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School health programs: education, health, and welfare dependency of young adults

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School Health Programs: Education, Health, and Welfare Dependency of Young Adults

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Abstract

This paper provides new evidence that preventive health care services delivered at schools and provided at a relatively low cost have positive and lasting impacts. We use variation from a 1999-reform in Norway that induced substantial differences in the availability of health professionals across municipalities and cohorts. In municipalities with one fewer school nurse per 1,000 school-age children before the reform there was an increase in the availability of nurses of 35% from the pre- to the post-reform period, attributed to the policy change. The reform reduced teenage pregnancies and increased college attendance for girls. It also reduced the take-up of welfare benefits by ages 26 and 30 and increased the planned use of primary and specialist health care services at ages 25-35, without impacts on emergency room admissions. The reform also improved the health of newborns of affected new mothers and reduced the likelihood of miscarriages.

JEL Classification: H75, I10, I12, I28, I30, I38
Keywords: School Health Services, Teenage Pregnancy, Welfare Dependency, Utilization of Health Services, Health Status.

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1 Introduction

While there is an extensive literature on the long-term consequences of in utero, neonatal and early childhood health programs (Currie and Almond, 2011; Aizer and Currie, 2014; Currie et al., 2010), much less is known about health interventions in the next phase of a child's life, i.e. during school age. Programs that expose children to safe, stable and nurturing environments have been proved effective in promoting health and well-being in a long-lasting fashion (Muennig, 2015), with the most robust evidence coming from small-scale randomized controlled trials that target particularly disadvantaged children in the US (e.g., Campbell et al., 2014; Conti, Heckman and Pinto, 2016). However, despite recent work supporting that at later stages of childhood it is possible to ameliorate early disadvantage by investing in non-cognitive skills (Heckman, 2006; Cunha, Heckman and Schennach, 2010), there is still scarce evidence about the effectiveness of interventions at school age. This lack of evidence based knowledge has prompted the Lancet Commission for Adolescents' Health and Wellbeing to call to fill in this gap (Patton et al., 2016). The main contribution of this paper is to provide the first evidence on how universal school health services affect individuals' lives. We focus on a wide range of outcomes measured in early adulthood, namely, educational attainment, teenage childbirth, labor market attachment, welfare dependency, physical and mental health, and the impacts on the next generation of such services.

Poor childhood health has immediate costs such as health service expenses and reduced quality of life, and it impacts health in adulthood. Poor child health has also been associated with reduced investments in human capital and education, youth unemployment, poorer adult labor market outcomes, and criminal behavior (see e.g. Case, Fertig and Paxson, 2005; Egan, Daly and Delaney, 2015; Delaney and Smith, 2012; Currie et al., 2010; Smith, 2009; Cunha and Heckman, 2008).[1] Mental health problems in childhood and adolescence stand out as especially important for such long-term outcomes (see e.g. Smith and Smith, 2010; Currie et al., 2010; Egan, Daly and Delaney, 2015). In developed countries, mental illness is an increasingly prevalent problem: it accounts for up to one-half of all long-term sickness absences from work across OECD countries (OECD, 2013, 2015).[2]

The World Health Organization reports that 10-20 percent of children and adolescents worldwide experience mental disorders of some kind (Hosman, Jané Llopis and Saxena, 2004). In spite of this, mental health problems are less likely to be detected in young people than in any other age group (Knapp et al., 2016). Psychological and epidemiological literature have shown that preventive measures are often effective in promoting mental health and preventing mental problems to develop (Marmot and Wilkinson, 2005). Given that many of the mental health issues that hinder the working age population from successful participation in the labor market develop already in childhood or adolescence, there is a strong case for early detection and prevention of such problems.

[1]Educational attainment has also been associated with other outcomes, such as better physical and mental health, lower involvement in crime, and longer life expectations (see e.g. Stark and Noel, 2015; Chevalier and Feinstein, 2006; Grossman, 2005; Blanchflower and Oswald, 2004; Lochner and Moretti, 2004).

[2]Poor mental health has been identified as a key predictor of receiving a DI benefit even when the DI is awarded on the basis of a somatic diagnosis (Mykletun et al., 2006).

Therefore, in contexts where children spend a large part of their days outside the home, child care institutions and schools represent arenas outside the family where both physical and mental health problems can be effectively detected at an early stage. In both places, there are in addition opportunities to promote health-enhancing behavior and thereby prevent physical and mental health problems later in life. In light of this, the scarcity of studies trying to pin down the causal effect of promoting healthy behavior and to detect and prevent health problems at school age, is surprising. Despite evidence on the impacts of preschool interventions on the education, behaviors and mental health of adolescents and young adults (e.g., Garces, Thomas and Currie, 2002; Ludwig and Miller, 2007; Carneiro and Ginja, 2014; Conti, Heckman and Pinto, 2016), existing evidence on school interventions is limited to studies with samples of at most a few hundred observations and limited temporal coverage (Maughan, 2003).[3] Lovenheim, Reback and Wedenoja (2016) is the closest to our work; they study the impacts of providing primary health care through school-based health centers in deprived school districts in the USA, on fertility and high school dropout, and find a 5 percent reduction in teenage pregnancies, but no impacts on dropout rates. We add to this literature by investigating the effects of a longstanding universal school health program on a wider set of outcomes measured during early adulthood and using rich panel data to probe the mechanisms behind our findings.

We focus on the Norwegian school health services, which are mainly provided by school nurses, who are educated nurses with an additional one or two-years specialization in child and youth health and social work. School nurses provide a low-threshold, easily accessible service, which is potentially of vital importance as youths are often impulsive when seeking treatment or health advice (Tylee et al., 2007). In general, the school nurses conduct regular check-ups, collaborate with teachers and the school in preventive social work, and engage with the pupils. The delivery of services we study is similar to those available in the U.K.,[4] Sweden,[5] France and many others.

To identify the impact of school health services we rely on the 1999 Escalation Plan for Mental Health. This reform was gradually implemented between 1999 and 2008, and one important feature was the increased investment in preventive care through the school health sector, with the explicit goal of increasing the availability of school nurses. This setting allows us to estimate the effects of access to school nurses in a difference-in-differences framework that compares the outcomes for cohorts in school before and after the 1999-reform implementation (first difference) between higher- and lower-coverage municipalities (second difference). Thus, we use a ”dose-response” strategy where lower pre-reform coverage is the strongest predictor of growth. One less school nurse per 1,000 6-19 years old in the immediate pre-reform period is associated with an increase of about 0.71 school nurses from the pre- to the post-reform period (35 percent relative to the pre-reform mean of school nurses of 2 nurses per 1,000 6-19

[3] Recent health interventions have produced discouraging results among teenagers ages 13-17 ((see e.g. Stice, Shaw and Marti, 2006) for a meta-analysis on interventions to reduce obesity or Horowitz et al. (2007) for a meta-analysis of interventions to reduce depression).

[4] See https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/303769/Service_specifications.pdf.

[5] Fagerholt (2009).

year old). In addition, individuals 19 years and older in 1998, the year before the reform was enacted, had graduated by the time the reform was implemented and were not affected by the expansion of school nurses. For younger cohorts, exposure to the reform is a decreasing function of age in 1999. We rely on individual level administrative data covering the entire Norwegian population and the majority of the outcomes we consider are measured between ages 20 and 35, and they include educational attainment, teenage childbirth, labor market attachment, and physical and mental health.

Our paper has three main findings. First, increased availability of school nurses had substantial positive impacts on later-life outcomes. We find that increased availability of school nurses reduced teen childbirth, in particular, one fewer school nurse per 1,000 school-age children at baseline reduced the likelihood of teen childbirth by 0.6 percentage points, which is equivalent a 12 percent reduction from a baseline mean of 5 percent. For women there is also an increase the likelihood of college enrolment by age 20 of 1.6 percentage points (4 percent relative to the control mean). The reform also increased attachment to the labor market by ages 26 and 30 and reduced welfare use by ages 26 and 30 by 3 percent. We also found increased use of primary health services (1.6 percent increase in the likelihood of a visit and .24 extra annual visits to GPs), and increased inpatient (4 percent) and outpatient (5 percent) specialist care visits between ages 25 to 35.

Second, the detailed data used in this paper allow us to study the mechanisms behind our findings. In particular, we do not find impacts in admissions through the emergency room (ER, hereafter) in primary care or the emergency wards in hospitals. The increase in use of medical services is driven by conditions related to respiratory infections, digestive, musculoskeletal, endocrine, obstetric and diverse medical examinations. Interestingly, the increase in the use of primary and specialist care are related to the same type of medical conditions. In Norway, it is not possible for a patient to proceed directly to specialist care within the public health care system. GPs are acting as gatekeepers in the public health care system and the first contact with specialist care takes place via the referral of the patient by the GP. All this suggests that the increase in the use of primary and specialist care is due to planned appointments, and not driven by sudden changes in health status. Additionally, among women this increase in use of medical services was translated into a reduction in the likelihood of miscarriages before week 12 and to an improvement in the health of newborns, so that the reform had impacts beyond the individuals directly exposed to it. Taken together these impacts suggest a long term behavioral change towards individual raised awareness of health resulting in usage of the existing medical services rather than a change in health. Among women, the increased probability of college enrolment also suggests that the reduction in teen childbirth translates into educational gains.

Finally, since some children are exposed to the reform from elementary school and others from high school, we assess how impacts vary by time of exposure. While the impacts on teen childbirth are detected for those exposed to the reform just during high school (ages 16 to 18) and are similar for those first exposed in middle school (13 to 15 years old) or since primary school (6 to 12 years old), the impacts on the use of health care, employment and welfare use are increasing with exposure. This suggests two, not mutually exclusive, explanations. First, teen childbirth is more malleable to interventions at later stages of life, while for labor market outcomes and health investments in the early years are particularly important (Cunha, Heckman and Schennach, 2010). Second, the services provided by the nurses at different ages vary, and it is possible some of the services provided at an early stage, e.g. early detection and prevention, are especially important for long term health and labor market, but not so much for teen childbirth.

We provide different evidence that the key identifying assumption of pre-reform parallel trends is likely to hold. First, we show that municipalities with different baseline coverage of school nurses have similar trends in the outcomes studied and in several other characteristics prior the reform. Second, our estimates are robust to a number of alternative specifications.

2 History and Expected Effects of School Health Services in Norway

2.1 School Health Services in Norway

All Norwegian school children and youth are entitled to vaccinations, health education and guidance, as well as medical examinations and access to health care professionals when needed (Helse- og omsorgsdepartementet, 2003). These services are part of the primary health services and, thus, are the responsibility of municipalities. Municipalities are also responsible for taking preventive and health promoting measures (Kommunal- og moderniseringsdepartementet, 1992). For school-age children, these responsibilities are primarily taken care of by the school health services (at both private and public schools), and for younger children by child health stations.[6]

School health services are easily accessible to students and are free of charge. These services are available at school premises during school hours and primarily provided by school nurses, who are certified nurses with an additional one or two year specialization in preventive and health promoting work.[7] School nurses are employed by municipalities and not by schools and may provide services to more than one school simultaneously. Furthermore, municipalities have some discretion with respect to how they organize their activities. Some choose to also include physicians, psychologists and other health professionals as part of the school health services, either permanently or for shorter periods, and these professions are normally not based on the school premises.[8] Importantly, the school health services are preventive. For curative purposes, the children are referred to primary or specialist care services (Statens Helsetilsyn, 1998). The school health services often serve as a first line service; they are well positioned to detect needs and challenges and they can refer children to primary care and specialist services.

[6] Younger children receive these services in child health care centers that also provide pre- and postnatal services for mothers and newborns.

[7] The length of the specialisation varies between institutions across the country.

[8] In 1990, in total 1744 man-years were spent in the health stations and school health services across Norway. Of these, 208 were physicians, 119 physiotherapists, and 1416 school nurses, midwifes and other personnel. In 1998 the corresponding numbers were 2817 (total), 222 (physicians), 296 (physiotherapists) and 2354 (school nurses, midwifes and other personnel (Statistics Norway, 2002).

Securing good health for school children has been a central task for Norwegian school and health authorities since the end of the 18th century. Originally the focus was on hygiene, (mal)nourishment, individual health examinations and the school environment, as well as on combating infectious diseases through the implementation of a vaccination program. However, as living conditions and medical treatments improved, the main focus of these services shifted to detecting and preventing health problems related to life style (Statens Helsetilsyn, 1998). In the beginning of the 1990s the authorities passed a bill that described which health services should be given priority at schools and child health stations; these were *prevention* of psychosocial problems, strain injuries, accidents and injuries, asthma and allergies and *promotion* of healthy behaviors in terms of nutrition and use of tobacco and drugs.

In 1998 the Norwegian Board of Health Supervision issued national guidelines for school health services for the first time (Statens Helsetilsyn, 1998).[9] These guidelines describe the norms of practice and signal the expectation of the health authorities about municipality level school health services.[10] The main services to be delivered depend on the age of children and include:

1. The most comprehensive health examination is conducted at school start, or ideally a few months before, when the child is 5 or 6 years old. Height and weight are measured and the children are screened for any physical and developmental conditions that may need attention. There is also an evaluation of the child's family situation, and socioeconomic and emotional environment. General advice on conditions for a child's development and health (e.g. on nutrition/eating habits, sleep, screen time, setting limits etc.) is given to parents during the assessment.

2. School health services administrate vaccines for school-age children (usually at age 8, 11, 12, 14 and 15).[11]

3. At ages 8, 12/13, and 16, height is registered, and health examinations are conducted according to the schools' assessments of individual risk and needs. Individual supervision and advice should be offered to parents and/or pupils based on individual needs. These services are not universal to the same extent as the school start examination, but rather more targeted consultations with the goal to follow up on identified needs and challenges over time.

4. During the whole schooling period, health information and guidance is provided in groups or classes at various stages. Information about general health improving behavior like eating habits, the importance of physical activity, how to express feelings,

[9]The work started already in 1995. Many of the guidelines built upon already well established practices, but others were attempts to equalise practices across the different municipalities.

[10]Schools and municipalities are not obliged to follow the guidelines however. If they deviate from the guidelines, they are expected to justify their choices, and there is evidence that deviation from the guidelines are taken into consideration in cases where conflicts between parents/pupils and the municipalities are taken to court.

[11]The recommended ages changed slightly over time. Vaccinations rates are close to universal in Norway; e.g., 94% of children born in 1995 had completed the official vaccination program by the age of 16 (https://www.fhi.no/globalassets/dokumenterfiler/tema/vaksine/2011-fylker-16-aringer-1995.pdf).

boundary setting etc. are reoccurring topics, while puberty, sexuality, contraception, and issues related to the use of tobacco, alcohol and drugs are recommended to be introduced gradually. This is the area where the school nurses have the greatest amount of discretion and, consequently, there is variation both across municipalities and between schools in how these services are organized.

5. Open office hours for general counseling. For adolescents, an important service is the provision of free non-prescription contraceptives, and since 2002, school nurses are entitled to prescribe birth control pills (free of charge) to women 16-19 years old.

There is no systematic registry of the use of school health services by students for the period studied, so we do not have exact information about take-up of services. Survey information from 2013 show that 23,21% and 24,78% of the students in middle and high school, respectively, reported at least one annual consultation with a school nurse.[12] However, there are substantial gender differences in use: 16,75% and 13.14% of boys in middle school and high school, respectively, consult school nurses at least once a year. For girls, the figures double: 29,35% and 35,35% in middle and high school, respectively, had consulted the school nurse at least once. During middle school, physical problems were the most common reason to visit the school nurse, followed by well-being/friendship trouble and family problems. During high school, sexuality and contraceptives were reported to be the most important cause, followed by physical and psychological problems.[13]

2.2 The 1999 Reform

In the late 1990s, several areas of the Norwegian psychiatric sector had for a long time been strongly criticized. This resulted in a review of the sector and a Parliament's white paper, that revealed generally deficient and inadequate mental health care service levels, with large discrepancies in the availability and quality of services across municipalities (Sosial- og helsedepartementet, 1996). Hence, with the aim of providing better preventive care and improved treatment for mentally ill patients, as well as equalizing the service levels across municipalities, the Escalation Plan for Mental Health (*Opptrappingsplanen for psykisk helse* in Norwegian) was passed in Parliament in 1997 to be effective from 1999 (Helse- og omsorgsdepartementet, 1997). The overall goal of the reform was to reduce stigma, prevent mental health problems, and to promote independence and increase the ability to live meaningful lives among people with mental disorders.

The main focus areas were: 1) Informing the population about mental health problems and disorders as well as strengthening initiatives directed at users of mental health services. 2) Reorganization and strengthening of the health services for people with mental health problems, primarily through establishing new and reinforcing existing district psychiatric centres.

[12]Since 2010, surveys have been conducted with youth in most Norwegian municipalities. These surveys include questions about the utilization of the school health services (Froyland, 2017) and here we report information from the 2013 survey, that has covered the highest number of schools and municipalities.

[13]90% of the school nurses are women (own calculations from the Social Security records).

3) Programs to support labor market participation among people with mental health problems. 4) Strengthening of the municipalities' preventive health services, especially those for children and youth, and 5) Expansion of the psychiatric services for children and youth.

To support the escalation plan, subsidies were allocated to the municipalities based on objective criteria: the municipalities had to prepare concrete plans for the intended use, and report on actual use. These grants were given as an addition to, not as a replacement of, the municipalities' own funding.

One of the most important components of the reform were increased investments in the school health sector, with the explicit goal of increasing the availability of school nurses. The escalation plan period was initially set to 1999-2006, but after an evaluation in 2002, this period was extended throughout 2008. In 2002, the Government also decided on an increased attention and a more explicit commitment to children and youth, with emphasis on early detection of mental problems, preventive work, and referral to the appropriate treatment (Helsedepartementet, 2002; 2003). From thereon, at least 20 percent of the subsidies allocated under the escalation plan were earmarked to treatment and increased resources targeting children and adolescents, with an explicit goal of 800 new man-years (50% increase) in the school health and child health centers. This is reflected in the availability of school nurses: in 1990, the national average was 1.7 school nurses per 1000 children, in 1998 (the year before the reform was implemented) this number had increased slightly, to 2.1, and by the end of 2014, it was 2.9. In general, municipalities with lower pre-reform coverage of school nurses (measured as the number of nurses per 1,000 children aged 6-19 years) experienced a stronger growth from pre- to post-reform period. This is visible in Figure 1 that illustrates the relationship between pre-reform levels of school nurses and the growth from 1995-1997 (pre-reform period) to 1999-2008 (post-reform period). This targeting of low pre-reform coverage is also confirmed by Figure 2, that shows how the municipality coverage evolved before and after 1997 for municipality with high vs. low pre-reform coverage between 1990 and 2009. This figure presents estimates for βs from the following model

$$Cov_{mt} = \sum_{k=1990}^{1997} \beta_k^B L_m \mathbf{1}\left[t - T_m = k\right] + \sum_{k=1999}^{2009} \beta_k^A L_m \mathbf{1}\left[t - T_m = k\right] + \mu_m + \pi_t + \varepsilon_{mt} \quad (1)$$

where Cov_{mt} is the log of school nurses per 1,000 children 6-19 years old in year t and municipality m, L_m is an indicator variable equal to 1 if the coverage between 1995-1997 is below the median coverage, and 0 otherwise. μ_m and π_t are municipality and year fixed effects, respectively. Figure 2 shows no pre-1998 differences in the changes in the expansion of school nurses in low vs. high pre-reform coverage municipalities, while there is a larger increase for low pre-reform municipalities in post-1998; the jump is specially large in 2002. In the following analysis, we use the pre-reform levels to predict growth in school nurse availability across municipalities (see section 4).

2.3 Expected Effects of the Reform

School nurses may affect later-life outcomes through a range of possible channels.

Education Increased availability of health professionals for children/youth may improve educational attainment through their collaboration with the school and the teachers to improve children's learning environment, as well as through the direct services provided to students. For instance, one common problem in high school is the high absence rates among some students. School nurses will typically be involved in following up on these students, and assistance to cope with some of the problems motivating the absence.[14] High absence rates have potential detrimental impacts on academic achievement and school graduation rates (Goodman, 2014; Aucejo and Romano, 2016; Cattan et al., 2021). Additionally, if increased access to school nurses directly affects health (see discussion below), this may also affect the ability and willingness to learn, and in turn have positive effects on future educational outcomes (Grossman, 2015).

Teenage Childbirth Access to school nurses may reduce childbearing by teenagers in at least two ways. First, there is potentially a direct effect through guidance given in sexuality and contraception. School nurses provide free non-prescription contraceptives, and since 2002 they can prescribe hormonal contraceptives, which may reduce unwanted pregnancies (Buckles and Hungerman, 2018). Second, if improved access to school nurses affects dropout rates, there is likely also an additional effect on teenage childbearing through the so called lock-in effect; fertility postponement has been consistently associated with increased educational attainment among females (see e.g., Goldin and Katz, 2002; Bailey, 2006; Pantano, 2007; Guldi, 2008; Ananat and Hungerman, 2012), and staying longer in education has been shown to affect fertility decisions (see e.g., Black, Devereux and Salvanes, 2008; Marcotte, 2013). In the US, access to school based health centres in deprived areas reduced teenage childbearing (Lovenheim, Reback and Wedenoja, 2016).

