

Healthcare for newborns has long-term benefits



By Therese Nilsson

Photo 1920: Karl Pettersson, property of Stadsmuseet, Stockholm.

Recent research at IFN finds that free infant care during the first year of life has not only substantial positive short-term health effects, but also positive long-term effects. These services, including the provision of soft inputs to parents, also seem to have positive welfare effects over the life span in other respects, such as through improved cognitive skills and labour market outcomes. The effects are particularly strong for women.

Services such as prenatal and infant care, are usually considered to contribute to improved public health, while free and universal access to this kind of services has been identified by the UN as a Millennium Development Goal for the world's poor. But the question of availability of infant care is also highly relevant in developed countries. For example, there has been a discussion in Sweden concerning whether regular visits to childcare centres during the first year of life should be free or at a cost. However, very little is known about the effects of these services, and in particular with regard to their medium- and long-term effects (Almond and Doyle, 2011). On-going research at the IFN is about to change this. In a

broad project, we examine the effects of a number of Swedish reforms implemented in the early 20th Century.

The importance of the first year of life

Epidemiologist David J. Barker (1992) hypothesized that chronic, degenerative conditions of adult health may be triggered by events decades earlier. He specifically focused on the role of nutrition in utero, arguing that inadequate feeding during pregnancy might program the fetus to adopt metabolic characteristics that later would make the individual more susceptible to diseases—what has become known as the Barker hypothesis.

In order to identify the existence of such an effect, economists have investigated the effects of a broad range of conditions affecting children in utero and in early life for socioeconomic outcomes in adulthood. This body of research has identified a large number of effects that are consistent with the Barker hypothesis, and also a range of effects on educational attainment and income (for an overview see Almond and Currie, 2011).

Prominent examples of economics research that derive causal conclusions based on exogenous conditions in utero and in early life include Almond (2006), who finds a significant effect of exposure to the 1918 Spanish flu pandemic on adult wages and welfare dependence, and Black et al. (2007), who find a negative effect of low birth weight on educational attainment and earnings later in life.

An exogenous event like a pandemic can certainly increase our knowledge about causal effects, but can rarely help us understand what effects political initiatives may have. Yet there is a very limited set of studies examining exposure to policy in early life (for notable exceptions see Bharadwaj et al. (2013), Bhalotra and Venkataramani (2016), Bütikoffer et al. (2015) and Hjort et al. (2016)). The main reason for this knowledge gap is that it is very rare that public services are randomly allocated (Todd,

2007), making it hard to determine causality.

Examination of policy-induced differential treatment is also of interest since it allows us to gain knowledge about parental investments in children. For instance, Almond and Mazumder (2013) emphasise that we have very limited knowledge regarding how parents respond to the fact that their children have been part of government programs, whether this makes parents invest less or more in the children.

The introduction of infant care trial in Sweden

The Swedish welfare state is often thought of as having been built up after the Second World War. But in many respects it dates further back, since many programs were initiated already at the beginning of the 20th century. These welfare reforms included a wide range of measures, including pensions, education and health insurance. They were for the most part quite generally accepted (perhaps with the exception of the pension reform). But reforms were far more controversial in areas relating to family organization, and attempts to equalize economic and social conditions (Lundqvist, 2011; Nyberg, 2012).

Infant mortality decreased significantly in Sweden during the first two decades of the 20th century, but from the 1920s onwards there were only marginal reductions. In the late 1920s, infant mortality had remained at the same level of around 6 percent for almost a decade. At the same time deaths occurring during the first few days of life increased. This caused an intense public debate about how to improve conditions for new-borns, and whether to facilitate access to, and make more systematic use of, existing child health expertise.

