheses. We include birth cohorts 1936-1960. Health stations open from 1937-1955. Earnings are average, discounted earnings from 1967-2010. All specifications include a full set of cohort and municipality fixed effects. Additional control variables in Columns (ii) and (iv): mother's education, age and marital status, father's education and age and gender, birth order, and the number of doctors per inhabitants.

Table 5: Mother-specific Fixed Effects

	Mean pre-reform (i)	Mother fixed effects (ii)	OLS fixed effect sample (iii)
Years of education	10.54	0.090**	0.120***
		(0.043)	(0.040)
Obs.		235,609	235,609
Earnings 1967-2010	156,593	4639***	3379***
		(1482)	(1292)
Obs.		235,610	235,610
Earnings age 31-50	169,087	3389**	2665*
		(1675)	(1412)
Obs.		218,715	218,715
Log Earnings 1867-2010	11.58	0.021	0.011
		(0.014)	(0.016)
Obs.		235,298	235,298

Significance Levels: *** 1% level, ** 5% level, * 10% level

Note: 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 municipality of birth level in parentheses. We include birth cohorts 1936-1960. Health stations open from 1937-1955. Earnings are average, discounted earnings from 1967-2010. All specifications include a full set of cohort and municipality fixed effects and gender, birth order, and the number of doctors per inhabitants.

Table 6: Heterogenous Effects by Gender

	Women		Men	
	Mean pre-reform	Baseline	Mean pre-reform	Baseline
	(i)	(ii)	(iii)	(iv)
Years of education	10.21	0.088*	10.77	0.182***
		(0.048)		(0.048)
Obs.		145,168		165,348
Earnings 1967-2010	94,923	2883***	199,141	2930***
		(1361)		(1677)
Obs.		145,353		165,577
Earnings age 31-50	97,148	1683	216,931	1356
		(1385)		(1948)
Obs		131,013		145,353
Log Earnings 1967-2010	10.97	0.019	11.95	0.005
		(0.020)		(0.011)
Obs.		144,985		165,477

Significance Levels: *** 1% level, ** 5% level, * 10% level

Note: 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 municipality of birth level in parentheses. We include birth cohorts 1936-1960. Health stations open from 1937-1955. Earnings are average, discounted earnings from 1967-2010. 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 and the number of doctors per inhabitants.

Table 7: Municipality-Specific Time Trends

		Municipality specific time trends	
	Baseline (i)	Quadratic (ii)	Cubic (iii)
Years of education	0.149***	0.108***	0.140***
	(0.035)	(0.37)	(0.040)
Obs.	310,516	310,516	310,516
Earnings 1967-2010	3673***	2491**	3352***
	(1189)	(1200)	(1261)
Obs.	310,930	310,930	310,930
Earnings age 31-50	2644***	2509*	2974**
	(1204)	(1283)	(1321)
Obs.	310,930	310,930	310,930
Log Earnings 1867-2010	0.017	0.012	0.022*
	(0.011)	(0.012)	(0.012)
Obs.	310,462	310,462	310,462

Significance Levels: *** 1% level, ** 5% level, * 10% level

Note: 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 municipality of birth level in parentheses. We include birth cohorts 1936-1960. Health stations open from 1937-1955. Earnings are average, discounted earnings from 1967-2010. 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 and the number of doctors per inhabitants. Column (ii) includes county-specific linear time trends; Column (iii) includes municipality-specific linear time trends; Column (iv) includes municipality-specific quadratic time trends; and Column (v) includes municipality-specific cubic time trends.

Table 8: Robustness Tests: World War II

	Baseline (i)	Excluding War Years (ii)
Years of education	0.149**	0.161***
	(0.035)	(0.038)
Obs.	310,516	289,657
Earnings 1967-2010	3673***	2649***
	(1189)	(1343)
Obs.	310,930	290,061
Earnings age 31-50	2644***	2467*
	(1204)	(1397)
Obs.	310,930	290,061
Log Earnings 1967-2010	0.017	0.012
	(0.011)	(0.013)
Obs.	310,462	289,691

Significance Levels: *** 1% level, ** 5% level, * 10% level

Note: 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 municipality of birth level in parentheses. We include birth cohorts 1936-1960. Health stations open from 1937-1955. Earnings are average, discounted earnings from 1967-2010. 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 and the number of doctors per inhabitants. Column (ii) excludes individuals born during the occupation of Norway during World War II.