Labor Market Attachment and Welfare Dependency To the extent that improved access to school nurses increases educational attainment, this may in turn impact a range of other outcomes. Dropping out of high school likely leads to reduced labor market attachment.[15] Dropping out of high school has further been linked to a number of poor later life outcomes, such as criminal behavior (Bjerk, 2012; Sweeten, Bushway and Paternoster, 2009; Lochner and Moretti, 2004), poor physical and mental health, as well as generally lower well-being (Liem, Lustig and Dillon, 2010; Chevalier and Feinstein, 2006; Oreopoulos, 2007; Oreopoulos and Salvanes, 2011).[16] Weak attachment to the labor market may lead to unemployment and welfare dependency. Additionally, dependence on welfare benefits may also be explained directly by

[14] Absence may have a number of possible explanations besides health problems; they can also be due to substance abuse, problems at home, etc.

[15] The link between education and income has been thoroughly assessed, see Card (1999) for a review, or e.g. Campolieti, Fang and Gunderson (2010); Oreopoulos (2007) for more recent studies.

[16] see Grossman (2005) for a review of the effects of education on non-market outcomes.

poor health, and if improved access to school nurses leads to improved health, this in turn can reduce welfare dependency in the longer run.

Health The reform can affect physical and mental health in various ways. First, the health of children and youth may be improved through the school nurses' increased capacity to detect and prevent health problems at an early stage. Early detection is especially important in treatment and prevention of mental health problems, which often start to develop before age 20 (Marmot and Wilkinson, 2005). Detection of health problems (both physical and mental) can happen at the universal medical examinations around school start, or when the students consult the school nurse at later school years. With increased availability of school nurses due to the reform the capacity to follow up on children and youth with identified needs and challenges through targeted health examinations increased. This can in turn can lead to improved health outcomes both in school age, but also later in life.

Second, improved availability of school nurses may also have indirect effects on health through provision of information, guidance, and promotion of healthy behavior related to e.g. diet, sufficient physical activity, and social relations.

Third, the open door policy of school nurses is an important feature of the school health system, especially at lower and upper secondary school levels (grades 8-13). How open the door is (and implicitly the impact of this service) depends on the workload of the nurses. Thus, increased availability of school nurses likely increases the capacity to offer counselling on socio-emotional and physical health issues, and on problems related to sexuality and contraception.

Finally, the national vaccination program is the responsibility of school nurses for school-age children. However, these services have always been the priority of the school health services, and hence we do not expect the reform to affect outcomes related to vaccination, such as infectious diseases, in our context.

Our measures of health rely on administrative records of health care use (see section 3), and the impact of improved availability of school nurses on the use of health services is a priori ambiguous. Literature discussing what makes a youth-friendly primary health care service often highlights the importance of low barriers for use, including availability, accessibility, acceptability, confidentiality, and privacy (Shaw, 2009; Tylee et al., 2007; Ford et al., 1997). This description fits well with the school health services in Norway, and increased availability of school nurses should make these services even more accessible and youth-friendly. Following this line of argumentation, we can expect the reform to increase the utilization of health services in the long run by raised awareness of the existing preventive health care, of the importance of healthy behaviors such as regular health check-ups, and by reduced stigma related to seeking medical treatment for substance dependency and mental health problems.

On the other hand, improved availability of school nurses may lead to less use of long term health care services through health improvements. In a context as the Norwegian, with universal and affordable health services, it is likely that a reduction in use of services reflects better health rather than changes in price. Hence, we study the impacts on health and preventive behavior by studying also the use of services due to specific health conditions to understand the extent to which the reform might change the health seeking behaviors and/or changes in the severity of medical conditions that lead individuals to seek care.

3 Data

The data for this paper is compiled from several Norwegian administrative records, including the national educational registers, tax records, family registers, and health registers. Our broadest sample uses all individuals attending school around of the time of the 1999-reform, more precisely, the cohorts of individuals born between 1971 and 1993.

3.1 Municipality-Level Data

Data from the Norwegian Social Science Data (NSD) provides annual information about the number of school nurse man-years in each municipality for the period 1990-2014. Information on population and other municipality-level characteristics are provided by the NSD and Statistics Norway.

3.2 Demographic and Socioeconomic Information

We gather individual level information from several administrative registers provided by Statistics Norway. These registers cover the entire resident population in Norway between 1967 and 2020, and include demographic information such as date of birth, gender, immigration status and municipality of residency in each year, and socioeconomic data, such as education and earnings. All registers include unique individual identifiers that allow to match individuals across administrative registers and to match each individual to their parents and other relatives.

Educational Attainment Information on educational attainment comes from administrative registers of the Norwegian school system. These data sets include information about the number of years and the level of completed education. Since 1970, for each individual we also observe each degree in which he/she is enrolled. We construct indicators of whether an individual has graduated high school by age 20 and for starting and completing higher education (two or four years college university degrees) by age 20 and 24, respectively.

Teenage Childbearing Teenage childbearing is defined as the probability of a girl giving birth before turning 20. This information is constructed from the demographic registers.

Labor Market Attachment and Welfare Dependency Labor market earnings information is obtained from the tax registers. Employment is defined as having earnings above the administratively set basic amount.[17] Information on welfare dependency comes from the social insur-

[17]The basic amount, denominated as G-level, is adjusted each quarter of the year, and are used to determine eligibility in the national social security system. In 2014 one G amounted to approximately $12,000.

ance database, which we use to construct an indicator of whether an individual received any welfare benefits each year. Welfare benefits include social assistance, unemployment benefits, work assessment allowance, and disability insurance.[18] All outcomes related to labor market attachment and welfare dependency are measured at both age 26 and 30.

3.3 Health Data

We rely on administrative health records in this paper. On the one the hand, these data allow us to study objective measures of health for the whole population in contrast to work relying on survey data, and hence our results are externally valid. On the other hand, these are measures of use of health services, not the health per se. Thus, while effects on the use of health services are important and of interest to policy makers at various levels, we should be cautious about the less straightforward interpretation of our results for health (we discuss this issue in section 6).

The Norwegian health services are publicly financed and universally accessible for all citizens. The services are organized in two levels: primary care and specialist care. Primary care services are the responsibility of the municipalities and GPs and local ERs are the bases of such services. Nearly all citizens belong to a specific GP's list, and each GP is responsible for providing primary health care services to patients in his/her list. The GPs diagnose their patients, certify sick leaves, assess DI applications, prescribe treatments and refer their patients to specialist care when needed. They also follow up on their patient after they have received care in the specialist system. In general, the GPs serve as gatekeepers to the specialist care system as well as health related welfare benefits. Specialist care is the responsibility of four health regions in Norway, and care is provided through public hospitals and outpatient care clinics, but it can also be provided by contracted private specialists. As a general rule, it is not possible for the patient to go directly to specialist care within the public health system, thus the first contact with specialist care only take place after a referral of a patient from his/her GP or ER services.

Primary Care We use administrative data from GP consultations and visits to the ER as measures of utilization of primary care services. GPs and ERs are obliged to report all services provided and actions taken during each consultation, including the main symptom or diagnosis, referrals and certification of sick leaves. The database containing such information is called Control and Payment of Health Refunds ("*KUHR - Kontroll og Utbetaling av Helserefusjoner*" in Norwegian) and is available between 2006 and 2020. We study impacts on all visits to GPs and ERs, and admissions due to specific medical conditions. The list of symptoms and diagnoses

[18]Social assistance is a temporary income given as a last resort when a person is considered unable to financially support himself/herself. Unemployment benefits are given to active job seekers. Individuals considered active job seekers must have earned at least 1,5G the last year, or 3G over the last three years. The work assessment allowance provides a partial income replacement in periods during which individuals are ill or injured and need assistance from the Norwegian Labor and Welfare Administration to return to work. The allowance is given for a maximum of 3 years. Finally, disability insurance is given when an individual's earnings capacity is permanently reduced due to illness or injury.

is specified in the International Classification of Primary Care (ICPC-02).[19]

Specialist Care Information on the use of specialist health care services is obtained from the Norwegian Patient Registry (NPR) and is available for the years 2008 to 2014. This registry contains information about all patients who are waiting for, or have received treatment in the specialist health service, and includes separate registers for different specialist areas. We use the registers that cover somatic specialist care, and the two registers that cover psychiatric care and the use of contracted private psychological therapists.

We study impacts on hospitalizations (inpatient admissions) and consultations at outpatient clinics. An inpatient admission includes both overnight stays and day treatments, such as less invasive surgical procedures. We also identify emergency admissions. We study also impacts on different medical conditions; to do so, we use the code range of each chapter in the 10th revision of the International Statistical Classification of Diseases and Related Health Problems (ICD10).

The psychiatric specialist care register provides information on all activity in mental health care at hospitals and contracted private institutions in the specialist health service. These visits can be related to psychiatric treatment or related to treatment for substance abuse/addiction.[20] The psychological therapy register covers all outpatient contact with private psychologists and psychiatrists that receive operating grants from regional health authorities.[21] Individuals in this register have been referred to a psychologist or psychiatrist either by his or her GP, or from the specialist care system.

Construction of Variables As reported in **Table A1** in the Appendix, the data on primary care is available for the period of 2006-2020 while the specialist care data is available for the period of 2008-2014. We are therefore not able to measure all outcomes at the exact same age for all individuals as there is no complete overlap between the pre- and post-cohorts. The oldest and the youngest cohorts included in the study turn 35 and 15 years old respectively in 2006, the first year of collection of the primary health care data (KHUR). In the last year of observation (2020) they are 49 and 27, respectively. Thus, to have a comparable sample across the different health outcomes and cohorts, we measure all outcomes between ages 25 and 35. For each type of health service, we construct 1) an indicator of whether an individual has used the service at all for every year available in the age interval 25 to 35 years old (extensive margin), and 2) a variable that measures the number of visits/consultations (intensive margin) each of these years. We then take the average for both of these measures. Our measures are thus the average yearly probability and number of visits for the years data is available for each person between 25 and 35 years old.

[19]See https://ehelse.no/kodeverk/icpc-2e--english-version.

[20]Note that in some municipalities the distinction between psychiatric treatment and treatment of substance abuse/addiction is hard to make as the two sectors are organized as one unit. In practice this means that some patients with substance addiction as their main diagnosis will be registered as users of psychiatric specialist care.

[21]The register does not contain data from private practising psychologists or psychiatrists that do not receive reimbursements from the regional health authorities.

While all cohorts will be observed at least once (the 1971 cohort) in KHUR, the time coverage of the NPR between 2008 and 2014 means that only cohorts born between 1973 and 1989 will be observed in our data.

4 Empirical Strategy

To identify the impact of improved access to school nurses we rely on the Escalation Plan for Mental Health, which generated geographical and temporal variation in changes in the availability of school nurses across the country. In particular, we combine the differential increase in the school nurse ratio across municipalities with the differential exposure to treatment across cohorts.[22]

Variation Across Municipalities In Table 1 we show how different pre-reform municipality characteristics correlate with the growth in the school nurse coverage in the post-reform period, controlling by county fixed effects. Growth is measured as the change in the number of school nurses per 1000 school-age children (ie, 6-19 years old) between 1999 and 2008, the first and last years of the Escalation Plan for Mental Health. Within each county, lower pre-reform coverage is the strongest predictor of growth: one less school nurse per 1,000 6-19 years old in the immediate pre-reform period (between 1995 and 1997; hereafter, this is referred to as *pre-reform coverage*) is associated with an increase of about 0.71 school nurses from the pre- to the post-reform period. This change represents an increase of 35 percent relative to the pre-reform mean of school nurses of 2 nurses per 1,000 6-19 year old (Figure 1 plots the correlation between the coverage between 1995-1997 and the change between the pre- and post- reform period). Table 1 also shows that within counties, municipalities with higher unrestricted municipality income,[23] less populated and/or rural experienced larger expansions in coverage. As noted in section 2, the 1999 Escalation Plan for Mental Health was broader than dedicating funds to increase the availability of school nurses. As a consequence, we use of the *pre-reform coverage* as a proxy for the growth in the school nurse ratio between 1999 and 2008.

Figure A2 in the Appendix shows a large variation in the pre-reform coverage of school nurses across Norwegian municipalities. In Table A2 in the Appendix we characterize municipalities with different levels of pre-reform coverage, estimating the correlation between municipality characteristics taken in 1997 and the pre-reform coverage. Municipalities with higher pre-reform coverage are less populated, have a smaller share of their population in school age (6-19 years old), they have higher unrestricted municipality income, and they have higher levels of supply of health services (as measured by the total employment in health care sector per 1,000 inhabitants, GPs per 1,000 inhabitants and school doctors per 1,000 children in school age). Additionally, characteristics related to low population density, such rurality are associated with higher pre-reform coverage. Interestingly, there is a negative correlation

[22] This strategy is similar to that used, e.g., by Duflo (2001) to estimate the effect of school construction on education, by Løken, Lundberg and Riise (2017) to estimate the effects of formal elder care expansion, and by Goodman-Bacon (2018) to estimate the effects of introducing Medicaid on infant and child mortality.

[23] Unrestricted municipality income is the set of municipality funds that are not tagged to pre-specified expenses.

between municipality (per capita) spending on education and the pre-reform school nurse coverage. Finally, differences in the early life health across municipalities as measured by the average birth weight and infant mortality rates are unrelated to the levels of pre-reform coverage. To account for the potential threats to internal validity driven by unobserved differences in municipalities, we include municipality fixed effects in our empirical specification.

Furthermore, Figure 1 in the Appendix reveals a visible drop in the coverage of some municipalities. These were the municipalities with high coverage at baseline and with less school age children (see Table A3 in the Appendix). Figure 1 and Figure A1 show how the Escalation Plan was implemented: the increase in availability of school nurses described in section 2 was accomplished through the combination of reassigning nurses from areas with reduced demand for them (Figure 1) and increased yearly supply of graduating specialized nurses just before the reform from around 400 before 1996 to 549 in 1996, 756 in 1997 and 574 in 1998 (panel (a) in Figure A1), while there a stable supply of regular nurses (panel (b) in Figure A1).

The increase in the school nurse coverage can be correlated with other simultaneous changes at the municipality level. In subsection 4.2 we examine this closer, and find no evidence of validity threats to our set up. We also show that the key identifying assumption of the absence of pre-existent differential trends in outcomes in municipalities with different levels of pre-reform coverage is likely to hold.

Variation Across Cohorts We also use cohort variation in exposure to the reform: Figure A3 illustrates the temporal variation of exposure to the reform across cohorts. Individuals aged 19 and older in 1998 were over school age in 1999, and too old to be exposed to the reform.[24] For individuals 18 years old or less in 1998, exposure to the reform is a decreasing function of age, with younger cohorts being exposed to more school years in the post-reform period. Individuals aged 5 and younger in 1998 were fully exposed, i.e. spent the entire school period in the treatment period.[25]

4.1 Main Specification

We estimate the effects of access to school nurses in a difference-in-differences framework that compares the outcomes for cohorts in school before and after the 1999-reform implementation (first difference) between higher- and lower-coverage municipalities (second difference). Our main specification is the model below:

$$Y_{imt} = \alpha + \left(I_m \times Post_i\right)\gamma + \mathbf{X}_i'\delta + \mu_m + \theta_t + \epsilon_{imt} \tag{2}$$

[24] In Norway, the on-time high school graduation age is 19. Of those who start high school, about 70% graduate at age 19. Thus, we cannot entirely rule out that some individuals in the cohorts aged 19 and older in 1998 were in school in the reform period.

[25] Individuals born in 1991 or after were exposed to a reform that reduced the school starting age from 7 to 6 years in 1997. These children spend 13 years in school and not 12 as for cohorts starting school prior to 1997. This 1997-reform took place nationwide and it does not affect our findings, because it is absorbed by the cohort fixed effects, while to identify the impacts of the 1999 Escalation Plan for Mental Health we rely on the differential exposure to treatment across both municipalities and cohorts.

where Y_{imt} is the outcome of interest for individual i residing in municipality m at age 5 and born in year t. I_m measures the intensity of treatment in municipality m. $Post_i$ indicates whether the individual is exposed to the reform, i.e. in school age at least one year in the post-reform period. $\mathbf{X}_i$ is a vector of individual controls, including the child's gender, mother's age at birth and education when the child is 5 years old, dummies indicating whether the mother and child are born in Norway, the number of siblings when the child was 5, the child's birth order, and whether there is information about the father. μ_m are fixed effects for the municipality of residence at age 5 which absorb all permanent differences across municipalities that may affect Y_{imt}. θ_t are cohort fixed effects that account for common cohort characteristics. Finally, ϵ_{imt} are idiosyncratic shocks. As the outcomes might be correlated within municipalities across cohorts, the standard errors are clustered at the level of the municipality of residence at age 5 (Bertrand, Duflo and Mullainathan, 2004).

We define I_m as the negative of the *pre-reform* number of school nurses per 1,000 6-19 year old. Thus, γ captures the average effect of having one *less* school nurse per 1,000 6-19 year old in the pre-reform period, which corresponds to a growth of about 0.71 additional school nurses (or a 35 percent increase in school nurses). Because we do not observe actual visits to school nurses, model (2) estimates the reduced form impact on all individuals in the cohorts affected by the reform, and γ is interpreted as an intention-to-treat (ITT) effect. In section 5, we discuss how to translate these intention-to-treat effects into average treatment effects on the treated.

Alternatively, we use a specification where we split the sample at the median in municipalities with high versus low baseline coverage rates

$$Y_{imt} = \alpha + \left(L_m \times Post_i\right)\kappa + \mathbf{X}_i'\delta + \mu_m + \theta_t + \epsilon_{imt}. \tag{3}$$

The variable L_m takes value one if individual i at age 5 lived in a municipality with a low coverage rate (hence with high expansion from pre- to post-reform period), and zero otherwise. Here, κ measures the differences in outcome Y_{imt} across individuals residing in low versus high coverage municipalities.

Importantly, cohorts not exposed to the reform provide a pre-trend test and it is possible to estimate an event-study model that allows for the estimation of the time path of the effects of exposure to the reform. To do so, we estimate a parsimonious model that allows for different impacts of exposure depending on the age in 1998. In particular, we estimate the following equation:

$$\begin{aligned} Y_{imt} = \alpha + I_m \times 1[21 \leq Age98_i \leq 27]\gamma_1 + I_m \times 1[16 \leq Age98_i \leq 18]\gamma_2 \\ + I_m \times 1[13 \leq Age98_i \leq 15]\gamma_3 + I_m \times 1[5 \leq Age98_i \leq 12]\gamma_4 + \mathbf{X}_i'\delta_1 + \mu_m + \theta_t + \epsilon_{imt}. \end{aligned} \tag{4}$$

In the model above, ages 19 and 20 are the excluded category, which correspond to the cohorts just too old to be exposed to the reform. The age groups are defined to correspond to the age in 1998 and to enrolment in high school (16 to 18), middle school (13 to 15) and exposure since primary school (6 to 12). Individuals between 21 and 27 would be too old to be exposed to the reform, hence, we expect γ_1 to be indistinguishable from zero.

In the main specification we exclude municipalities with less than 1,500 inhabitants in 1997, restricting our main analyses to 374 of the 428 municipalities. We do so because municipalities with few inhabitants are typically located in remote areas and are distinct from the majority of municipalities with respect to the organization of local services, and changes in the population composition and its needs.

Finally, because we study impacts on a large number of outcomes simultaneously, we correct inference for multiple hypothesis testing. For each outcome in the main tables we include the p-value obtained using the stepwise procedure described in algorithms 4.1 and 4.2 of Romano and Wolf (2005). Variables measuring conceptually similar outcomes are grouped together. In practice, this means that for each table in section 5, the outcomes are tested simultaneously.