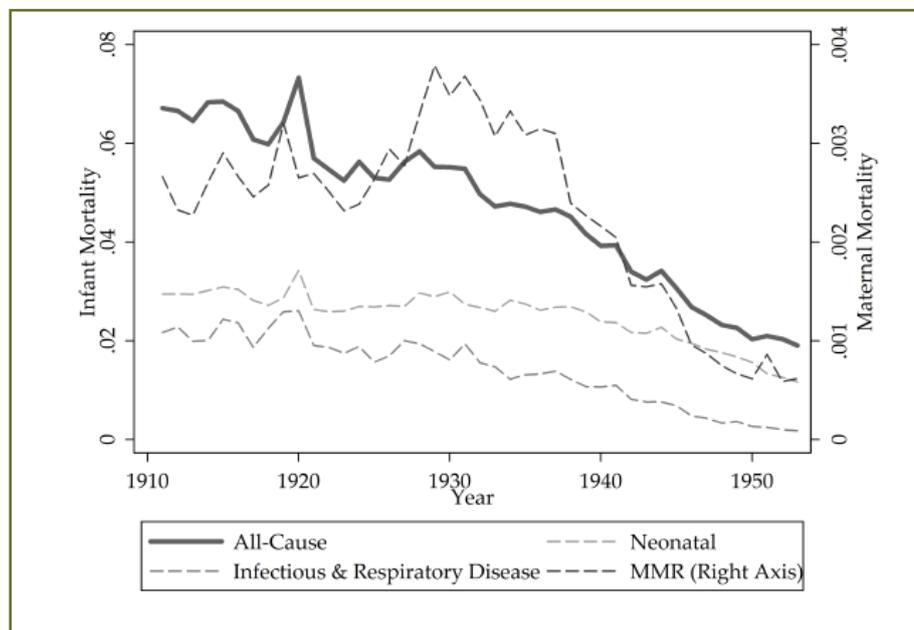
The debate gave rise to a proposal to arrange a trial that would offer free infant care in some areas of the country, areas that should accurately reflect the diversity of the country's various local conditions with respect to inter alia population density, demographic structure and standard of living. The trial was implemented in 1931–1933, and was a precursor to

legislation that rolled out free infant care nationwide from 1937 as part of the further expansion of the welfare state.

Health care surgeries were opened in certain areas. They had regular opening hours, and placed special emphasis on giving equal access and care to all children, regardless of socioeconomic background. The main activities focused on preventive care and included guidance services and examinations at the surgeries, home visits and information campaigns including instructions on hygiene, breastfeeding and appropriate nutrition.

Families having access to the free infant care were, among other things, provided with an illustrated leaflet (see Figure 2) with advice on appropriate feeding of infants and special instructions on the importance of breastfeeding. At the time it was not

Figure 1 – Trends in child mortality



uncommon to feed infants with cow milk, which they cannot digest. The leaflet also included advice on cleanliness in the household and how to sanitize a baby's room. Many families lived in cramped conditions, sanitary standards were poor, and pests such as lice, mange and rats were rife.

The fact that these changes were implemented in certain areas, while other areas of the country made no changes, implies that the authorities unknowingly undertook an experiment in conditions that allow us to draw some conclusions concerning causal effects. In modern economic parlance, the areas where the programs were introduced received "treatment". The quality of this controlled experiment is further enhanced by the fact that the treated areas were representative of the country. Together with almost universal enrolment of individuals in the treated areas, this enables us to draw interesting conclusions concerning the causal effects of the policies.

Infant care causes a substantial increase in longevity

To examine if and how the infant care trial improved individual health, we have constructed a unique data set with digitized birth certificate data from parish records. These records in turn are matched to death registers for more than 25,000 individuals. Our empirical analysis (for details see

Figure 2 – Illustration from leaflet provided within the infant care trial



Advice on appropriate feeding of infants and cleaning practices from leaflet provided within the infant care trial. The illustration to the left emphasizes the importance of breastfeeding and the danger of feeding infants with cow milk, which they cannot digest. The mother breastfeeds her baby and the baby says to the cow: "Go away! I have my mother."

Bhalotra et al., 2017) suggests that the reform led to substantial improvements in infant survival, but also to improvements in longevity for other reasons. This finding is consistent with the hypothesis that poor infant health creates structural changes that predict the onset or progression of chronic disease in later life.

We estimate that an individual who took part in the program during infancy for the average duration experienced a 24% reduction in infant mortality risk and a 7% reduction in the risk of dying by the age of 75 – an age by which almost 40% of their cohort had died. Our estimates imply that the programme accounted for between 20 and 50% of the overall decline in infant mortality, and was associated with reductions

in mortality that persist to this day.

It is interesting to note that the observed longevity effect is stronger for vulnerable groups, for instance children born out of wedlock. We also found that children to young mothers seemed to gain relatively more than children to older mothers, and that there were positive health effects for children to mothers who had previously experienced a child death. However, the trial did not find a different health impact on girls and boys. As the infant care reform coincided with the Great Depression in Sweden, it also seemed relevant to examine differences in impact by severity of the crisis at the parish level, but we found no such differences.

To highlight the role of parental investments in children, we have explored the fact that our data set includes information about older and younger siblings to the treated and non-treated individuals. The evidence suggests that parental efforts favoured children that were part of the trial compared to older siblings born before the treated child. On the other hand there is also evidence suggesting that there were important learning effects from the intervention for younger siblings that were born after the trial.