Table 9: Bounds Accounting for Infant Mortality

	Baseline	Dropping 60th percentile	Dropping 70th percentile	Dropping 80th percentile	Dropping 90th percentile	Dropping 100th percentile
	(i)	(ii)	(iii)	(iv)	(v)	(vi)
Dropping 1 percent	0.149***	0.147***	0.149***	0.146***	0.146***	0.147***
	(0.035)	(0.035)	(0.034)	(0.034)	(0.034)	(0.035)
Obs.	310,516	307,453	307,436	307,405	307,335	307,672
Dropping 4 percent	0.149***	0.141***	0.148***	0.139***	0.139***	0.145***
	(0.035)	(0.035)	(0.034)	(0.034)	(0.035)	(0.035)
Obs.	310,516	298,305	298,231	298,106	297,850	298,180

Significance Levels: *** 1% level, ** 5% level, * 10% level

Note: 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 municipality of birth level in parentheses. We include birth cohorts 1936-1960. Health stations open from 1937-1955. 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 and the number of doctors per inhabitants. In Columns (iii) to (vii), we drop 1 percent of individuals receiving treatment. In Column (iii) we drop individuals in the 60th percentile of the predicted education distribution which. In Columns (iv) to (vii), this procedure is repeated for individuals in the 70th, 80th, 90th, and 100th percentile of the percentile of the predicted education distribution.

Table 10: Long-term Effects of Access to a Mother and Child Health Care Center on Health at Age 40

	Men		Women	
	Mean pre-reform	Baseline	Mean pre-reform	Baseline
Index for bad health	0.00	-0.188***	0.00	-0.172**
		(0.041)		(0.052)
Obs.		68,051		67,922
BMI	25.74	-0.347**	24.25	-0.012
		(0.158)		(0.175)
Obs.		68,352		68,001
Obese	0.100	-0.040***	0.086	0.020*
		(0.011)		(0.011)
Obs.		68,450		68,671
Blood Pressure	138.20	-0.947*	127.98	-1.210
		(0.521)		(0.755)
Obs.		68,160		68,092
Hypertension	0.223	-0.012	0.106	-0.009
		(0.016)		(0.018)
Obs.		68,329		68,671
Diabetes	0.058	-0.046***	0.038	-0.035***
		(0.010)		(0.009)
Obs.		68,329		68,020
Cardiac Risk	0.198	-0.041**	0.001	0.001
		(0.018)		(0.002)
Obs.		68,450		68,671
Colesterol Risk	0.097	-0.051***	0.042	-0.011
		(0.010)		(0.008)
Obs.		68,450		68,671
Height	178.38	1.178***	165.09	1.922***
		(0.227)		(0.322)
Obs.		68,362		68,066

Significance Levels: *** 1% level, ** 5% level, * 10% level

Note: 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 municipality of birth level in parentheses. We include birth cohorts 1936-1960. Health stations open from 1937-1955. 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 and the number of doctors per inhabitants.

Table 11: Long-term Effects of Access to Different Types of Mother and Child Health Care Center on Education and Earnings

		Extra health care services	
	Baseline (i)	Centers with Tuberculosis testing (ii)	Open for older children (iii)
Years of education	0.149***	0.229**	0.204***
	(0.035)	(0.100)	(0.081)
Obs.	310,516	76,634	80,796
Earnings 1967-2010	3673***	8839***	6993***
	(1189)	(3388)	(3063)
Obs.	310,930	76,634	80,796
Earnings age 31-50	2644***	4945*	5323**
	(1204)	(2869)	(2579)
Obs.	310,930	76,634	80,796
Log Earnings 1867-2010	0.017	0.064***	0.044**
	(0.011)	(0.024)	(0.022)
Obs.	310,462	76,549	80,705

Significance Levels: *** 1% level, ** 5% level, * 10% level

Note: 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 municipality of birth level in parentheses. We include birth cohorts 1936-1960. Health stations open from 1937-1955. Earnings are average, discounted earnings from 1967-2010. 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 and the number of doctors per inhabitants.