4.2 Potential Threats to Identification

Pre-Reform Trends The validity of our empirical strategy relies on the assumption that municipalities with different levels of pre-reform coverage have similar underlying trends in health, educational and labor outcomes. We assess the potential threat to identification graphically in Figure 3 to Figure 5. As an intuitive approach to look at differential trends in the pre-reform period, we divide municipalities into two groups according to whether they fall above or below the median pre-reform coverage. For each group of municipalities, we plot the cohort level averages for the outcomes studied. The vertical line in the figure marks the *first cohort* fully affected by the Plan (1980). The graphs in the three figures reveal parallel trends for high and low coverage municipalities up to the 1980 cohort. In the bottom left corner of each figure, we include the estimates of coefficient δ_2 in the following model estimated for the cohorts 1971 to 1977:

$$y_m = \delta_1 + \delta_2 I_m \times t + \delta_3 t + \mu_m + \theta_t + \varepsilon_m \tag{5}$$

where I_m is the (negative of the) pre-reform coverage between 1995 and 1997 and t is a linear cohort trend, μ_m represents municipality of residence at age five fixed effects and θ_t are the cohort effects. There is no evidence of a correlation between pre-reform trends in outcomes studied and the pre-reform coverage.[26]

We supplement this investigation by also studying the pre-reform trends for a number of municipality characteristics over time related to school resources (Figure A4), municipality health services and health outcomes (Figure A5). These characteristics are measured around the time of the reform rather than by cohort of birth, hence the vertical line in the figure marks the *year* the Plan was implemented. All three figures (for the eleven different municipality characteristics) reveal parallel trends for high and low coverage municipalities up to 1998. In the bottom left corner of each figure, we also include the estimates of coefficient δ_2 in a modified version of model (12) estimated for the period 1990 to 1997, and where t refers to

[26] We exclude children born in 1978 and 1979 as they could potentially have been exposed to the reform if they took the four year vocational high school track or if they delayed school completion.

years rather than cohorts. The estimates show no evidence of correlation between pre-reform trends in municipality educational resources, health or early life health (measured by birth weight and infant mortality rate) or age-adjusted elderly mortality (measured as mortality post age 75) and the pre-reform coverage.

In sum, the evidence above suggests no pre-existing trends in both the outcomes studied, education and health services and health for municipalities with different levels of pre-reform coverage.

Other Changes Predicted by Pre-Reform Coverage A particular concern in our context is that the broad nature of the Escalation Plan for Mental Health might imply that the pre-reform school nurse coverage also predicts changes over time in other municipality characteristics, which, in turn, could be related to changes in the outcomes studied. If this is the case, our estimates could be partially driven by other aspects of the reform, and not by the increase in the coverage of school nurses. We assess this potential threat in Figure A6 and Figure A7 in the Appendix. In these figures, we plot the relation between the change from the pre- to the post-reform period for each variable and the baseline number of school nurses per 1,000 6-19 years old. Figure A6 shows a larger increase in the number of school doctors and psychologists in municipalities with lower pre-reform coverage; however, the coefficients in the bottom of the graphs show that the increase was much smaller than the increase of school nurses, and the provision of school doctors and psychologists in 1997, just before the reform, was negligible compared to that of the school nurses (on average, school doctors and psychologists, respectively, 0.299 and 0.0035 per 1,000 6-19 years old). There seems to be a larger increase in demand (more pupils in compulsory education) for municipalities with high pre-reform coverage, but not in terms of high school students. If anything, this increase in number of pupil in compulsory school attenuates the impacts of the reform. Finally, Figure A7 shows no relation between pre-reform coverage and changes in the number of GPS per 1000 inhabitants, nor in the provision of early life health services or elderly mortality.

5 Results

5.1 Main Results

We now turn to the main results estimated using model (2). Our baseline specification includes individual controls, as well as municipality and cohort fixed effects. All estimates are interpreted as the effect of living in a municipality that had one fewer nurse per 1,000 children/youth before the reform, which is related to an increase of 0.71 school nurses, or a 35% increase from the pre-reform to the post-reform period.

5.1.1 Teenage Childbirth and Educational Attainment

Column (1) of Table 2 reports the effect on teenage childbirth (for girls only); 5.9 percent of the female sample has had a child before turning 20. The estimates show that one fewer school nurse per 1,000 school-age children at baseline reduces the likelihood of teen childbirth by 0.6 percentage points (12 percent). In the Appendix, we estimate the impacts on the probability of the first child being born at any age between 18 and 38 years old. Figure A8 shows significant reductions in the probability of having the first child before turning 28. Some of the cohorts in our sample have not aged enough to allow the study of the impacts on completed fertility. By 2020 (the last year in our sample), all women in the sample had reached the age of 27 as the youngest woman in our sample was born in 1993.[27] In sum, the reform delayed childbirth which is also reflected in a drop in fertility (measured by the total number of children) for women up the age of 35 (see Table A4).

Columns (2) to (4) of Table 2 show that increased availability of school nurses had on average no impacts on educational attainment, measured by the high school graduation by age 20, starting college by age 20 or on the probability of graduating with a higher education degree by age 24.

Finally, the p-values obtained when using the procedure in Romano and Wolf (2005) to correct for multiple hypotheses testing in Table 2 show that the impact on teen childbirth is still significant at a 5% level.

5.1.2 Labor Market Attachment and Welfare Dependency

Table 3 presents the impact on labor market outcomes and welfare dependency. Panels A and B show the impacts at ages 26 and 30, respectively.[28] Column (1) shows an increase in the probability of ever been employed by ages 26 and 30 of 0.5 and 0.3 percentage points respectively. Among the control cohorts, about 93 and 97 percent of the individuals had been employed by ages 26 and 30, hence, the estimated impacts are of 0.5 and 0.3 percent, respectively. Beyond increasing the employment likelihood, column (2) shows that the reform also increased labor income by 5.7% and 4.8% by ages 26 and 30, respectively. Finally, column (3) shows a reduction in the probability of ever used welfare benefits of about 2 percentage points by ages 26 and 30 (about 3 percent of the control mean).

All the estimates are significant at a 5% level also after correcting for multiple hypotheses testing (see the adjusted p-values in Table 3).

5.1.3 Health Outcomes

We now turn assess the impacts on use of primary and specialist health care services. We have two main outcome variables: the likelihood of at least one consultation with primary or specialist per year and on the annual average number of consultations between ages 25 and 35.

Table 4 includes the impacts on the utilization of primary health care services, i.e. GP consultations and ER visits. One less school nurse per 1,000 school-age children increases the

[27] The sample size to estimate Figure A8 ranges between 611,789 (between first births at 27 years old or younger) and 315,950 (by age 38).

[28] When measuring outcomes at age 30 we exclude all cohorts that had not yet turned 30 by the end of our data period, reducing the sample size and restricting the analysis to individuals exposed to the reform only during middle and high schools (the oldest individual in this sample was born in 1990; see Figure A3 in the Appendix).

likelihood of at least one GP consultation of 1.2 percentage points (1.6 percent increase from a mean of 0.71; column 1), and it increases the mean annual number of visits by .24 (5.4 percent increase relative to a mean of 4.41 annual visits; column 2). The impacts are similar when excluding pregnancy related consultations (columns 3 and 4). All the estimates survive adjustment for multiple hypothesis testing. Finally, the increase on use of primary care is driven by planned visits as we find no impact on the utilization of the primary care ERs (column 5).

In Table 5 we turn to the utilization of specialist care. We exclude pregnancy related admissions and analyze them separately (see section 6). Columns (1) and (2) show an increase in both inpatient and outpatient visits in response to the reform and the estimates survive adjustment for multiple hypothesis testing. There are no impacts on acute admissions (column 3).

In sum, these findings suggests that the impact on the use of both primary health services and specialist care is driven by planned, elective demand. Whether this increase in the use of services refers to changes in health status or individuals' health related behavior is still an open question. In section 6 we examine closer some of the possible mechanisms that can explain these findings.

5.2 Robustness

5.2.1 Sensitivity Analyses

We now subject our findings to a battery of robustness checks. In Table A5 in the Appendix we restrict our sample to children 12 to 24 years old in 1998, i.e., we focus on six treatment and control cohorts. Our results remain largely unchanged, with the exception of the likelihood of working and (log) earnings by age 30, when the impacts are no longer significant.

In Table A6 in the Appendix we show that the estimates are also unchanged using a discrete treatment indicator as in model (3).

We assess the sensitivity of the estimates to different specifications in Table A7 - Table A9 in the Appendix. In these tables, column (1) shows our baseline specification for comparison. First in column (2), we re-estimate model (2) clustering the standard errors by cohort and municipality of residence at age 5. Then, in column (3) we drop individuals residing in rural municipalities at age 5, in column (4) we drop those residing in the five largest Norwegian cities (Oslo, Bergen, Trondheim, Stavanger and Kristiansand) at age 5, and in column (5) we include also the smallest municipalities. Except for the improvement on the probability of graduating from high school at age 20, college enrollment by 20 and college degree at 24 when dropping the five largest cities (col. 4, Table A7), the estimates in columns (2)-(4) in Table A7 - Table A9 are similar to our baseline estimates.

In columns (6) of Table A7 - Table A9 we use the fact that we are able to measure the outcomes for cohorts unexposed to the reform to include municipality-level pre-reform linear trends in these variables and account for omitted trends in outcomes that might be correlated with the expansion of school nurses coverage.[29]

[29]We estimate municipality-specific time trends for each outcome using data up to the reform year (1999), and

In column (7) we expand equation (2) to include linear trends in baseline characteristics of the municipalities. More specifically, we include trends for the following characteristics measured in 1997: (log of) population and individuals 6-19 years old, unrestricted municipality budget, school (per student) expenditure and number of doctors per 1,000 inhabitants. The fact that our estimates are virtually unchanged across the various columns of Table A7 - Table A9 provides reassuring evidence that our findings are driven by the exposure to increased availability of school nurses and not by local shocks or underlying trends.

Finally, we conduct a randomization inference test for the significant estimates, in the spirit of a placebo test. To do so, we randomly assign the baseline coverage for each municipality using 1,000 permutations (Duflo, Glennerster and Kremer, 2006). In accordance with MacKinnon and Webb (2019), we present randomization inference results based on t-statistics, as this is superior to inference based on coefficients. Figure A9 in the Appendix plots the distributions of the placebo treatment effect: the actual t-statistics for γ in equation (2) are represented by the solid vertical lines, while the dashed lines represent the 5th and 95th percentiles of the distribution of the placebo treatment effects. The distributions of the placebo treatment effects look smooth and the solid lines are always outside of the confidence interval, allowing us to reject the null hypothesis of no effect.

Event Study Estimates In Figure 7 we present estimates for model (4), where we use the cohorts not exposed to the reform to provide a pre-trend test and estimate a parsimonious event-study model that allows for the estimation of the time path of the effects of exposure to the reform. The five panels on the figure show that γ_1 in model (4) is indistinguishable from zero and, hence, no impacts for unexposed cohorts. The figure further supports our findings but also shows the time-path of the effects. In particular, it shows that the impacts on teen childbirth in Panel (a) of Table 2 are detected for those exposed to the reform just during high school (ages 16 to 18) and similar to those who were first exposed in middle school (13 to 15 years old) or since primary school (6 to 12 years old). The impacts on the use of primary care (Panel b), likelihood of working (Panel c) and welfare use by age 26 (Panel e) are detected for those exposed to the reform since middle school and primary school. There are, however, no impacts on log income (Panel d). This suggests two possible explanations. First, teen childbirth is easily affected by interventions during late adolescence, while for labor market outcomes and health investments in the early years are particularly important (Cunha, Heckman and Schennach, 2010). Second, the services provided by the nurses at different ages vary, and it is possible some of the services provided at an early stage, e.g. early detection and prevention, are especially important for long term health and labor market, but not so much for teen childbirth.

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obtain the slope estimate λ_{ms} for each municipality. We then extrapolate the pre-expansion time trends to the post-reform period and estimate the following version of model (2) (see also Bhuller et al. (2013)):

$$Y_{imy} = \alpha + \left(I_m \times R_i\right)\gamma + \mathbf{X}_i'\delta + \mu_m + \theta_y + \delta\widehat{\lambda_m}t + \epsilon_{imy}.$$

Heterogeneity in treatment effects de Chaisemartin and D'Haultfœuille (2020) emphasizes that heterogeneous treatment effects in a difference-in-difference design as equation (2) can generate negative weights for some groups. This possibility presents a potential threat to our identification strategy because such models produce average treatment effects from a weighted sum of the treatment effect for each group and time period and, in the presence of heterogeneous treatment effects, there can exist negative weights. Reassuringly, in Appendix Table A10 we find very few negative weights going into the average treatment effect and similar results using the alternative estimator proposed in de Chaisemartin and D'Haultfœuille (2020).

5.3 From Intention-To-Treat Effects to Average Treatment Effects on the Treated

The ITT estimates we have shown so far average the effect of school nurses over all individuals aged 6 to 19 years old in a municipality, regardless of whether they use the services or not. Given the lack of data on take-up of the services, we use two approaches to approximate the average treatment effect on the "treated" (ATET), i.e., those who, as a consequence of increased of availability of school nurses, obtained direct or indirect benefits they would not have obtained otherwise.

In the first approach we rely on a survey conducted in 2013, covering youth in most Norwegian municipalities. As mentioned in section 2 this survey found that about 23% and 25% of the students in junior high and high school, respectively, had visited the school nurse at least once during the previous year. Among high school girls, the same survey reports a usage rate of 35%. Using these numbers as approximations for take-up rates, we find an ATET of 1.7% for teenage childbirth.

The second approach builds on the same survey, but adds our finding from Table 1, namely that one fewer nurse per 1,000 children/youth before the reform is associated with an increase of 0.71 school nurses. Combining this with the usage rates from the 2013 youth survey, yields an ATET for teenage childbirth of 2.4%. In practice, we can think of these two sets of estimates as lower (1.7%) and upper (2.4%) bounds for the ATET.

6 Mechanisms

From the analyses presented in section 5, we conclude that increased availability of school nurses led to a reduction in the prevalence of teenage childbirth, an increased attachment to the labor market and reduced welfare use by ages 26 and 30. We also found increased elective use of primary and specialist health care services between 25 and 35 years old, but no changes in the use of acute services. We now turn to an investigation of possible mechanisms that can explain these findings.

In accordance to subsection 2.3, we put forward three possible mechanisms. First, the observed increase in the use of health care services can be driven by a change in health related behaviors. More exposure to school nurses can decrease the barriers to use health services, and it may have raised awareness towards the need of medical check-ups. Second, early detection of problems may have improved the health of the children, which in turn can have effects on completed education, labor market outcomes and fertility. Third, the impacts on fertility can be driven directly by better contraceptive advice and access to contraception, and indirectly via improved education. The observed impacts can also be driven by a combination of these mechanisms.

To assess which of these proposed mechanisms are likely to explain our results, we will study the heterogeneity of impacts across individuals and local characteristics, and which diagnoses are related to the use of health services.

6.1 Heterogeneity by Gender, Family Background and Local Characteristics

Our setting provides an example of a universal program where school health services and school nurses are free of charge and at disposition to all students in the school. Nevertheless, subgroups may be affected differently by the expansion. When estimating the average effect on the entire group affected by the reform, differences in the response across subgroups may be concealed. To capture potential heterogeneity in impacts, we interact the treatment with indicators of the child's gender, of whether the mother is single, maternal education, and of whether the child lived in a rural municipality at age 5.[30] While this analysis is useful to discuss possible mechanisms driving our results, some caution should be taken especially for the three first subgroups. This is because we do not have information on the utilization of school health services: hence, we cannot separate program effects from effects of take-up, i.e. we do not know whether the estimated heterogeneous impacts are due to differences in utilization across subgroups or whether they reflect heterogeneous impacts of the increased availability.

The results from this exercise are reported in Table 6-Table 8. In all the heterogeneity tables we include the p-value for the null hypothesis that the two groups have the same coefficient "p-value (I=II)". Using gender as an example, we test $H_0 : \beta_{boy} = \beta_{girl}$ vs. $H_A : \beta_{boy} \neq \beta_{girl}$.

Education and Teenage Childbirth The estimates in column (1) in Table 6 suggest that the reduction in teen childbirth is driven by less advantaged families: the estimates for daughters of single moms are larger than those for married moms (Panel B) and also larger for daughters of low educated moms than for those of high educated (Panel C). However, we are not able to reject the null hypothesis that the coefficients are the same. Finally, the impacts are driven for girls growing up in urban areas (Panel D).

Panel A of Table 6 shows an increase in the likelihood of college enrollment by age 20 among girls, but not for boys (column 3). This suggests that improvements in educational achievement for girls are related to the reduction in teenage childbirth (see also e.g., Goldin and Katz, 2002; Bailey, 2006; Pantano, 2007; Guldi, 2008; Ananat and Hungerman, 2012). The p-value in the bottom line of Panel A shows that the impacts on college enrollment by age 20 and the likelihood of having a college degree by 24 are statistically different between boys and girls (columns 3 and 4).

The impacts on higher education are furthermore driven by children of single mothers (column 3 - Panel B of Table 6) and by those growing up in rural areas (columns 3 and 4 - Panel

[30] Maternal education and the marital status are both measured when the child is 5 years old.

D). However, we do not reject the null hypothesis of equal coefficients between the subgroups.

Labor Market and Welfare Dependency In general, Panel A of Table 7 suggests that the impacts on labor market participation and income at ages 26 and 30 are driven by girls, but we can only reject the null of similar impacts for boys and girls for the likelihood having received welfare benefits by age 26 (column 3).

Panel B suggests no heterogeneous impacts by family structure, with just indications that log earnings increase more for those in two-parents families. For those whose mother had more education than a high school degree, the impact seems to be larger (Panel C), but we only reject the null hypothesis of equal coefficients for receiving welfare benefits. Finally, the impacts on labor market outcomes are driven by those in urban areas (Panel D).

Use of Health Services Table 8 presents heterogeneity on the impacts on the use of health services. Columns (1) to (3) of Table 8 show that the effects on primary care and specialist care are driven by women (Panel A). We note that these measures do not include obstetric or fertility related health care visit, hence larger impacts among girls may reflect the fact that higher usage rate of school health services among girls might be reflected into higher use of health services during early adulthood.

While the increase in visits is larger for those growing up in two-parents families, it is not possible to reject the null of similar impacts for one- and two-parents families (Panel B). The impacts are larger for those with less educated mothers (Panel C); finally, while the increase in use of primary health care services is driven by those in rural areas, the increase in specialist care is driven by those in urban municipalities (Panel D), perhaps reflecting supply side factors and that hospitals are located in urban areas.

As previously mentioned, there is no systematic collection of data on the individual use of school health services, nor on potential differences in use across subgroups defined by individual level characteristics (i.e., gender, family type or maternal education). Therefore, the estimated heterogeneity must be interpreted with caution, as they can reflect both differences in the utilization and in the impacts.

6.2 Changes in health and/or behaviors? Diagnoses related to GP Visits and Use of Specialist Care

To understand the extent to which the increase in the use of primary and specialist health care services due to 1999 Escalation Plan is driven by changes in the health related behaviors and/or changes in the underlying health status of individuals, we study the impact the impacts of the reform on specific diagnoses and medical conditions.

Table A11 includes estimates for γ in model (2) for the main categories of health conditions and treatments specified in the ICPC-2 list, i.e. those related to GP visits. The impact on GP visits is driven by conditions associated with (i) general/unspecified conditions (column 1), which include conditions such as chills, fever, felling ill, weakness or general tiredness or allergic reactions; (ii) a small increase in digestive conditions which mainly include complains of abdominal pain or cramps (column 3); (iii) musculoskeletal conditions (column 7), including back or muscle pain; (iv) respiratory conditions (column 10) such as breathing problems, cough, influenza or pneumonia; (v) endocrine conditions (column 12) as weight gain/loss, excessive appetite; and (vi) conditions related to pregnancy, childbearing and family planning (column 14).

Although there is an increase in the use of GP services on the extensive and intensive margin, we find no impacts on ER visits in Table 4. In conjunction, these findings suggest a long term behavioral change towards raised awareness of health and preventive measures such as following up of symptoms of health problems.

In Table A12 we include estimates for γ in model (2) for the main categories of health conditions and treatments related to the use of specialist care; they are classified in the ICD-10 list. GPs are the gateway to health services in the Norwegian system: to access specialist care the patient first has to visit his/her GP which refers the patient when needed (see also section 3). This is reflected in the increases in specialist care, which are driven by the same medical conditions related to the increase in GP visits. There is a small increase in admissions due to endocrine diseases (column 3), diseases of the respiratory system (column 7), the digestive system (column 8), diseases of the skin and subcutaneous tissue (column 9), diseases of the genitourinary system (column 11),[31] and obstetric related admissions (column 12). Finally, column 15 shows an increase in conditions coded as ICD10 R or Z; these are the most prevalent reasons for the use of specialist care, and represent medical examinations and screenings. In particular, within this set of conditions, codes Z30-–Z39, defined as "persons encountering health services in circumstances related to reproduction" represent 40% of the admissions. Most of them are related to pre-natal services (Z34 "supervision of normal pregnancy", Z35 "supervision of high-risk pregnancy" and Z36 "antenatal screening"). Codes Z00-–Z13 "persons encountering health services for examination and investigation" represent 26% of all Z-type conditions. Therefore, there is generally, a correspondence between the changes in the conditions where we identify an increase in the use of GP and specialist care, that is expected given the role in referrals played by GPs.