Why does infant care increase longevity?

For younger children the programme emphasised the importance of breast-feeding, but also advised mothers on how to properly prepare formula with clean water. For children older than six months, the intervention included dietary advice, such as the recommendation of a diet including fibre, vegetables and fresh fruit. The medical literature suggests that these elements of the programme may have reduced gastric diseases. Intestinal flora is thought to build up early in life and inadequate flora increases the risk of intestinal inflammation, which in turn may initiate genetic mutations (Kumar et al., 2015; Rinne et al., 2005).

For the population we are following, the main causes of death are cardiovascular disease, cancer and infections. But individuals that received infant care during the first year of life have had a reduced risk of death from colorectal cancer. Overall, it thus seems that it was nutritional improvements in infancy brought about by the intervention that have reduced cancer mortality in adulthood. These findings have the potential to influence current global health priorities by highlighting that large gains in terms of improved infant health and reduced chronic disease may be achieved by relatively low-cost and scalable interventions.

Additional welfare benefits over the life span

An important contribution of economists to the literature on health and early life events has been the modelling of child development as a production process. Cunha and Heckman (2007 and 2008) develop a modelling framework of skill formation emphasizing that critical and sensitive periods in a child's development. From this research, the early years in life particularly seem to represent a crucial period for the development of cognitive and non-cognitive skills.

Based on this work, and the findings that nutrition was an important mediator when examining health effects, it is reasonable to expect that the trial introducing free infant care to

parts of Sweden in the early 1930s not only had an impact on longevity, but also on test scores and educational attainment. Theoretically such education effects can either be direct, though e.g. improved nutrition in turn improving cognitive skills, or indirect, through e.g. improved health that in turn makes it easier for a child to assimilate school education. In the wake of these postulated educational effects are potentially a range of other outcomes, such as higher income, better employment and labour market outcomes.

In on-going research we are now extending the project by collecting information on school test scores and sickness absence at age 7 and 10 (grade 1 and 4 of Swedish compulsory schooling), and later life information about completed levels of education, labour market outcomes and pensions, which we will merge into our data set. In comparison to previous studies on the effects of health interventions in early life, we can study not only long-term effects (see e.g. Bharadwaj et al., 2013; Bütikofer et al., 2015, Hjort et al., 2016), but also medium-term effects. This can give us a better understanding of how and when long-term effects are seen. Having information on test scores also gives us a unique opportunity to study cognitive attainment, which impacts adult income and employment conditional on years of education.

Preliminary results (for details see Bhalotra et al., 2016) suggest that the 1930s infant intervention had a positive effect on academic attainment driven by improvements in reading, speaking and writing in fourth grade. The magnitude of the effect is quite small, but in line with the very limited literature using test score data (see Bharadwaj et al., 2013 examining the effect on educational test scores of modern advanced neonatal treatment for premature children). Interestingly, the trial did not significantly reduce sickness absence.

In contrast to the quite small medium-term effects there are large, positive long-term effects for females. Females that received infant care during the first year of life were more often enrolled in secondary schooling, had a larger propensity to work fulltime and had higher incomes than their peers that did not have access to the care services. However, there does

not seem to be any such improvements for males.

A preliminary examination of the potential mediators for the long-term effects for females and males suggest that ability and higher returns from education for women, together with increased access to public secondary schooling for girls in the 1930s, led to increased human capital investment for the treated females. In addition the later expansion of the Swedish welfare state in the period 1950–1970 pulled these well-educated females into the labour force. When the welfare state expanded there was a high demand for skilled labour but also a general demand for female labour. The empirical analysis suggests that females who had been part of the trial started to work in the public sector and were more likely to work in the local municipal and central government (public) sector.

At the same time the data tell us that males who received infant care and then performed better in compulsory education to a larger extent took on apprenticeship education that generated specific craft skills compared to males in the control group. While specialised craft skills had traditionally implied a favourable career, the cohorts of the 1930s met a different labour market in the 1950–1970 period (Nilsson, 2013). Technological change, e.g. new building methods which were more industrialised, shifted demand towards more general skills that that could be supplied by less educated and less costly workers.

All in all, our research points to that free infant care during the first year of life has important positive short-term health effects, but also positive medium- and long-term effects on health, cognition and labour market outcomes. These results suggest that relatively low-cost and scalable interventions can address not only the origins of chronic disease, but also inequalities, and can have substantial impact over the life span.

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