To corroborate the hypothesis that the health of individuals did not change in relation to the reform, we show in the Appendix in Table A13 that there are no impacts on overall mortality between ages 25 and 35 (column 1), nor on deaths due to suicide (column 2), drug use (column 3), other risky behaviors as accidents, alcohol abuse or accidental poisoning (column 4) or mental health conditions (column 5). More importantly, column 6 shows no effects on the

[31] Although in Table A11 we do not seem to find an impact on genitourinary related conditions, we find an impacts on conditions related to pregnancy, childbearing and family planning. Some of the most prevalent diagnoses between ages 25 and 25 for diseases of the genitourinary system are associated to the female reproductive system such as endometriosis (N80), noninflammatory disorders of ovary, fallopian tube and board ligament (N83), dysplasia of cervix uteri (N87) and female infertility (N97). These are also supported by estimates presented in Table A14 that shows the impacts on any pregnancy, childbearing and family planning. We estimate model (2) using genitourinary system as dependent variable allowing the impacts to vary by gender, indeed the impacts are mostly driven by females: $\hat{\gamma}$ is 0.004 (s.e. 0.001) for females and 0.002 (s.e. 0.001) for males.

mean Charlson Comorbidity Index in case of hospital admission, suggesting no changes in the health status of individuals admitted to hospital.[32]

Turning to pregnancy and fertility related visits to the GP, Table A14 shows that there is no impact on visits related to contraceptives (columns 3 and 4), but in those related to pregnancies, both normal and high risk pregnancies, (columns 5 and 6), and to other fertility and family planning related issues (such as questions about pregnancy, infertility, post-partum bleeding, post-partum symptom/complaint, breast/lactation symptom/complaint, and concerns related to body image in pregnancy). Thus, there were no impact on advice seeking on contraception, but rather on about pre- and postnatal maternal services for women aged 25-35. Furthermore, this increase in use of medical services related to prenatal care and related to (in)fertility was translated into a reduction in the likelihood of miscarriages before week 12 (column 1 of Table A15) and to an improvement in the health of newborn babies among new mothers as shown by an increase in the probability that newborns have a 1- and 5-minutes APGAR score of 10 (columns 7 and 8 of Table A15).

Lastly, the 1999-reform had a special focus on mental health (see section 2). In Table A16 in the Appendix, we study the impact on psychological, psychiatric care and sick leave. Column (1) shows no impacts on GP visits associated with psychologic symptoms or diagnoses, which are defined by codes starting with letter P in the ICPC-2 list. There are also no impacts when we separate by specific conditions. In particular, we use the ICPC-2 codes to classify the different types of mental health problems, and create three categories: anxiety or depression symptoms and diseases, substance use, and other psychological symptoms or disorders (columns 2-5).[33] However, column (6) shows an increase in the prescription of sick leaves.

All in all, despite the reform aimed to tackle mental health problems, most of its impacts are not directly related to mental health problems but rather to general well-being (as measured by labor market attachment and reduced welfare dependency) and health care use.

7 Discussion and Conclusion

While there is a large literature on the effectiveness of early interventions, much less is known about the interventions in the next phase of a child's life, i.e. among school-age children. Hence, governments may ask whether low cost interventions taking place at school have long lasting impacts on the life of children. In this paper, we aim to answer this question focusing on the Norwegian school health program, which is predominantly run by nurses with an additional specialization in child and youth health, and social work. Exogenous variation in the access to school health care comes from a reform that expanded and improved services

[32]The Charlson Comorbidity Index is a method of categorizing comorbidities of patients based on the International Classification of Diseases (ICD) diagnosis codes found in administrative data, such as hospital data. Each comorbidity category has an associated weight (from 1 to 6), based on the adjusted risk of mortality or resource use, and the sum of all the weights results in a single comorbidity score for a patient. A score of zero indicates that no comorbidities were found. The higher the score, the more likely the predicted outcome will result in mortality or higher resource use.

[33]We bundle anxiety and depression together given the possibility of co-diagnoses and common treatments for both conditions (see, e.g., Pratt, Brody and Gu (2017)).

for mental health illnesses. This reform was implemented between 1999 and 2008, and it increases in 35 percent the number of school nurses available for each 1,000 school-age children. Thus, we can estimate effects of the access to the program using a differences-in-differences approach. In particular, we compare the outcomes at ages 20-35 of children who were 6-18 years old before and after the reform, from municipalities exposed to a large expansion in the availability of nurses relative to municipalities that had little or no changes in the availability of nurses.

We find that increased availability of school nurses had positive effects on educational attainment of girls. We further find a substantial decrease in the likelihood of teenage childbearing. Given that fertility did not increase at later ages, this points to reduced total fertility. We further find evidence of a stronger labor market attachment and reduced welfare dependency.

With respect to health, increased availability of school nurses led to increased use of primary and specialist outpatient services. The increased use of health services is planned, and not driven by sudden changes in health status, as we do not find any changes in admissions to the primary care ERs or the emergency wards at hospitals. We conjecture that the improved availability of school nurses could have affected the utilization of health services in four ways: (i) early detection and treatment of health problems, (ii) increased awareness of services available, (iii) increased awareness of the importance of and practice of healthy behavior, including the need for necessary health check-ups, and (iv) lowered barriers to consult health professionals through making youth more accustomed to using health services. The increase in GP visits and mostly due to conditions related to pregnancies, respiratory infections and medical examinations, provides suggestive evidence that the increased use of health services is driven by behavioral changes. Even though we do not observe strong evidence of a change in the underlying health, it is worth noting that the sample we study is still very young, the oldest individuals are 35 years old, and sustained healthier behavior may improve health in the longer run.

The impacts identified are interpreted as the effect of living in a municipality that had one fewer school nurse per 1,000 children before the reform, which led to an increase of about 0.7 school nurses per 1,000 children from pre to post-reform period. To put the costs of this policy into perspective, in 2014, the cost of hiring a full-time equivalent school nurse was approximately 550,000 NOK per year (Sykepleien, 2014). Hence, hiring one additional nurse per 1,000 children implies a yearly cost of 550 NOK per child. This is a small investment compared to, for instance, the average yearly expenditures per child attending compulsory schooling, which amounts to 112,200 NOK (Utdanningsdirektoratet, 2018).

To our knowledge, we are the first to study the causal effects of universal access to school nurses in childhood and adolescence on later life outcomes. Thus, it is not straightforward to discuss our results in light of available literature. It is nevertheless interesting to compare our results to previous studies assessing the effects of other policy interventions on similar outcomes, especially considering the low costs related to increasing the availability of school nurses. Therefore, we compare our findings to those from a number of policies targeting the first years of life; in Norway, there have been numerous studies on the impacts of such policies.

Qualitatively, the improvements in education and employment are similar to those found for the introduction of paid maternity leave, expansion of childcare and of increasing compulsory education in Norway. In particular, for part of the cohorts used in this paper, Carneiro, Løken and Salvanes (2015) find that the introduction of paid maternity leave in 1977 (going from 12 weeks of unpaid leave to 4 months of paid leave *plus* 12 months of unpaid leave) reduced the probability of high school dropout and increased wages at age 30 by 5%. Further expansions of the paid maternity leave period over the years 1987 to 1992, had no impacts on children's academic achievement or on high school graduation (Dahl et al., 2016). Also for children born in the 1970s, Mogstad and Havnes (2011) study a large-scale expansion of subsidized child care, and find that it improved educational attainment, labor market participation and that it reduced welfare dependency. Again, the impacts on education were mostly driven by children with low-educated mothers, whereas the effect on labor market attachment was found to be driven by girls (Mogstad and Havnes, 2015). Expanding the mandatory years of schooling has improved educational achievement (Hægeland, Raaum and Salvanes, 2012), and reduced teen pregnancies (Black, Devereux and Salvanes, 2008).[34]

The literature on health effects of public investments in children and youth is sparser, most likely due to data availability, and the majority of recent work comes from Sweden. Siflinger and van den Berg (2020) find that expanding day care availability decreases the prevalence of infectious diseases and reduces in behavioral disorders and mental health problems by ages 6-7. Meghir, Palme and Simeonova (2018) find no effects on mortality, hospitalizations or consumption of prescribed drugs from expanding compulsory education in Sweden.

Our findings have implications for the discussion of policies that target children and youth. We show that universal health services delivered in the school context, making them easily accessible to children and adolescents, can have significant lasting impacts on educational attainment, family formation, employment, and on the use of health services later in life. This suggests that in developed countries there is scope for governments to use the school as a ground to deliver effective low-cost health-services.

[34]Hægeland, Raaum and Salvanes (2012) find that increased school expenditures positively affect educational achievement. Their findings show that a NOK 10,000 (US$ 1,500) increase in the annual school expenditures per child raised the exam results by .2, which translates to every fifth pupil having his or her exam mark raised by one level on a 1 to 6 scale. Expanding compulsory schooling by two years during the 1960s in Norway reduced the probability of becoming a teen mother by about 3.5% (Black, Devereux and Salvanes, 2008).

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8 Tables and Figures

Table 1: Post-reform growth in school nurse coverage

	(1)
School nurse coverage	
(school nurse per 1,000 6-19 year old)	-0.708464***
	(0.098643)
Population ages 6-19 years old	-3.642108
	(2.283213)
Disposable municipality budget 1997	0.291271**
	(0.132336)
Total Population	-0.000004**
	(0.000002)
Rural municipality	0.325504**
	(0.100760)
Observations	373

Note: The dependent variable is the change in school nurse coverage from pre- to post-reform period. The pre-reform period is defined as 1995-1997, while the post-reform period is between 1999 and 2008. The regression includes county fixed effects (there were 19 counties in Norway during the period studied). Municipalities with less than 1,500 inhabitants in 1997 are excluded. There is no information for disposable municipality budget for 1997 for one municipality. Robust standard errors in parentheses. * p<0.1, ** p<0.05, *** p<0.01

Table 2: Educational Attainment and Teenage Childbirth

	(1) Teen Childbirth	(2) High School at 20	(3) Ever College at 20	(4) College Degree at 24
ITT	-0.006***	0.002	0.007	0.005
	(0.002)	(0.010)	(0.005)	(0.008)
Control Mean	.049	.611	.288	.289
Romano-Wolf p-value	0.012	0.814	0.407	0.810
N	611789	1244716	1244716	1244716

Note: High school includes both vocational and general training. For higher education, graduation is defined as completing a university or university college degree. The effect on teenage childbearing is estimated for girls only. Controls included in the regressions, but excluded from table, are: child's gender, mother's age at birth and education when child is 5 years old, dummies indicating whether mother and child are born in Norway, the number of siblings when child was 5, child's birth order, and whether there is information on the father. All regressions include municipality of residence at age 5 and year of birth fixed effects. The means of the outcomes are measured for children that were 19 or older in 1998. Municipalities with less than 1,500 inhabitants in 1997 are excluded. Robust standard errors, clustered at the level of municipality of residence when child was 5 years old, in parentheses. * p<0.1, ** p<0.05, *** p<0.01

Table 3: Labor Market and Use of Welfare

	(1) Ever Worked	(2) Log Earnings	(3) Ever in Welfare
		Panel A: At age 26	
ITT	0.005***	0.058**	-0.018**
	(0.002)	(0.024)	(0.009)
Control Mean	.939	11.3	.523
Romano-Wolf p-value	0.018	0.038	0.044
N	1160976	1160976	1160976
		Panel B: At age 30	
ITT	0.003***	0.050**	-0.020**
	(0.001)	(0.020)	(0.008)
Control Mean	.97	11.7	.582
Romano-Wolf p-value	0.018	0.036	0.022
N	925805	925805	925805

Note: All outcomes are measured as the likelihood of occurrence at age 26 (Panel A) or at age 30 (Panel B). Education is defined as being in an ongoing education program. Employment is defined as annual income exceeding 1G (1 administrative unit). Controls included in the regressions, but excluded from table, are: child's gender, mother's age at birth and education when child is 5 years old, dummies indicating whether mother and child are born in Norway, the number of siblings when child was 5, child's birth order, and whether there is information on the father. All regressions include municipality of residence at age 5 and year of birth fixed effects.. The means of the outcomes are measured for children that were 19 or older in 1998. Municipalities with less than 1,500 inhabitants in 1997 are excluded. Robust standard errors, clustered at the level of municipality of residence when child was 5 years old, in parentheses. * p<0.1, ** p<0.05, *** p<0.01

Table 4: Health Care Services: Primary Health Care

	(1)	(2)	(3)	(4)	(5)
	GP consultations		GP cons. (excl. preg. rel)		ER visits
	Prob.	# cons	Prob.	# cons.	Prob.
ITT	0.012***	0.242***	0.010***	0.171***	0.002
	(0.003)	(0.055)	(0.003)	(0.042)	(0.003)
Control Mean	.712	4.41	.708	4.05	.188
Romano-Wolf p-value	0.002	0.000	0.002	0.002	0.230
N	1254470	1254470	1254470	1254470	1254470

Note: The columns labelled "Prob." consider the average yearly likelihood of a consultation in the age interval 25-35 years, while in columns labelled "# cons." we measure GP consultations as the average yearly number of consultations in the age interval 25-35 years. Controls included in the regressions, but excluded from table, are: child's gender, mother's age at birth and education when child is 5 years old, dummies indicating whether mother and child are born in Norway, the number of siblings when child was 5, child's birth order, and whether there is information on the father. All regressions include municipality of residence at age 5 and year of birth fixed effects. The means of the outcomes are measured for children that were 19 or older in 1998. Municipalities with less than 1,500 inhabitants in 1997 are excluded. Robust standard errors, clustered at the level of municipality of residence when child was 5 years old, in parentheses. * p<0.1, ** p<0.05, *** p<0.01

Table 5: Health Care Services: Specialist Health Care

	(1)	(2)	(3)
	Elective Admissions		Acute Admissions (Prob.)
	Inpatient (Prob.)	Outpatient (Prob.)	
ITT	0.002**	0.009***	-0.003
	(0.001)	(0.001)	(0.005)
Control Mean	.049	.192	.093
Romano Wolf p-value	0.013	0.000	0.577
N	890915	890915	890915

Note: Controls included in the regressions, but excluded from table, are: child's gender, mother's age at birth and education when child is 5 years old, dummies indicating whether mother and child are born in Norway, the number of siblings when child was 5, child's birth order, and whether there is information on the father. All regressions include municipality of residence at age 5 and year of birth fixed effects. The means of the outcomes are measured for children that were 19 or older in 1998. Municipalities with less than 1,500 inhabitants in 1997 are excluded from all specifications. Robust standard errors, clustered at the level of municipality of residence when child was 5 years old, in parentheses. * p<0.1, ** p<0.05, *** p<0.01

Table 6: Heterogeneity: Educational Attainment and Teenage Pregnancy

	(1) Teen Childbirth	(2) High School at 20	(3) Ever College at 20	(4) College Degree at 24
Panel A: Gender				
I.ITT (boy)		-0.000	-0.002	0.000
		(0.014)	(0.005)	(0.009)
II.ITT (girl)		0.005	0.016***	0.009
		(0.008)	(0.005)	(0.007)
p-value (*I* = *II*)		.490	0.000	.047
Panel B: Family Structure				
I.ITT (single mom)	-0.012***	-0.003	0.013***	0.006
	(0.004)	(0.009)	(0.005)	(0.007)
II.ITT (two parents)	-0.006***	0.005	0.008	0.006
	(0.002)	(0.010)	(0.005)	(0.008)
p-value (*I* = *II*)	.175	.141	.405	.878
Panel C: Maternal Education				
I.ITT (less than high school)	-0.005**	0.000	-0.009	-0.010
	(0.002)	(0.014)	(0.010)	(0.012)
II.ITT (high school or more)	-0.002	-0.008	0.006	0.002
	(0.002)	(0.009)	(0.006)	(0.009)
p-value (*I* = *II*)	.299	.171	.127	.0308
Panel D: Area of Residence				
I.ITT (rural)	-0.002	0.020***	0.009*	0.015***
	(0.003)	(0.007)	(0.005)	(0.004)
II.ITT (urban)	-0.011***	-0.011	0.007	-0.002
	(0.003)	(0.013)	(0.010)	(0.013)
p-value (*I* = *II*)	.0239	.0385	.869	.213
N	611789	1244716	1244716	1244716

Note: High school includes both vocational and general training. For higher education, graduation is defined as completing a university or university college degree. The effect on child birth before 20 years old is estimated for girls only. Controls included in the regressions, but excluded from table, are: child's gender, mother's age at birth and education when child is 5 years old, dummies indicating whether mother and child are born in Norway, the number of siblings when child was 5, child's birth order, and whether there is information on the father. All regressions include municipality of residence at age 5 and year of birth fixed effects. The means of the outcomes are measured for children that were 19 or older in 1998. Municipalities with less than 1,500 inhabitants in 1997 are excluded from all specifications. The p-value is for the null hypothesis that the two groups have the same coefficient "p-value (I=II)". Using gender as an example, we test $H_0 : \beta_{boy} = \beta_{girl}$ vs. $H_A : \beta_{boy} \neq \beta_{girl}$. Robust standard errors, clustered at the level of municipality of residence when child was 5 years old, in parentheses. * $p<0.1$, ** $p<0.05$, *** $p<0.01$

Table 7: Heterogeneity: Labor Market and Welfare Dependency at age 26 and 30

	(1)	(2) Age 26	(3)	(4)	(5) Age 30	(6)
	Ever Worked	Log Earnings	Ever in Welfare	Ever Worked	Log Earnings	Ever in Welfare
Panel A: Gender						
I.ITT (boy)	0.004*	0.033	-0.014	0.003***	0.031	-0.018**
	(0.002)	(0.032)	(0.009)	(0.001)	(0.024)	(0.008)
II.ITT (girl)	0.007***	0.083***	-0.022**	0.002	0.068**	-0.022**
	(0.002)	(0.032)	(0.009)	(0.001)	(0.034)	(0.009)
p-value (*I* = *II*)	.223	.222	.0982	.623	.385	.425
Panel B: Family Structure						
I.ITT (single mom)	0.009**	0.030	-0.023***	0.003	0.025	-0.022***
	(0.004)	(0.054)	(0.006)	(0.003)	(0.048)	(0.006)
II.ITT (two parents)	0.005***	0.064***	-0.018*	0.002**	0.057***	-0.021**
	(0.002)	(0.023)	(0.010)	(0.001)	(0.021)	(0.009)
p-value (*I* = *II*)	.203	.467	.591	.773	.52	.907
Panel C: Maternal Education						
I.ITT (less than high school)	0.004**	0.060*	-0.006	0.002*	0.057**	-0.011*
	(0.002)	(0.034)	(0.006)	(0.001)	(0.026)	(0.006)
II.ITT (high school or more)	0.007***	0.048*	-0.026***	0.002	0.022	-0.027***
	(0.002)	(0.028)	(0.009)	(0.002)	(0.024)	(0.008)
p-value (*I* = *II*)	.201	.765	.000815	.966	.268	.0014
Panel D: Area of Residence						
I.ITT (rural)	0.003*	0.031	0.004	0.002	0.030	-0.001
	(0.002)	(0.028)	(0.005)	(0.001)	(0.028)	(0.005)
II.ITT (urban)	0.008***	0.101***	-0.039***	0.004**	0.080*	-0.040***
	(0.002)	(0.028)	(0.007)	(0.002)	(0.041)	(0.005)
p-value (*I* = *II*)	.0332	.0731	3.22e-07	.378	.307	1.26e-08
N	1160976	1160976	1160976	925805	925805	925805

Note: All outcomes are measured as the likelihood of occurrence at age 25. Education is defined as being in an ongoing education program. Employment is defined as annual income exceeding 1G (1 administrative unit). Controls included in the regressions, but excluded from table, are: child's gender, mother's age at birth and education when child is 5 years old, dummies indicating whether mother and child are born in Norway, the number of siblings when child was 5, child's birth order, and whether there is information on the father. All regressions include municipality of residence at age 5 and year of birth fixed effects. The means of the outcomes are measured for children that were 19 or older in 1998. Municipalities with less than 1,500 inhabitants in 1997 are excluded from all specifications. The p-value is for the null hypothesis that the two groups have the same coefficient "p-value (I=II)". Using gender as an example, we test $H_0 : \beta_{boy} = \beta_{girl}$ vs. $H_A : \beta_{boy} \neq \beta_{girl}$. Robust standard errors, clustered at the level of municipality of residence when child was 5 years old, in parentheses. * p<0.1, ** p<0.05, *** p<0.01

Table 8: Heterogeneity: Primary and Specialist Health Care Services

	(1) GP	(2) Inpatient	(3) Outpatient
Panel A: Gender			
I.ITT (boy)	0.006	0.001	0.005**
	(0.004)	(0.001)	(0.003)
II.ITT (girl)	0.013***	0.004***	0.013***
	(0.003)	(0.001)	(0.003)
p-value (*I* = *II*)	.173	.042	.081
Panel B: Family Structure			
I.ITT (single mom)	0.007*	0.003	0.008**
	(0.004)	(0.002)	(0.003)
II.ITT (two parents)	0.010***	0.002**	0.009***
	(0.003)	(0.001)	(0.002)
p-value (*I* = *II*)	.504	.755	.601
Panel C: Maternal Education			
I.ITT (less than high school)	0.014***	0.003**	0.012***
	(0.003)	(0.001)	(0.002)
II.ITT (high school or more)	0.006**	0.001	0.005**
	(0.003)	(0.001)	(0.002)
p-value (*I* = *II*)	.008	.172	.012
Panel D: Area of Residence			
I.ITT (rural)	0.012***	0.001	0.004*
	(0.003)	(0.001)	(0.002)
II.ITT (urban)	0.006*	0.003***	0.013***
	(0.004)	(0.001)	(0.002)
p-value (*I* = *II*)	.181	.114	.007
N	1254470	890915	890915

Note: All outcomes are measured as the average yearly likelihood of utilization in the age interval 25-35 years. Controls included in the regressions, but excluded from table, are: child's gender, mother's age at birth and education when child is 5 years old, dummies indicating whether mother and child are born in Norway, the number of siblings when child was 5, child's birth order, and whether there is information on the father. All regressions include municipality and year of birth fixed effects. The means of the outcomes are measured for children that were 19 or older in 1998. Municipalities with less than 1,500 inhabitants in 1997 are excluded from all specifications. The p-value is for the null hypothesis that the two groups have the same coefficient "p-value (I=II)". Using gender as an example, we test $H_0 : \beta_{boy} = \beta_{girl}$ vs. $H_A : \beta_{boy} \neq \beta_{girl}$. Robust standard errors, clustered at the level of municipality of residence when child was 5 years old, in parentheses. * p<0.1, ** p<0.05, *** p<0.01

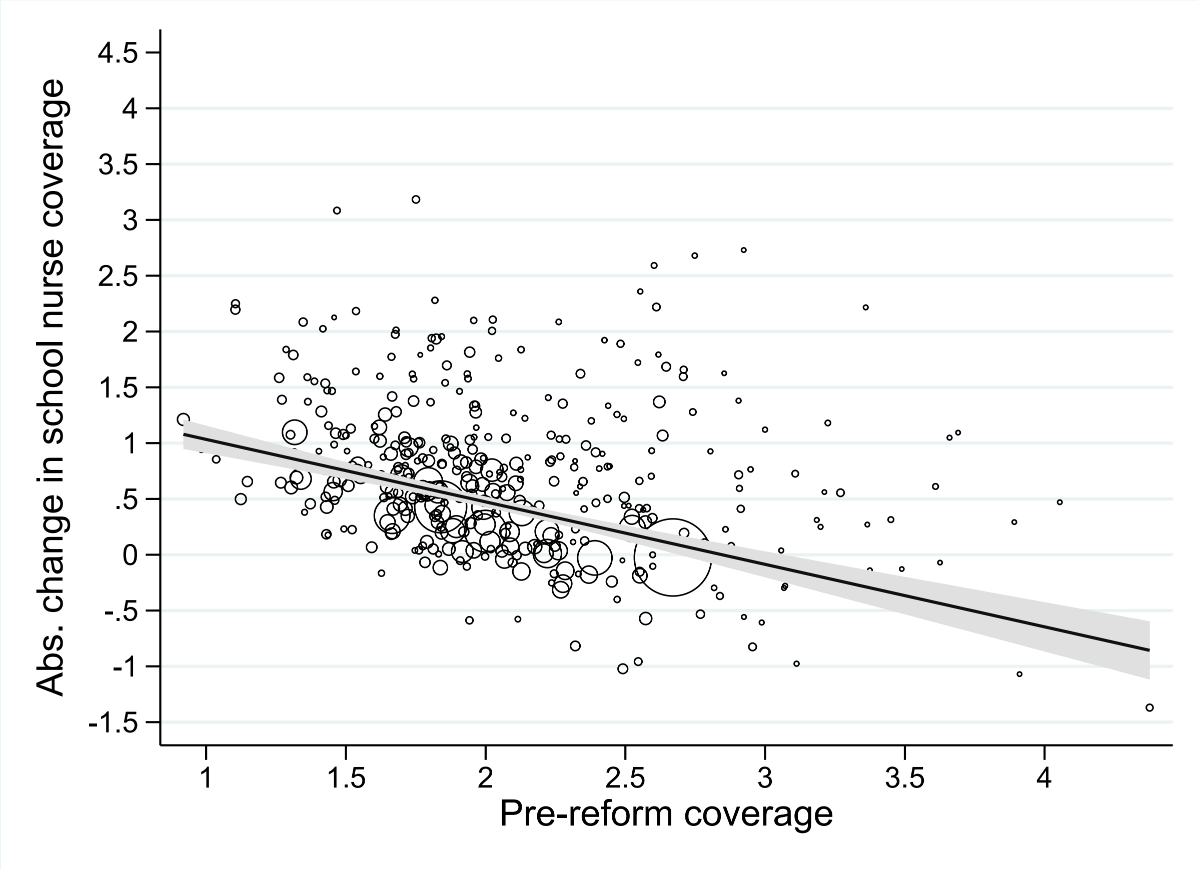


Figure 1: Growth in School Nurse Coverage

Note: The figure shows the relationship between pre-reform coverage levels of school nurses and the growth in school nurse coverage from pre- to post-reform period (ie, between 1999 and 2008). School nurse coverage is defined as the number of school nurses per 1,000 6-19 year old in the municipality. The pre-reform period is defined as 1995-1997. Municipalities with less than 1,500 inhabitants in 1997 are excluded. The solid line in this figures shows the fitted values with a 95% CI.

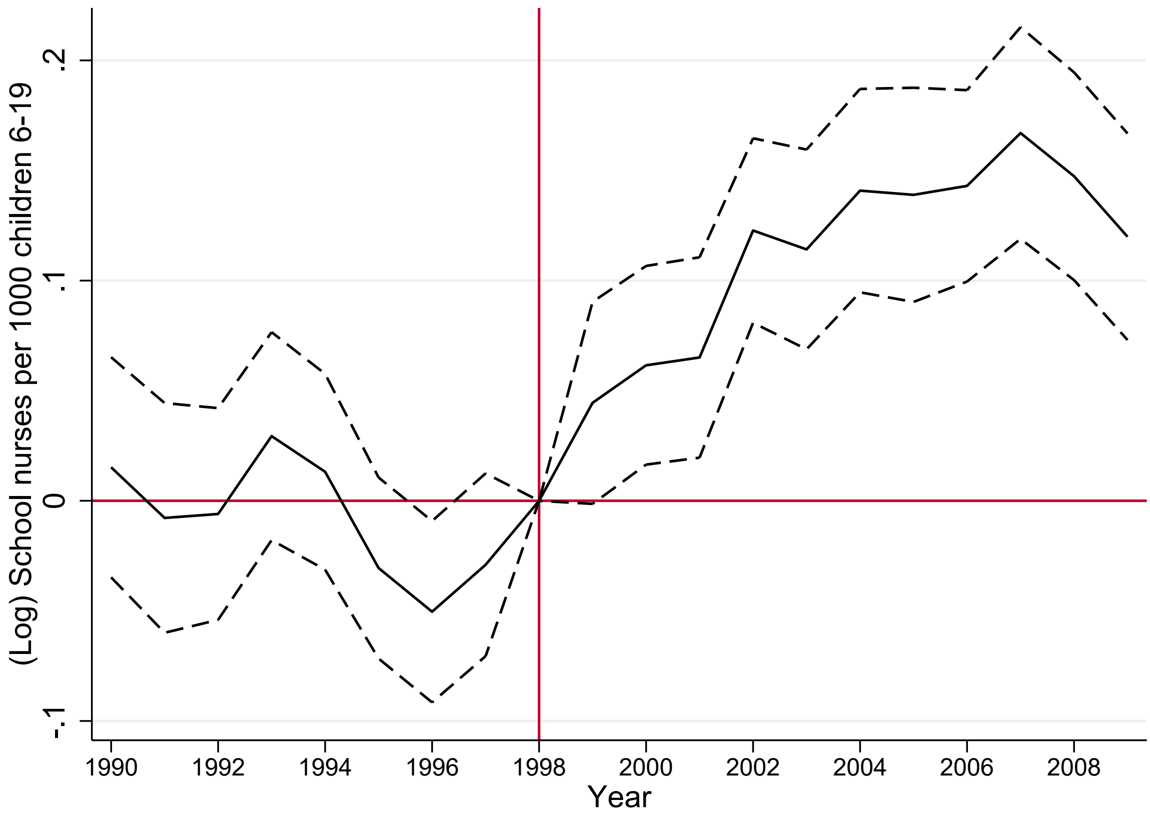


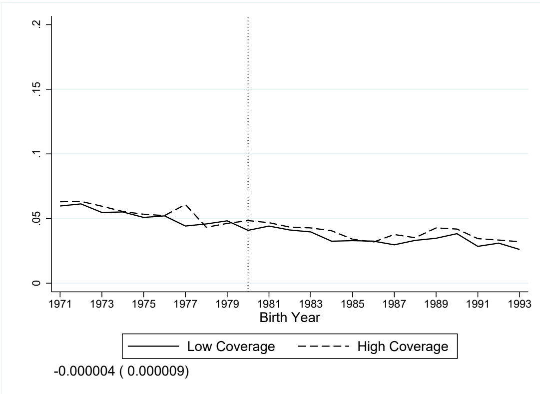
Figure 2: Growth in School Nurse Coverage

Note: This figure presents estimates for βs from the following model

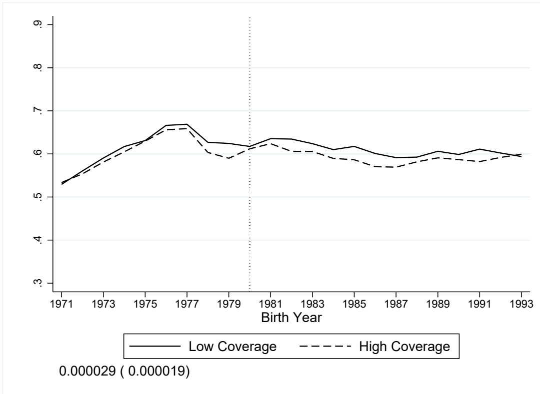
$$Cov_{mt} = \sum_{k=1990}^{1997} \beta_k^B L_m \mathbf{1}\left[t - T_m = k\right] + \sum_{k=1999}^{2009} \beta_k^A L_m \mathbf{1}\left[t - T_m = k\right] + \mu_m + \pi_t + \varepsilon_{mt} \tag{6}$$

where Cov_{mt} is the log of school nurses per 1,000 children 6-19 years old in year t and municipality m, L_m is an indicator variable equal to 1 if the coverage between 1995-1997 is below the median coverage, and 0 otherwise. μ_m and π_t are municipality and year fixed effects, respectively. The dashed lines are 95% confidence intervals.

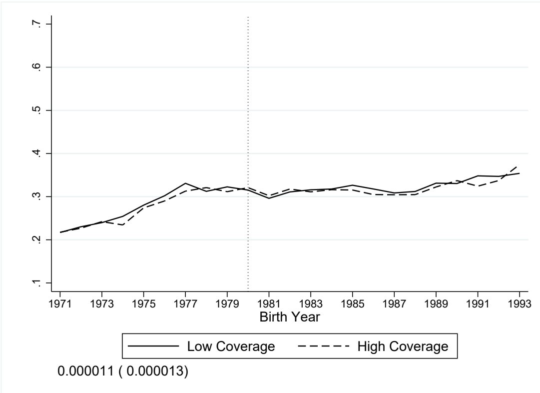
(a) Childbirth before 20



(b) High School Completion 20



(c) Enrolled in College by 20



(d) College degree at 25

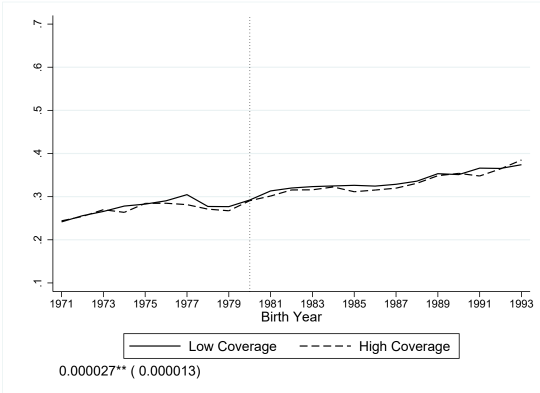


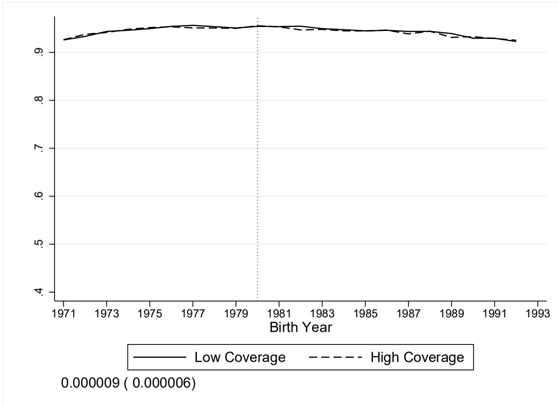
Figure 3: Educational Attainment and Teenage Pregnancy

Note: Municipalities are split according to whether they fall below (solid line) or below (dashed line) the median of the distribution of the pre-reform level of school nurses per 1,000 children. Municipalities with population below 1,500 inhabitants are excluded. In the bottom left corner of each figure, we include the estimates of coefficient δ_2 in the following model estimated for the cohorts 1971 to 1977:

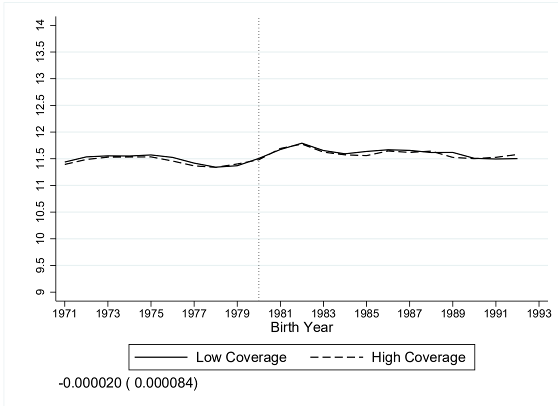
$$y_m = \delta_1 + \delta_2 I_m \times t + \delta_3 t + \mu_m + \theta_t + \varepsilon_m \tag{7}$$

where I_m is the (negative of the) pre-reform coverage between 1995 and 1997 and t is a linear cohort trend, μ_m represents municipality of residence at age five fixed effects and θ_t are the cohort effects.

(a) Ever Worked



(b) Log income



(c) Ever Welfare

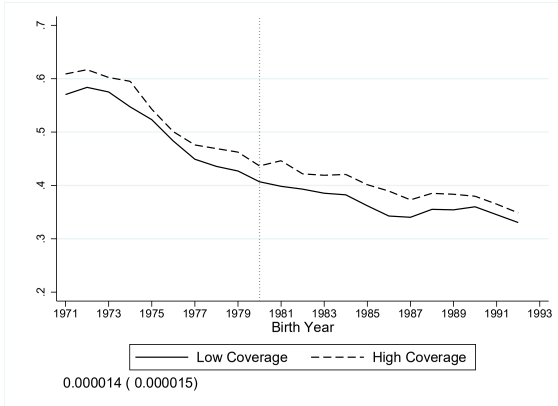


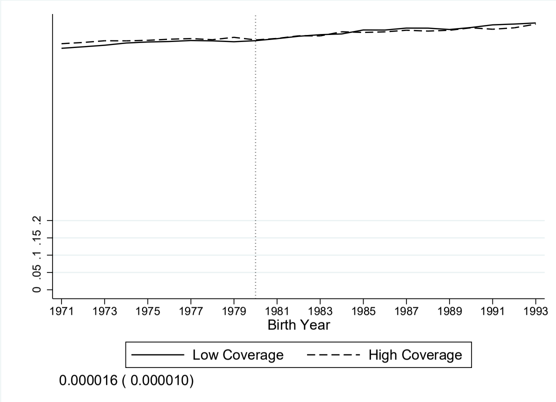
Figure 4: Labor Market and Welfare Dependency at age 26

Note: Municipalities are split according to whether they fall below (solid line) or below (dashed line) the median of the distribution of the pre-reform level of school nurses per 1,000 children. Municipalities with population below 1,500 inhabitants are excluded. In the bottom left corner of each figure, we include the estimates of coefficient δ_2 in the following model estimated for the cohorts 1971 to 1977:

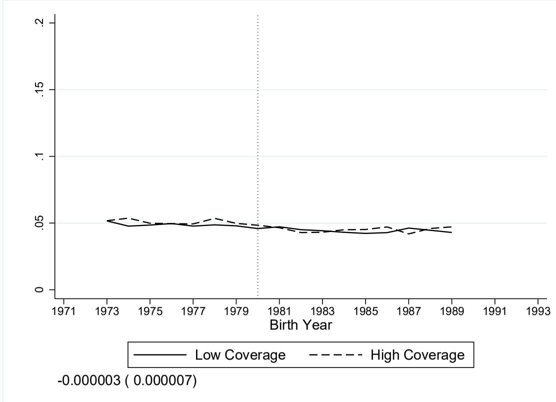
$$y_m = \delta_1 + \delta_2 I_m \times t + \delta_3 t + \mu_m + \theta_t + \varepsilon_m \tag{8}$$

where I_m is the (negative of the) pre-reform coverage between 1995 and 1997 and t is a linear cohort trend, μ_m represents municipality of residence at age five fixed effects and θ_t are the cohort effects.

(a) Primary Health Care



(b) Somatic Health Care: Inpatient



(c) Somatic Health Care: Outpatient

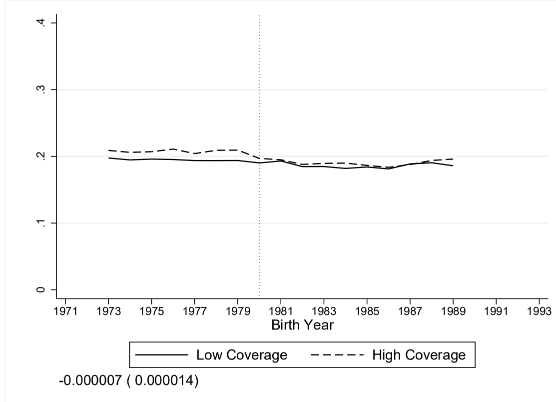


Figure 5: Utilization of Health Care Services

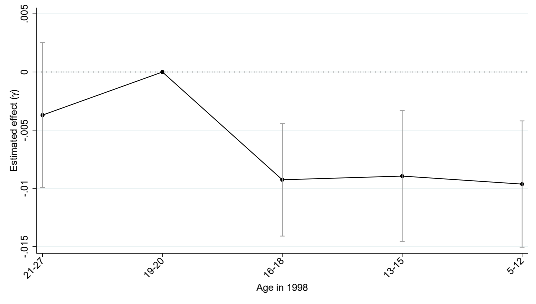
Note: Municipalities are split according to whether they fall below (solid line) or below (dashed line) the median of the distribution of the pre-reform level of school nurses per 1,000 children. Municipalities with population below 1,500 inhabitants are excluded. In the bottom left corner of each figure, we include the estimates of coefficient δ_2 in the following model estimated for the cohorts 1971 to 1977:

$$y_m = \delta_1 + \delta_2 I_m \times t + \delta_3 t + \mu_m + \theta_t + \varepsilon_m \tag{9}$$

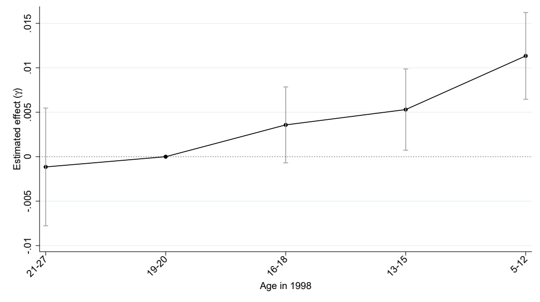
where I_m is the (negative of the) pre-reform coverage between 1995 and 1997 and t is a linear cohort trend, μ_m represents municipality of residence at age five fixed effects and θ_t are the cohort effects.

Figure 6: Time to event

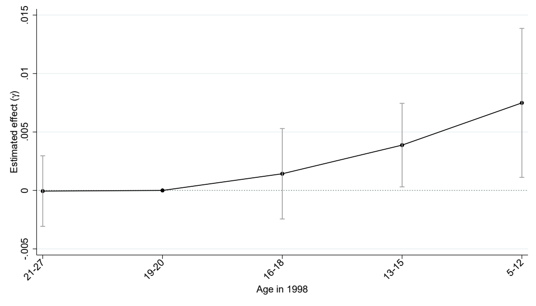
(a) Teen Childbirth



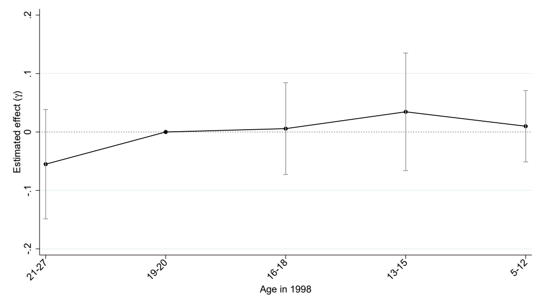
(b) Primary Health Care



(c) Worked 26



(d) Log income 26



(e) Welfare 26

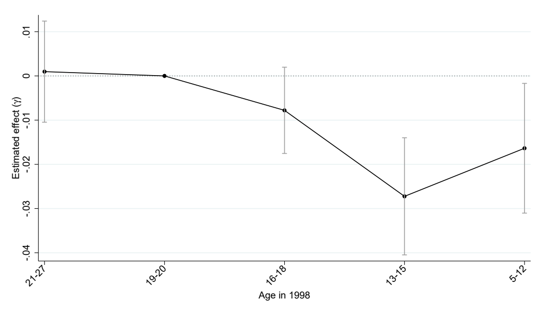


Figure 7: Event study Estimates

Note: The plots include estimates for γs in from the following model

$$Y_{imt} = \alpha + I_m \times 1[21 \leq Age98_i \leq 27]\gamma_1 + I_m \times 1[16 \leq Age98_i \leq 18]\gamma_2 \qquad (10)$$
$$+ I_m \times 1[13 \leq Age98_i \leq 15]\gamma_3 + I_m \times 1[5 \leq Age98_i \leq 12]\gamma_4 + \mathbf{X}_i'\delta_1 + \mu_m + \theta_t + \epsilon_{imt}.$$

In the model above, ages 19 and 20 are the excluded category, which correspond to the cohorts just too old to be exposed to the reform. The age groups are defined to correspond to the age at enrolment in high school (16 to 18), middle school (13 to 15) and exposure since primary school (6 to 12). Individuals between 21 and 27 would be too old to be exposed to the reform. The dashed lines are 95% confidence intervals.

A Appendix

Table A1: Outcome Data Availability

Cohort	Reform	Number of school years in reform period	KUHR data measured at age 25-35	NPR data measured at age 25-35	Other outcomes measured at age: 20	25	30
1971	Pre	0	X		X	X	X
1972	Pre	0	X		X	X	X
1973	Pre	0	X	X	X	X	X
1974	Pre	0	X	X	X	X	X
1975	Pre	0	X	X	X	X	X
1976	Pre	0	X	X	X	X	X
1977	Pre	0	X	X	X	X	X
1978	Pre	0	X	X	X	X	X
1979	Pre	0	X	X	X	X	X
1980	Post	0.5	X	X	X	X	X
1981	Post	1.5	X	X	X	X	X
1982	Post	2.5	X	X	X	X	X
1983	Post	3.5	X	X	X	X	X
1984	Post	4.5	X	X	X	X	X
1985	Post	5.5	X	X	X	X	X
1986	Post	6.5	X	X	X	X	X
1987	Post	7.5	X	X	X	X	X
1988	Post	8.5	X	X	X	X	X
1989	Post	9.5	X	X	X	X	X*
1990	Post	10.5	X		X	X	X*
1991	Post	11.5	X		X	X	
1992	Post	12.5	X		X	X	
1993	Post	13	X		X	X	

Note: The KUHR data is available for 2006-2020 and includes data on primary health care services (ER visits and GP consultations and related information). The NPR data is available for 2008-2014 and includes data on specialist health care: Somatic hospitalizations, Psychiatric specialist care, interdisciplinary drug/addiction treatment, and psychologists (psychological/psychiatric therapy). The rest of the outcomes are available for the whole period when measured at age 20, while when measuring at age 26 and 30, and fewer cohorts are included.

Table A2: Pre-reform Differences for Municipalities with different Levels of Baseline Coverage

	(1) Mean	(2) Coefficient	(3) S.E.
Pre-Reform Coverage (nurses per 1,000 6-19 year old) :			
Mean	2.074		
S.D.	0.559		
Demography			
Total Population	11588	-2482.1*	(1343.2)
Share of pop. aged 6-19	0.185	-0.0110***	(0.00207)
Share of 16+ with compulsory schooling	0.409	-0.00285	(0.00922)
Share of 16+ with high school	0.451	0.000546	(0.00643)
Share of 16+ with university degree	0.126	-0.00607	(0.00415)
Private income (100,000 NOK)	16558	-2000.5	(2306.7)
Unemployment rate (%)	3.87	0.011	(0.166)
Unrestricted budget (10,000 NOK per capita)	1.26	0.253***	(0.0638)
Labor Party has majority of votes	0.548	-0.0555	(0.0540)
Geography			
Land area (km^2)	740	12.3	(167.1)
Rural	0.607	0.183***	(0.0610)
Health Services			
Empl. in munic. health care sector /1,000 inh.	10.5	2.013**	-0.714
School doctors per 1,000 6-19 year old	0.299	0.124***	(0.0206)
School psychologists per 1,000 6-19 year old	0.0035	0.0036	(0.00316)
GPs in munic. health care sector /1,000 inh.	0.936	0.199***	(0.0240)
Man-yrs in child welfare services per 1,000 6-19 year old	2.46	0.121	(0.149)
Education			
Munic. spending on compulsory schooling (10,000 NOK)	3202	463.3***	(72.46)
Share of schools private	0.0117	0.00501	(0.00534)
Share of pop. in 1st-10th grade	0.133	-0.00785***	(0.00137)
Share of pop. in high school	0.0308	-0.00398	(0.00376)
Early Health			
Birth weight (grams)	3541	-1.03	(8.949)
Infant Mortality Rate	5.56	0.0368	(0.997)

Note: The table shows in column (2) estimates for the coefficient δ in the following model

$$y_m = \alpha + \delta I_m + \pi_c + \nu_m$$

where y_m is a municipality characteristic measured in 1997, I_m is the pre-reform school nurse coverage between 1995 and 1997 and π_c is a county fixed effect. Municipalities with less than 1,500 inhabitants in 1997 are excluded. Robust standard errors in parentheses in column (3). * p<0.1, ** p<0.05, *** p<0.01

Table A3: Post-reform growth in school nurse coverage

	(1)	(2)
School nurse coverage		
(school nurse per 1,000 6-19 year old)	0.23766***	
	(0.04718)	
Very High (pre-reform coverage above percentile 75)		0.24758***
		(0.05775)
High (pre-reform coverage between percentiles 50 and 75)		0.09557**
		(0.04323)
Total Population 6-19	-2.95938*	-3.22558*
	(1.43112)	(1.58855)
Unrestricted budget of municipality(10,000 NOK per capita) 1997	-0.01122	-0.00417
	(0.07115)	(0.07997)
Total Population	-0.00000	-0.00000
	(0.00000)	(0.00000)
Rural municipality	0.02285	0.01066
	(0.04667)	(0.04681)
Labor Party has majority of votes	-0.00369	0.00124
	(0.04325)	(0.04519)
Man-years in child welfare per 1,000 6-19 year old	0.01238	0.01500
	(0.02002)	(0.02159)
School doctors per 1,000 6-19 year old	-0.08723	-0.00370
	(0.12169)	(0.10940)
School psych. per 1,000 6-19 year old	1.41020*	1.31288
	(0.79293)	(0.75672)
Doctors in munic per 1,000 inhabitant	-0.05079	-0.01115
	(0.08281)	(0.09094)
Empl. in munic health care sector /1,000 inh.	0.00428	0.00487
	(0.00349)	(0.00366)
Munic. school exp. per 6-19 year old	-0.00003	-0.00002
	(0.00004)	(0.00005)
Number of pupils in compulsory schooling	4.11599**	3.48219
	(1.88850)	(2.04691)
Number of pupils in high school	-0.71642	-0.50140
	(0.72402)	(0.71439)
Birth weight	0.00012	0.00002
	(0.00024)	(0.00022)
Infant Mortality Rate	-0.00102	-0.00124
	(0.00330)	(0.00321)
Proportion of Municipalities with drop in coverage		.126

Note: The table shows in column (2) estimates for the coefficient δ in the following model

$$D_m = \alpha + \delta_0 I_m + \mathbf{X}_i' \delta_1 + \pi_c + \nu_m$$

where D_m indicator that takes value 1 if the coverage dropped between the pre- and the post-reform period (and 0 otherwise), I_m is the pre-reform school nurse coverage between 1995 and 1997, $\mathbf{X}_i$ is a vector of municipality characteristic measured in 1997 and π_c is a county fixed effect. Municipalities with less than 1,500 inhabitants in 1997 are excluded. Robust standard errors in parentheses. * p<0.1, ** p<0.05, *** p<0.01

Table A4: Number of Children

	(1) Nb. of Children at 30	(2) Nb. of Children at 35
ITT	-0.040***	-0.024***
	(0.008)	(0.009)
Control Mean	1.26	1.93
N	400041	323940

Note: Controls included in the regressions, but excluded from table, are: child's gender, mother's age at birth and education when child is 5 years old, dummies indicating whether mother and child are born in Norway, the number of siblings when child was 5, child's birth order, and whether there is information on the father. All regressions include municipality of residence at age 5 and year of birth fixed effects. The means of the outcomes are measured for children that were 19 or older in 1998. Municipalities with less than 1,500 inhabitants in 1997 are excluded from all specifications. Robust standard errors, clustered at the level of municipality of residence when child was 5 years old, in parentheses. * p<0.1, ** p<0.05, *** p<0.01

Table A5: Alternative Sample: born between 1974 and 1986 (ie, 12 to 24 in 1998)

	(1)	(2)	(3)	(4)
		Panel A		
	Teen Childbirth	High School at 20	Ever College at 20	College Degree at 24
ITT	-0.005**	0.003	0.006	0.002
	(0.002)	(0.009)	(0.004)	(0.006)
N	323735	660206	660206	660206
		Panel B		
	Ever Worked at 26	Log Earnings at 26	Ever in Welfare at 26	
ITT	0.004**	0.060**	-0.023***	
	(0.001)	(0.024)	(0.007)	
N	644629	644629	644629	
		Panel C		
	Ever Worked at 30	Log Earnings at 30	Ever in Welfare at 30	
ITT	0.001	0.035	-0.022***	
	(0.001)	(0.024)	(0.007)	
N	641959	641959	641959	
		Panel D		
	GP (Prob.)	GP not preg. (Prob.)	Inpatient (Prob.)	Outpatient (Prob.)
ITT	0.008***	0.006***	0.002***	0.008***
	(0.002)	(0.002)	(0.001)	(0.001)
N	663518	663518	663468	663468

Note: The table includes estimates of γ for model (2). Controls included in the regressions, but excluded from table, are: child's gender, mother's age at birth and education when child is 5 years old, dummies indicating whether mother and child are born in Norway, the number of siblings when child was 5, child's birth order, and whether there is information on the father. All regressions include municipality of residence at age 5 and year of birth fixed effects. The means of the outcomes are measured for children that were 19 or older in 1998. Municipalities with less than 1,500 inhabitants in 1997 are excluded from all specifications. Robust standard errors, clustered at the level of municipality of residence when child was 5 years old, in parentheses. * p<0.1, ** p<0.05, *** p<0.01

Table A6: Alternative Treatment Definition: Discrete treatment variable

	(1)	(2)	(3)	(4)
		Panel A		
	Teen Childbirth	High School at 20	Ever College at 20	College Degree at 24
ITT	-0.006***	-0.002	-0.000	-0.002
	(0.002)	(0.008)	(0.006)	(0.006)
		Panel B		
	Ever Worked at 26	Log Earnings at 26	Ever in Welfare at 26	
ITT	0.004**	0.045*	-0.021***	
	(0.002)	(0.024)	(0.007)	
		Panel C		
	Ever Worked at 30	Log Earnings at 30	Ever in Welfare at 30	
ITT	0.001*	0.037*	-0.020***	
	(0.001)	(0.020)	(0.007)	
		Panel D		
	GP (Prob.)	GP not preg. (Prob.)	Inpatient (Prob.)	Outpatient (Prob.)
ITT	0.012***	0.009***	0.002*	0.007***
	(0.003)	(0.003)	(0.001)	(0.002)

Note: Estimates for κ in model (3). Controls included in the regressions, but excluded from table, are: child's gender, mother's age at birth and education when child is 5 years old, dummies indicating whether mother and child are born in Norway, the number of siblings when child was 5, child's birth order, and whether there is information on the father. All regressions include municipality of residence at age 5 and year of birth fixed effects. The means of the outcomes are measured for children that were 19 or older in 1998. Municipalities with less than 1,500 inhabitants in 1997 are excluded from all specifications. Robust standard errors, clustered at the level of municipality of residence when child was 5 years old, in parentheses. * p<0.1, ** p<0.05, *** p<0.01

Table A7: Specification Checks: Educational Attainment

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
						Trend versions	
	Baseline	Cluster at munic Xcohort	No rural muns.	No large cities	All munic.	Linear estimated pre-trend	Trend baseline charact.
Panel A: Teen Childbirth							
ITT	-0.006***	-0.006***	-0.011***	-0.005***	-0.003**	-0.006***	-0.007***
	(0.002)	(0.001)	(0.002)	(0.002)	(0.001)	(0.001)	(0.001)
N	611798	611798	431105	480724	621034	611798	609486
Panel B: High School at 20							
ITT	0.002	0.002	-0.011	0.017***	-0.000	-0.001	0.008*
	(0.010)	(0.005)	(0.007)	(0.003)	(0.003)	(0.005)	(0.004)
N	1244714	1244714	875619	980394	1263522	1244714	1240112
Panel C: Ever College at 20							
ITT	0.006	0.006*	0.008	0.012***	0.003	0.006	0.013***
	(0.005)	(0.004)	(0.006)	(0.003)	(0.003)	(0.004)	(0.004)
N	1244714	1244714	875619	980394	1263522	1244714	1240112
Panel D: College Degree at 24							
ITT	0.004	0.004	-0.002	0.015***	0.002	0.000	0.010**
	(0.008)	(0.005)	(0.007)	(0.003)	(0.003)	(0.004)	(0.004)
N	1244714	1244714	875619	980394	1263522	1244714	1240112

Note: Column (1) includes the baseline specification. In column (2) the standard errors are clustered by cohort-municipality of residence at age 5. Column (3) excludes rural municipalities. Column (4) excludes the five largest cities. Column (5) includes the smallest municipalities. In columns (6) includes controls for municipality-level pre-reform linear trends in the outcome. Column (7) we expand equation (2) to include for municipality linear trends in baseline characteristics of municipalities, in particular, we include trends in municipality characteristics measured in 1997. * $p<0.1$, ** $p<0.05$, *** $p<0.01$

Table A8: Specification Checks: Labor Market and Welfare Dependency

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
						Trend versions	
	Baseline	Cluster at munic Xcohort	No rural muns.	No large cities	All munic.	Linear estimated pre-trend	Trend baseline charact.
Panel A: Ever Worked at 26							
ITT	0.005***	0.005***	0.008***	0.003***	0.005***	0.005***	0.004***
	(0.002)	(0.001)	(0.002)	(0.001)	(0.001)	(0.001)	(0.001)
N	1160976	1160976	813718	916962	1178726	1160976	1156741
Panel B: Log Earnings at 26							
ITT	0.058**	0.058***	0.100***	0.034**	0.040***	0.045***	0.052***
	(0.024)	(0.019)	(0.028)	(0.017)	(0.015)	(0.018)	(0.018)
N	1160976	1160976	813718	916962	1178726	1160976	1156741
Panel C: Ever in Welfare 26							
ITT	-0.018**	-0.018***	-0.039***	-0.006**	-0.010***	-0.018***	-0.024***
	(0.009)	(0.003)	(0.004)	(0.003)	(0.003)	(0.003)	(0.003)
N	1160976	1160976	813718	916962	1178726	1160976	1156741
Panel D: Ever Worked at 30							
ITT	0.003***	0.003***	0.004***	0.003***	0.003***	0.002***	0.002*
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
N	925805	925805	642972	736176	940577	925805	922474
Panel E: Log Earnings at 30							
ITT	0.050**	0.050***	0.083***	0.051***	0.038***	0.022	0.038**
	(0.020)	(0.018)	(0.029)	(0.018)	(0.015)	(0.018)	(0.019)
N	925805	925805	642972	736176	940577	925805	922474
Panel F: Ever in Welfare 30							
ITT	-0.020**	-0.020***	-0.040***	-0.010***	-0.011***	-0.021***	-0.024***
	(0.008)	(0.003)	(0.004)	(0.003)	(0.003)	(0.003)	(0.003)
N	925805	925805	642972	736176	940577	925805	922474

Note: Column (1) includes the baseline specification. In column (2) the standard errors are clustered by cohort-municipality of residence at age 5. Column (3) excludes rural municipalities. Column (4) excludes the five largest cities. Column (5) includes the smallest municipalities. In columns (6) includes controls for municipality-level pre-reform linear trends in the outcome. Column (7) we expand equation (2) to include for municipality linear trends in baseline characteristics of municipalities, in particular, we include trends in municipality characteristics measured in 1997. * p<0.1, ** p<0.05, *** p<0.01

Table A9: Specification Checks: Utilization of Primary and Specialist Health Care Services

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
						Trend versions	
	Baseline	Cluster at munic Xcohort	No rural muns.	No large cities	All munic.	Linear estimated pre-trend	Trend baseline charact.
Panel A: Probability of GP Consultations							
ITT	0.012***	0.012***	0.012***	0.013***	0.010***	0.009***	0.006***
	(0.003)	(0.002)	(0.002)	(0.002)	(0.001)	(0.002)	(0.002)
N	1254470	1254470	883836	985655	1273355	1254470	1249836
Panel B: Probability of GP Consultations (excl. pregnancy related)							
ITT	0.010***	0.010***	0.006**	0.010***	0.008***	0.007***	0.003*
	(0.003)	(0.002)	(0.002)	(0.002)	(0.001)	(0.002)	(0.002)
N	1254470	1254470	883836	985655	1273355	1254470	1249836
Panel C: Probability of Inpatient Hospital Admissions							
ITT	0.002**	0.002***	0.003***	0.001*	0.002***	0.002***	0.001
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
N	890915	890915	623286	704102	904458	890915	887682
Panel D: Probability of Outpatient Hospital Admissions							
post_cov	0.009***	0.009***	0.013***	0.009***	0.007***	0.007***	0.008***
	(0.001)	(0.001)	(0.002)	(0.002)	(0.001)	(0.001)	(0.002)
N	890915	890915	623286	704102	904458	890915	887682

*Note:*Column (1) includes the baseline specification. In column (2) the standard errors are clustered by cohort-municipality of residence at age 5. Column (3) excludes rural municipalities. Column (4) excludes the five largest cities. Column (5) includes the smallest municipalities. In columns (6) includes controls for municipality-level pre-reform linear trends in the outcome. Column (7) we expand equation (2) to include for municipality linear trends in baseline characteristics of municipalities, in particular, we include trends in municipality characteristics measured in 1997. * p<0.1, ** p<0.05, *** p<0.01

Table A10: Comparing Benchmark Difference-in-Difference Results to Heterogeneous Treatment Effects Model (de Chaisemartin and D'Haultfœuille, 2020)

	(1)	(2)	(3)	(4)	(5)	(6)
Panel A: Analysis of Average Treatment Effect (ATE) estimate						
	# weights in calculation of ATE			Sum of negative	sd(beta) s.t.	sd(beta) st ATT
	Total	Positive	Negative	weights	$ATT = 0$	opposite sign
Teen Childbirth	2926	2839	87	-0.002	0.012	0.155
Ever worked by 26	2717	2618	99	-0.003	0.007	0.076
Log Earnings 26	2717	2620	97	-0.003	0.029	0.305
Ever in welfare by 26	2717	2618	99	-0.003	0.036	0.392
Ever worked by 30	1881	1857	24	-0.001	0.003	0.072
Log Earnings 30	1881	1862	19	0.000	0.032	0.981
Ever in welfare by 3	1881	1857	24	-0.001	0.043	1.198
Prob. GP Consultations	2926	2802	124	-0.004	0.026	0.266
Panel B: Teen Childbirth		estimate	s.e.	N		
Definition 1	Benchmark DiD	-0.006	0.002	611798		
	C&H 2020	-0.006	0.004	49741		
Definition 2	Benchmark DiD	-0.005	0.002	611798		
	C&H 2020	-0.007	0.004	49741		

Note: Panel A reports statistics based on the de Chaisemartin and D'Haultfœuille (2020) heterogeneous treatment effects model. The third column reports the number of negative weights used in calculation of ATE. If there are no or few negative weights, then this suggests reporting DiD estimates that are robust to treatment effect heterogeneity. The lack of negative weights and very small standard deviation of weights suggests that the benchmark DiD is likely to be reliable. Panel B compares the benchmark DiD model with the approach suggested in de Chaisemartin and D'Haultfœuille (2020): in Definition 1 we split the sample at the median in municipalities with high versus low baseline coverage rates as in model 3; in Definition 2 we consider low baseline coverage rates, and hence treated, municipalities with at most coverage in the percentile 25 in the baseline period.

Table A11: Utilization of Primary Health Care Services – Specific Conditions

	(1) General/Unsp. ICPC-02 A	(2) Blood/Immune System ICPC-02 B	(3) Digestive ICPC-02 D	(4) Eye ICPC-02 F	(5) Ear ICPC-02 H	(6) Cardiovascular ICPC-02 K	(7) Musculoskeletal ICPC-02 L	(8) Neurological ICPC-02 N
ITT	0.017***	0.000	0.002*	-0.001	-0.000	-0.000	0.005***	0.001
	(0.006)	(0.001)	(0.001)	(0.001)	(0.000)	(0.001)	(0.002)	(0.001)
Control Mean	.266	.0176	.113	.0526	.0341	.0436	.258	.0739
N	1254470	1254470	1254470	1254470	1254470	1254470	1254470	1254470
	(9) Psychol/Social ICPC-02 PZ	(10) Respiratory ICPC-02 R	(11) Skin ICPC-02 S	(12) Endocrine ICPC-02 T	(13) Urological ICPC-02 U	(14) Pregnancy ICPC-02 W	(15) Female/Male Genital ICPC-02 XY	
ITT	0.003	0.008***	0.000	0.002**	0.000	0.024***	0.001	
	(0.002)	(0.002)	(0.001)	(0.001)	(0.001)	(0.007)	(0.001)	
Control Mean	.156	.267	.146	.0573	.051	.319	.0903	
N	1254470	1254470	1254470	1254470	1254470	611798	1254470	

Note: The table includes estimates of γ for model (2). All outcomes are measured as the average yearly likelihood of utilization in the age interval 25-35 years. Controls included in the regressions, but excluded from table, are: child's gender, mother's age at birth and education when child is 5 years old, dummies indicating whether mother and child are born in Norway, the number of siblings when child was 5, child's birth order, and whether there is information on the father. All regressions include municipality of residence at age 5 and year of birth fixed effects. The means of the outcomes are measured for children that were 19 or older in 1998. Municipalities with less than 1,500 inhabitants in 1997 are excluded. Robust standard errors, clustered at the level of municipality of residence when child was 5 years old, in parentheses. * p<0.1, ** p<0.05, *** p<0.01

Table A12: Utilization of Specialist Health Care Services – Specific Conditions

	(1) Infections Diseases ICD10 A/B	(2) Cancer ICD10 C/ D	(3) Endocrine Diseases ICD10 E	(4) Nervous System ICD10 G	(5) Ear and Eye Diseases ICD10 H
ITT	-0.001	-0.000	0.001**	0.001	-0.000
	(0.001)	(0.000)	(0.000)	(0.000)	(0.000)
Control Mean	.00341	.0184	.0163	.0178	.0121
N	890915	890915	890915	890915	890915

	(6) Cardiovascular System ICD10 I	(7) Respiratory System ICD10 J	(8) Digestive System ICD10 K	(9) Skin ICD10 L	(10) Musculoskeletal System ICD10 M
ITT	0.000	-0.014***	0.002***	0.001**	0.001
	(0.000)	(0.003)	(0.001)	(0.000)	(0.001)
Control Mean	.0131	.708	.0259	.0136	.0406
N	890915	890915	890915	890915	890915

	(11) Genitourinary System ICD10 N	(12) Obstetric ICD10 O	(13) Congenital ICD10 Q	(14) Accidents ICD10 R/S/T/W/Y	(15) Other ICD10 R/Z
ITT	0.003***	0.020***	0.000	0.000	0.010***
	(0.001)	(0.006)	(0.000)	(0.002)	(0.002)
Control Mean	.035	.108	.00315	.0474	.15
N	890915	434515	890915	890915	890915

Note: The table includes estimates of γ for model (2). All outcomes are measured as the average yearly likelihood of an admission in the age interval 25-35 years. Controls included in the regressions, but excluded from table, are: child's gender, mother's age at birth and education when child is 5 years old, dummies indicating whether mother and child are born in Norway, the number of siblings when child was 5, child's birth order, and whether there is information on the father. All regressions include municipality of residence at age 5 and year of birth fixed effects. The means of the outcomes are measured for children that were 19 or older in 1998. Municipalities with less than 1,500 inhabitants in 1997 are excluded. Robust standard errors, clustered at the level of municipality of residence when child was 5 years old, in parentheses. * p<0.1, ** p<0.05, *** p<0.01

Table A13: Mortality and Severity of Health Conditions

	(1)	(2)	(3)	(4)	(5)	(6)
	Any Cause	Specific Causes of Death				Hospitalizations
		Suicide	Substance use	Risky Behaviors	Mental Health Conditions	Charlson Index
ITT	0.00040	0.00024	0.00003	0.00034	0.00002	0.001
	(0.00058)	(0.00019)	(0.00028)	(0.00037)	(0.00001)	(0.001)
Control Mean	.011	.002	.002	.004	.00002	.023
N	1254470	1254470	1254470	1254470	1254470	890915

Note: The table includes estimates of γ for model (2). Controls included in the regressions, but excluded from table, are: child's gender, mother's age at birth and education when child is 5 years old, dummies indicating whether mother and child are born in Norway, the number of siblings when child was 5, child's birth order, and whether there is information on the father. All regressions include municipality of residence at age 5 and year of birth fixed effects. The means of the outcomes are measured for children that were 19 or older in 1998. Municipalities with less than 1,500 inhabitants in 1997 are excluded from all specifications. Robust standard errors, clustered at the level of municipality of residence when child was 5 years old, in parentheses. * $p<0.1$, ** $p<0.05$, *** $p<0.01$

Table A14: Pregnancy and Fertility related GP-visits

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	All Preg/Fert. ICPC-02 W		Contraceptive ICPC-02 W10-14		Pregnancy ICPC-02 W78-99		Other Fertility Remaining ICPC-02 W	
	Prob.	# cons.	Prob.	# cons.	Prob.	# cons.	Prob.	# cons.
ITT	0.017***	0.113***	0.001	0.001	0.016***	0.076***	0.010***	0.036***
	(0.005)	(0.030)	(0.002)	(0.003)	(0.005)	(0.025)	(0.003)	(0.007)
Control Mean	.336	1.43	.156	.232	.189	.883	.108	.328
N	4163312	4163312	4163312	4163312	4163312	4163312	4163312	4163312

Note: The table includes estimates of γ for model (2). Controls included in the regressions, but excluded from table, are: child's gender, mother's age at birth and education when child is 5 years old, dummies indicating whether mother and child are born in Norway, the number of siblings when child was 5, child's birth order, and whether there is information on the father. All regressions include municipality of residence at age 5 and year of birth fixed effects. The means of the outcomes are measured for children that were 19 or older in 1998. Municipalities with less than 1,500 inhabitants in 1997 are excluded from all specifications. Robust standard errors, clustered at the level of municipality of residence when child was 5 years old, in parentheses. * p<0.1, ** p<0.05, *** p<0.01

Table A15: Miscarriages and Birth Related Outcomes

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	Any Miscarriage		Head circumference	Length	Birth	Gestional Length	1min. APGAR	5min. APGAR
	before week 12	between weeks 12-24	in cm	in cm	Weight (grams)	in weeks	is 10	is 10
ITT	-0.010*	-0.000	0.004	-0.003	-5.625	-0.006	0.025***	0.028***
	(0.006)	(0.001)	(0.017)	(0.023)	(3.998)	(0.017)	(0.004)	(0.008)
Control Mean	.157	.026	35.1	50	3516	39.2	.081	.507
N	390111	388157	414507	410491	416542	415171	416456	416426

Note: The table includes estimates of γ for model (2). Controls included in the regressions, but excluded from table, are: child's gender, mother's age at birth and education when child is 5 years old, dummies indicating whether mother and child are born in Norway, the number of siblings when child was 5, child's birth order, and whether there is information on the father. All regressions include municipality of residence at age 5 and year of birth fixed effects. The means of the outcomes are measured for children that were 19 or older in 1998. Municipalities with less than 1,500 inhabitants in 1997 are excluded from all specifications. Robust standard errors, clustered at the level of municipality of residence when child was 5 years old, in parentheses. * $p<0.1$, ** $p<0.05$, *** $p<0.01$

Table A16: Mental health and sick leave

	(1)	(2)	(3)	(4)	(5)	(6)
	GP visits due to					Prescription of
	Psychological	Depression	Anxiety	Substance	Other	Sick Leave
ITT	0.003	0.000	-0.000	0.001	0.001	0.014***
	(0.003)	(0.001)	(0.001)	(0.001)	(0.002)	(0.004)
Control Mean	.150	.058	.065	.013	.053	.303
N	1254470	1254470	1254470	1254470	1254470	1254470

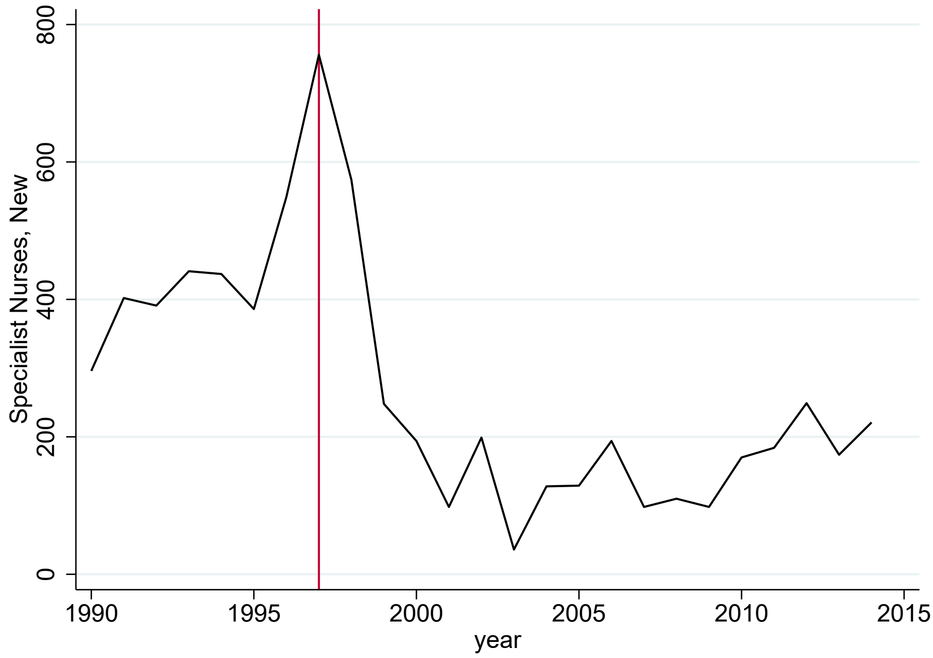
Note: The table includes estimates of γ for model (2). Controls included in the regressions, but excluded from table, are: child's gender, mother's age at birth and education when child is 5 years old, dummies indicating whether mother and child are born in Norway, the number of siblings when child was 5, child's birth order, and whether there is information on the father. All regressions include municipality of residence at age 5 and year of birth fixed effects. The means of the outcomes are measured for children that were 19 or older in 1998. Municipalities with less than 1,500 inhabitants in 1997 are excluded from all specifications. Robust standard errors, clustered at the level of municipality of residence when child was 5 years old, in parentheses. * p<0.1, ** p<0.05, *** p<0.01

Table A17: Classification of Mental Health Conditions

Mental Health Condition Grouping	
Anxiety	P01 Feeling anxious/nervous/tense
	P02 Acute stress reaction
	P06 Sleep disturbance
	P74 Anxiety disorder/anxiety state
Depression	P03 Feeling depressed
	P76 Depressive disorder
	P77 Suicide/suicide attempt
Substance Use	P15 Chronic alcohol abuse
	P16 Acute alcohol abuse
	P17 Tobacco abuse
	P18 Medication abuse
	P19 Drug abuse
Hyperkinetic Disorders	P81 Hyperkinetic disorder
Other	P04 Feeling/behaving irritable/angry
	P07 Sexual desire reduced
	P08 Sexual fulfilment reduced
	P09 Sexual preference concern
	P10 Stammering/stuttering/tic
	P11 Eating problem in child
	P12 Bedwetting/enuresis
	P13 Encopresis/bowel training problem
	P20 Memory disturbance
	P22 Child behaviour symptom/complaint
	P23 Adolescent behav. Symptom/complt.
	P24 Specific learning problem
	P25 Phase of life problem adult
	P27 Fear of mental disorder
	P28 Limited function/disability (p)
	P29 Psychological symptom/complt other
	P70 Dementia
	P71 Organic psychosis other
	P72 Schizophrenia
	P73 Affective psychosis
	P75 Somatization disorder
	P78 Neuraesthenia/surmenage
	P79 Phobia/compulsive disorder
	P80 Personality disorder
	P82 Post-traumatic stress disorder
	P85 Mental retardation
	P86 Anorexia nervosa/bulimia
	P98 Psychosis NOS/other
	P99 Psychological disorders, other

Note: This table presents the grouping of mental health problems based on the ICPC-02 diagnoses.

(a) All newly specialized nurses in the relevant fields



(b) All new graduates in nursing or caring (all fields)

Figure A1: Number of Newly Graduated Nurses in Norway

Note: Panel (a) includes specialized nurses graduating in the relevant fields to be a school nurses, these includes those the following degrees: public health nursing undergraduate degree (NUS2000 code 661101) or two-year master degree (NUS2000 code 761115) and those graduating with a supplementary education in psychiatric nursing (NUS2000 code 661117). Panel (b) includes all nurses, that is all degrees with codes starting with 661."

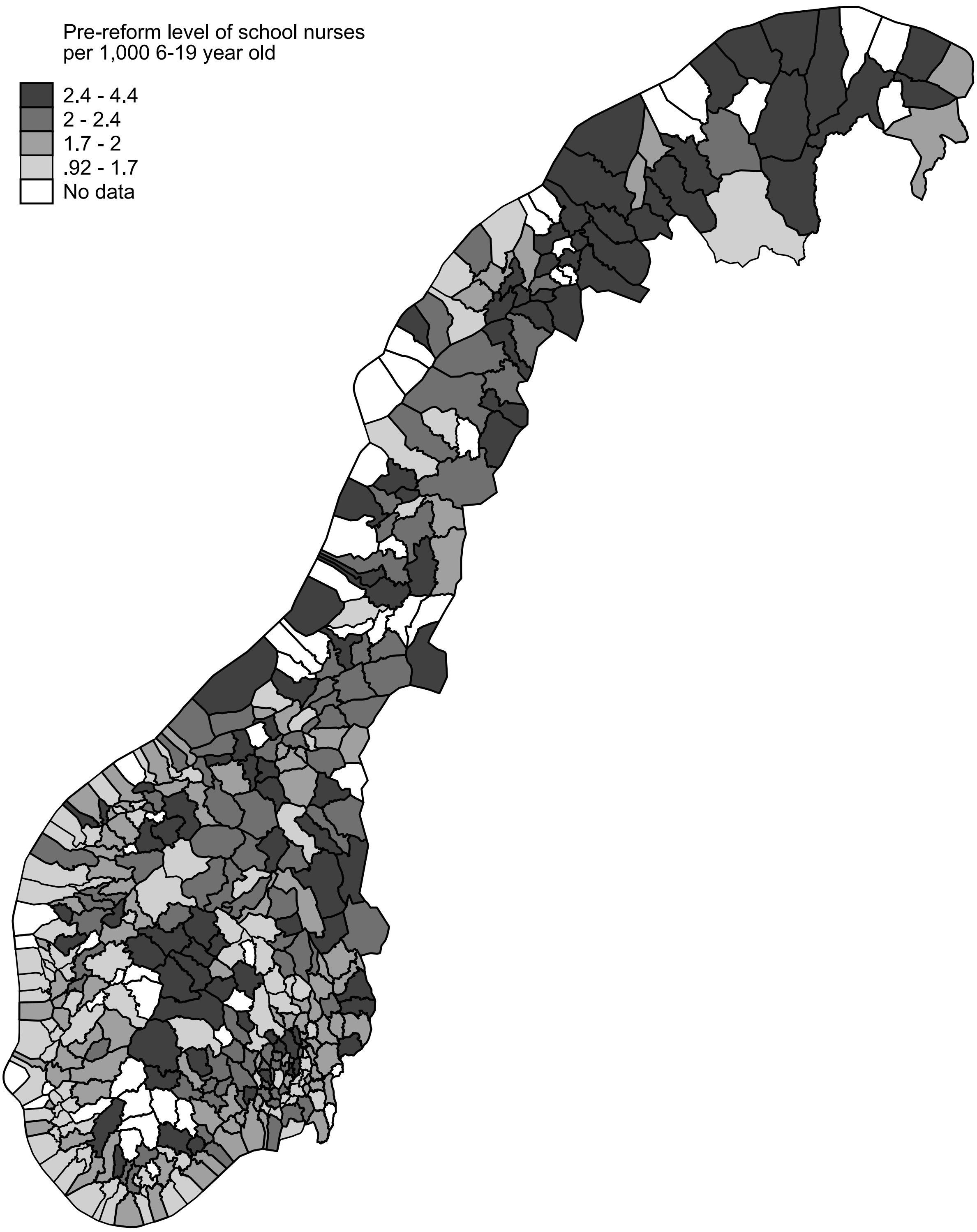


Figure A2: Regional Variation in Treatment Intensity

Note: The map shows variation in pre-reform levels of school nurse coverage, defined as school nurses per 1,000 6-19 year old, across municipalities in our preferred sample where we exclude municipalities with less than 1,500 inhabitants in 1997 are excluded. Pre-reform period is defined as 1995-1997. The darker shades indicate a higher school nurse coverage.

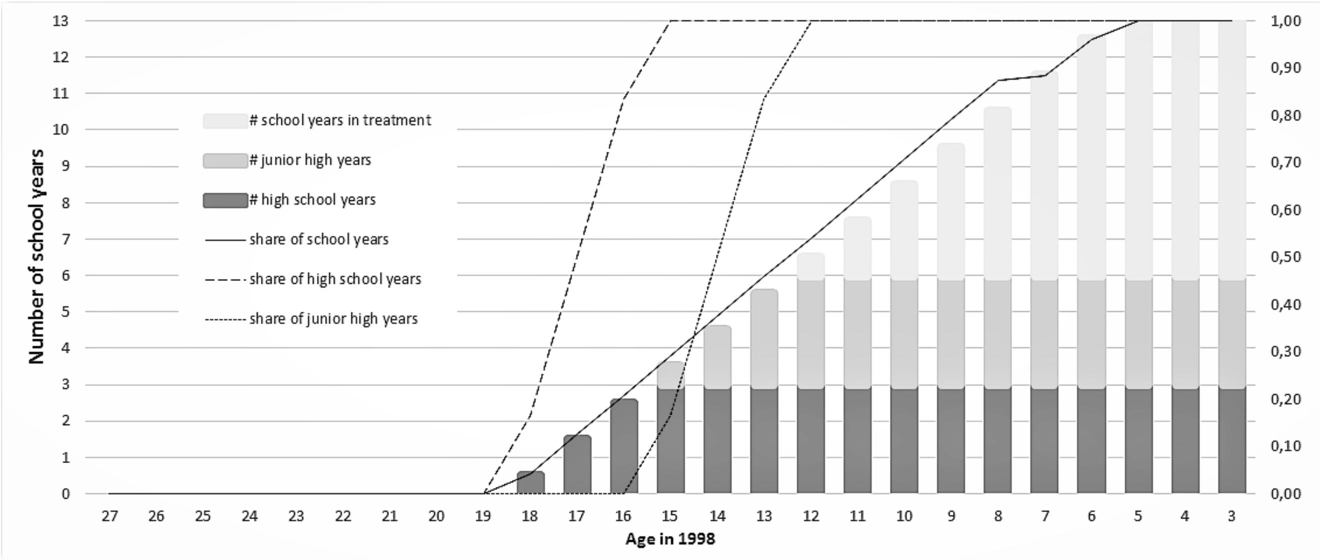


Figure A3: Treatment Exposure by Age

Note: The graph shows the number of school years (left hand side y-axis) and the share of the total school years (right hand side y-axis) exposed to the reform, by the age of the child in 1998 (the year before the reform). The kink in the share of school years appears because of the 1997 reform that changed school starting age from age 7 to age 6.

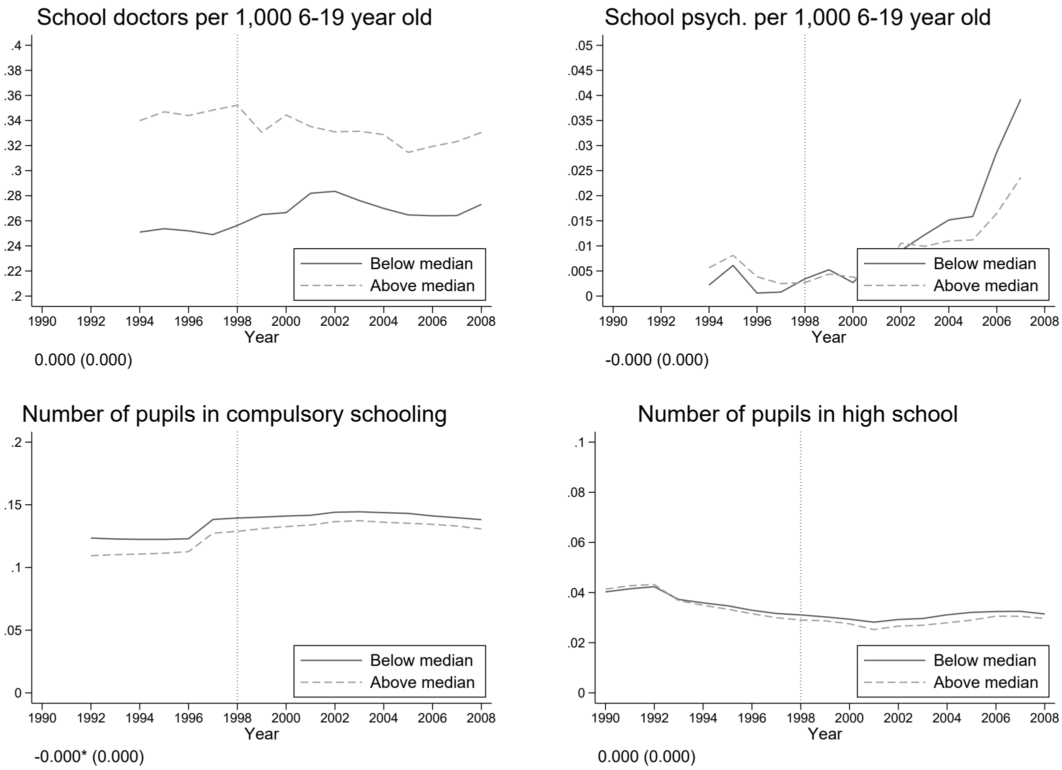


Figure A4: Municipality characteristics: school resources

Note: Municipalities are split according to whether they fall below (solid line) or below (dashed line) the median of the distribution of the pre-reform level of school nurses per 1,000 children. Municipalities with population below 1,500 inhabitants are excluded. In the bottom left corner of each figure, we include the estimates of coefficient δ_2 in the following model estimated for the years when data is available:

$$y_m = \delta_1 + \delta_2 I_m \times t + \delta_3 t + \mu_m + \theta_t + \varepsilon_m \quad (11)$$

where I_m is the pre-reform coverage between 1995 and 1997 and t is a linear cohort trend, μ_m represents municipality fixed effects and θ_t are the year effects.

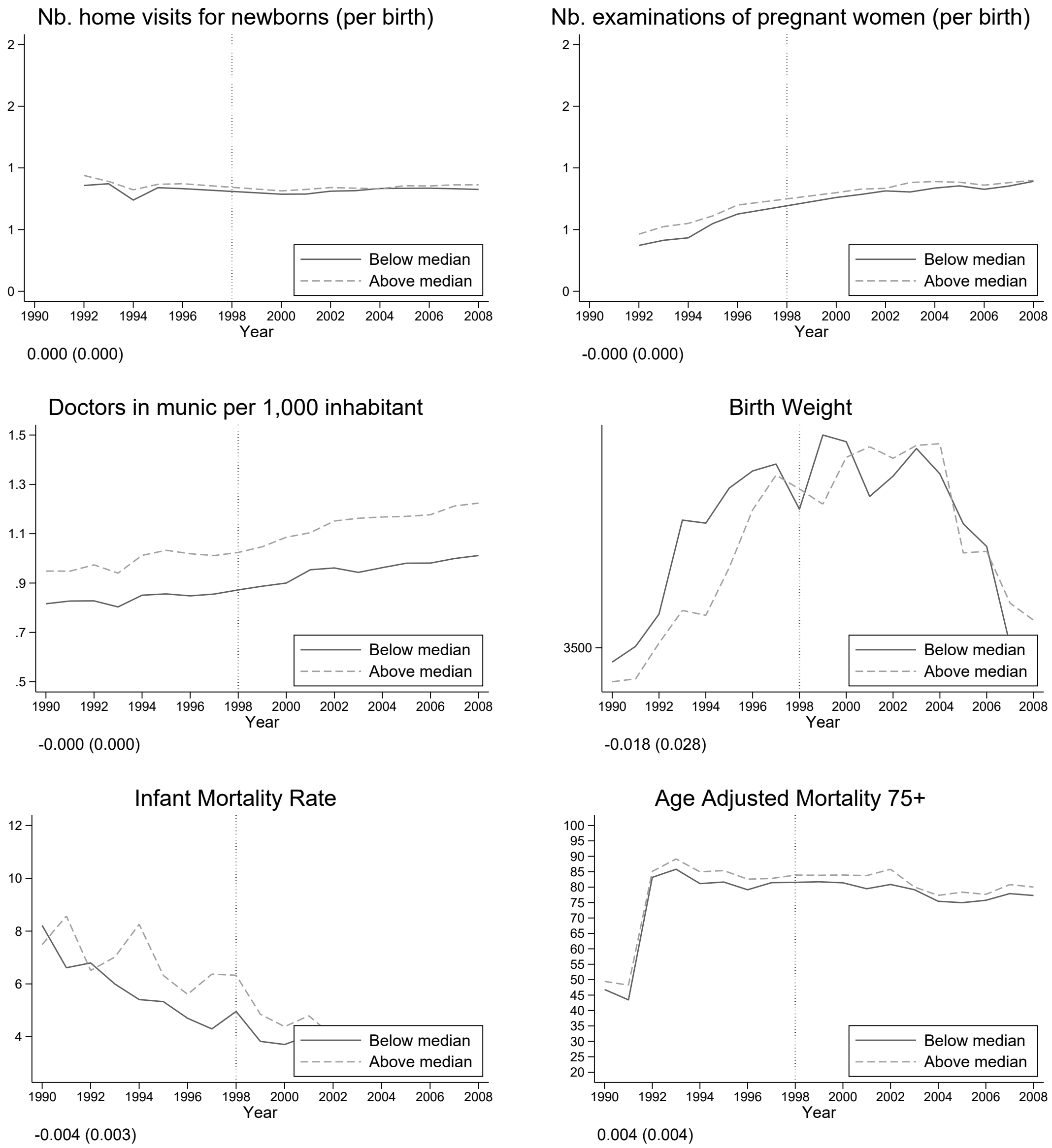


Figure A5: Municipality characteristics: health services early life health and elderly mortality
Note: Municipalities are split according to whether they fall below (solid line) or below (dashed line) the median of the distribution of the pre-reform level of school nurses per 1,000 children. Municipalities with population below 1,500 inhabitants are excluded. In the bottom left corner of each figure, we include the estimates of coefficient δ_2 in the following model estimated for the years when data is available:

$$y_m = \delta_1 + \delta_2 I_m \times t + \delta_3 t + \mu_m + \theta_t + \varepsilon_m \tag{12}$$

where I_m is the pre-reform coverage between 1995 and 1997 and t is a linear cohort trend, μ_m represents municipality fixed effects and θ_t are the year effects.

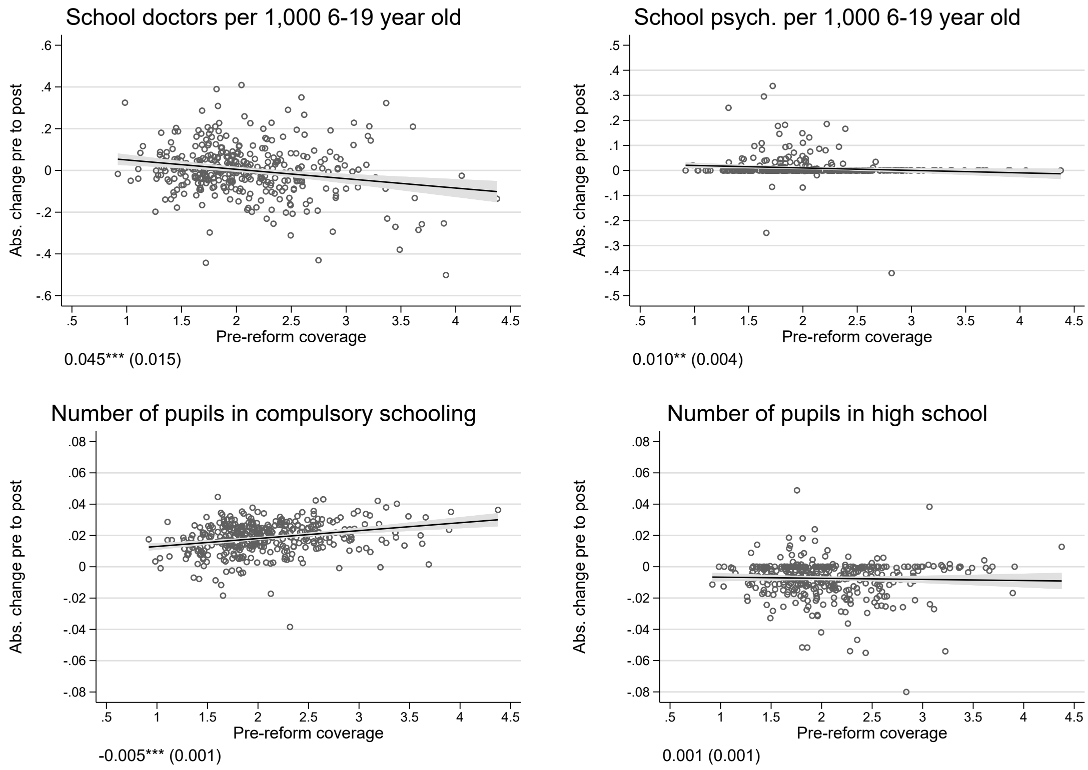


Figure A6: Municipality characteristics: school resources

Note: In the graphs, the pre-reform level of school nurses per 1,000 6-19 year old is graphed against the change in each outcome from the pre-reform period to the post-reform period. The solid line shows the fitted values with a 95% CI. In the bottom left corner include for $\hat{\alpha_1}$ of the following model

$$\Delta Cov = \alpha_0 + \alpha_1 I_m + \varepsilon$$

where ΔCov is the change in coverage between the baseline (ie, average between 1995 and 1997) and 2008 and I_m is the negative of the pre-reform coverage between 1995 and 1997. Municipalities with less than 1,500 inhabitants are excluded.

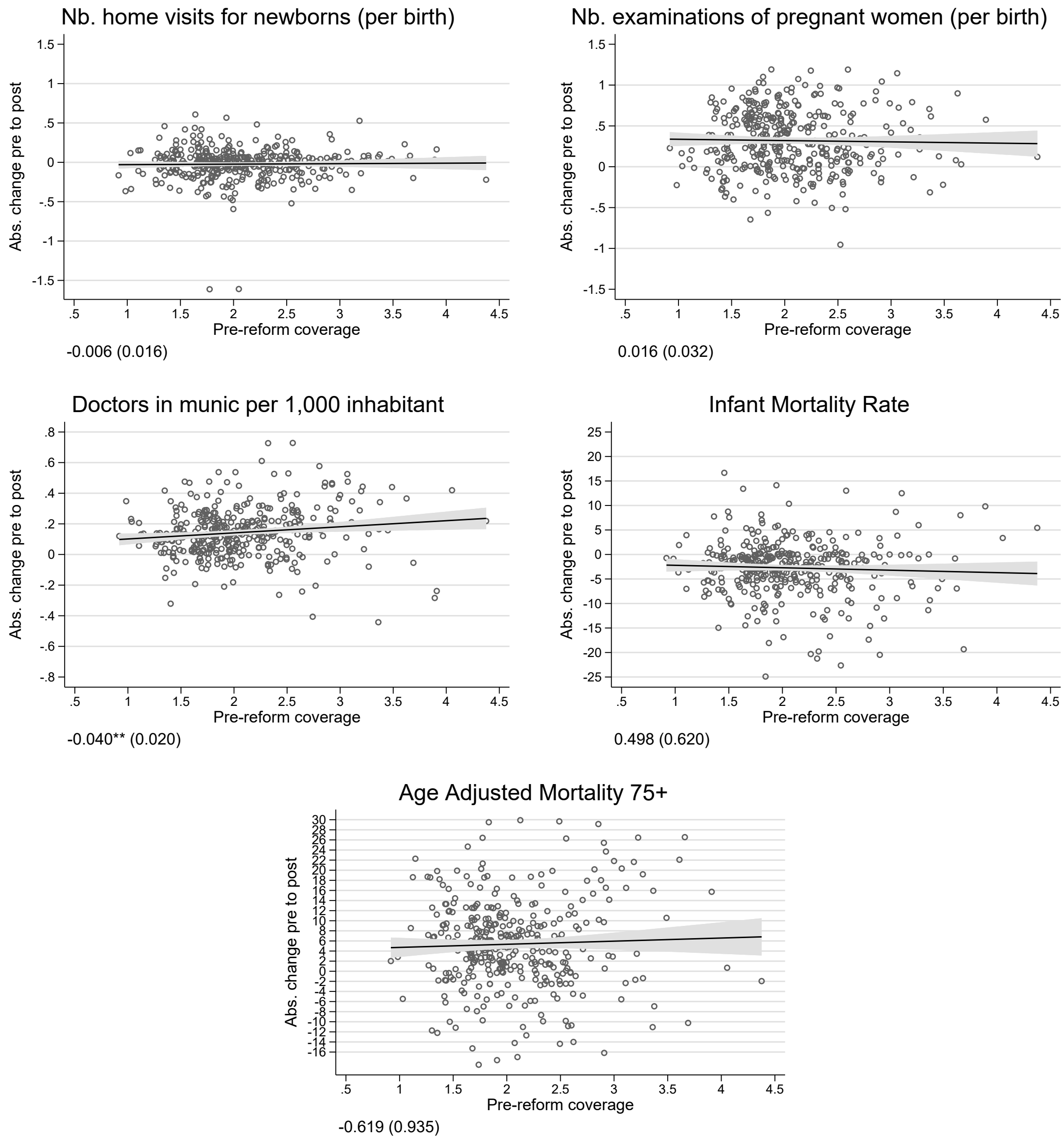


Figure A7: Municipality characteristics: health services early life health and elderly mortality
Note: In the graphs, the pre-reform level of school nurses per 1,000 6-19 year old is graphed against the change in each outcome from the pre-reform period to the post-reform period. The solid line shows the fitted values with a 95% CI. In the bottom left corner include for $\hat{\alpha_1}$ of the following model

$$\Delta Cov = \alpha_0 + \alpha_1 I_m + \varepsilon$$

where ΔCov is the change in coverage between the baseline (ie, average between 1995 and 1997) and 2008 and I_m is the negative of the pre-reform coverage between 1995 and 1997. Municipalities with less than 1,500 inhabitants are excluded.

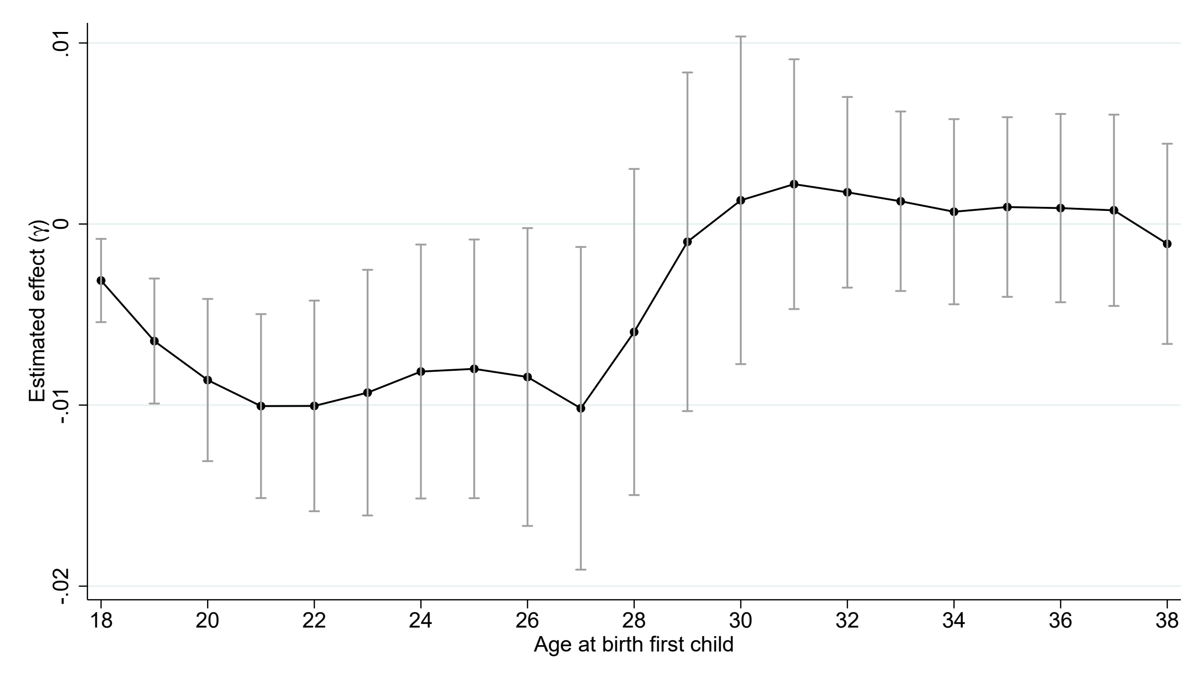


Figure A8: Probability of having first child at a given age

Note: The dots in the graph represent estimates for γ from model (2) along with the 95% confidence intervals. One regression is estimated for the probability of giving birth to the first child at ages between 18 and 38. Controls included in the regressions, but excluded from table, are: child's gender, mother's age at birth and education when child is 5 years old, dummies indicating whether mother and child are born in Norway, the number of siblings when child was 5, child's birth order, and whether there is information on the father. All regressions include municipality of residence at age 5 and year of birth fixed effects. The means of the outcomes are measured for children that were 19 or older in 1998. Municipalities with less than 1,500 inhabitants in 1997 are excluded from all specifications. Robust standard errors, clustered at the level of municipality of residence when child was 5 years old, in parentheses. * $p<0.1$, ** $p<0.05$, *** $p<0.01$

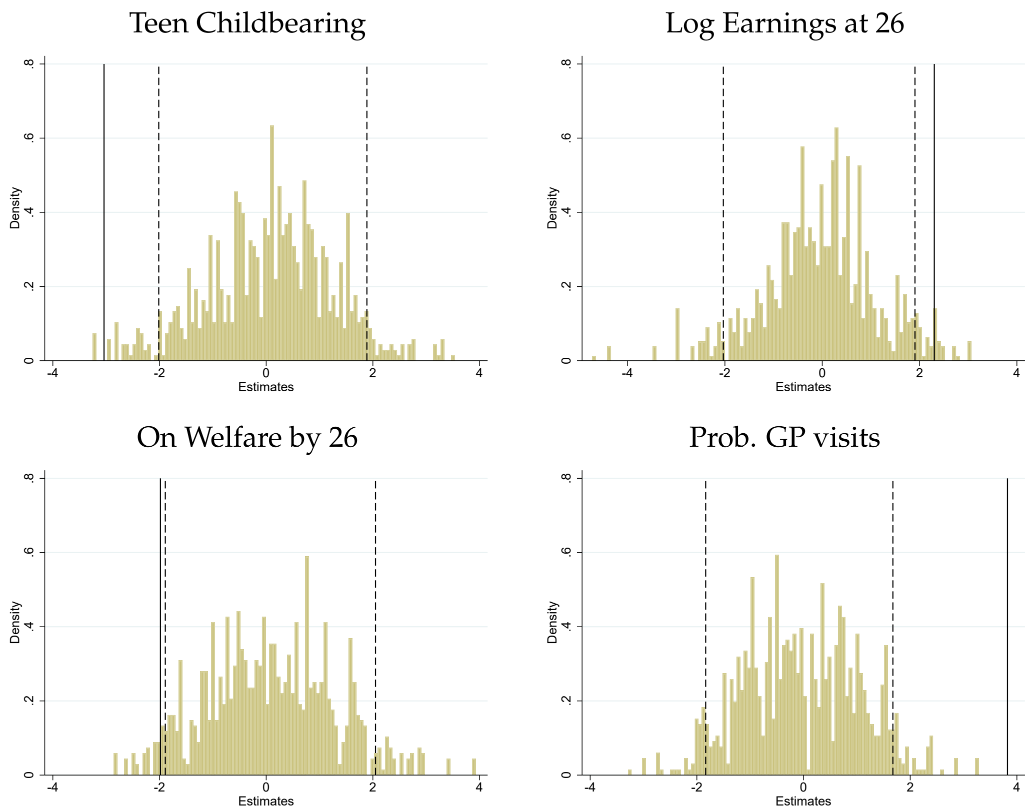


Figure A9: Randomized Inference Analysis

Note: The figure presents the distribution of estimates of γ for model (2). The vertical solid lines are the t-statistics for the actual estimate for γ; the dashed lines are the 5th and 95th percentiles of the distributions of placebo treatment effects.