Research evidence on early life health

A growing body of economic research is exploring the influence of pre-natal and early childhood conditions on later life outcomes and future generations. A recent CMPO workshop, organised by *Sonia Bhalotra*, discussed some of the latest findings.

There is growing evidence of the long-term benefits of 'investing' in children's health, and recognition that investments made during critical periods of their development draw larger returns – and, conversely, that failure to invest can lead to irreversible damage. The origins of life in the womb constitute one such period, when growth is rapid and neurological and physiological development is particularly sensitive to the environment.

Nutritional deprivation, for example, appears to lead to permanent changes in tissue structure and function that help the foetus survive, adaptively, through pregnancy. At the same time poor nutrition *in utero* exacts a penalty in terms of later life outcomes such as, diabetes and cardiovascular disease, reduced adult height, obesity among women and lower cognitive outcomes and earnings.

Some studies have directly analysed sharp disruptions in mothers' nutrition as a result of famine. The Great Chinese Famine of 1958-61 and the Dutch famine of 1944, known as the 'hunger winter', are examples. Others have used recessions in pre-industrial settings or recessions and infant mortality rates in developing countries as proxies for nutritional 'shocks'.

Further studies have documented long-run consequences of exposure of pregnant mothers to infection and radiation. Studies of the impact of smoking on birthweight naturally blend into this research literature too, smoking being a form of pollution and birthweight an often-used proxy for longer-term effects.

The studies presented at the recent CMPO workshop offered important new contributions to this rapidly advancing field. Most are summarised by the authors in the following pages; below is an overview.

Health shocks during pregnancy

A paper by Elaine Kelly explores the consequences of *in utero* exposure to the Asian influenza pandemic which struck Britain in 1957-58. The findings indicate significant detrimental effects of the epidemic on intrauterine growth and, conditional on birthweight, on test scores at 7 and 11. These effects are either restricted to or more pronounced among women who are relatively short or who smoke during pregnancy.

Kelly's findings reinforce earlier research by Douglas Almond, which documents the lasting impacts of the Spanish flu pandemic of 1918 in the United States.

Almond is co-author of the next paper (with Bhaskar Mazumder), which investigates the effects of the nutritional shock of maternal fasting during pregnancy. Thousands of Muslim women invite nutritional disruption by fasting through the month of Ramadan each year. This study finds that pre-natal exposure to Ramadan results in lower birthweight, reduced gestation length, a reduced probability that the birth is male, increased likelihood of learning disabilities in adulthood and adverse effects on schooling, earnings and measures of wealth.

Environmental conditions in childhood and intergenerational effects

Nutritional deprivation in childhood is more closely tied to aggregate income in poorer countries. A study by Gerard van den Berg and colleagues set in 19th century Denmark shows that individuals born in recessionary conditions are more likely to suffer cardiovascular disease in later life but they appear to be no more likely to suffer from cancer. The effects of genetic factors and family background are stronger when early life conditions are poor.

Sonia Bhalotra and Samantha Rawlings suggest a similar finding using data for 38 developing countries. The influence of maternal health on child health is stronger when early life conditions are poorer. Maternal health is indicated by height, which incorporates genetic and family background influences. Since adult height is an indicator of the scars of environmental deprivation in childhood, this suggests an intergenerational impact of early childhood conditions.

Bhalotra's work in progress establishes this directly, showing effects of nutrition and infectious disease in the mother's birth year on the survival chances of her children. These effects hold conditional on the mother's height. This indicates that while height captures some of the scars, mothers are scarred in ways that are not captured in height and which have an impact on the next generation.

As long ago as the 1920s, scientists cautioned against adding a known poison to petrol, highlighting the effects of lead on birthweight, sperm abnormalities, neurological development and the risk of stroke and heart disease. Four decades later, a series of regulations were introduced across the United States and Europe in the early 1970s with a view to phasing out lead in petrol.

Peter Nilsson analyses the impact of the phase-out in Sweden, which ran from the late 1970s through to the mid-1990s. He finds that reduced exposure early in life improves cognitive performance and labour market outcomes among young adults, and more so among families of low socio-economic status.

This issue remains topical. Lead pollution is now concentrated in developing countries although rapid phasing out is currently in progress. Initially, US corporations exported their lead additives overseas, using the profits to finance diversification at home.

More recently, international donors and corporations are helping developing countries achieve a phasing out. Britain has not completed its phasing out of lead in petrol, and there remains lead exposure from sources other than petrol such as lead-based paint, pipes or toys in many developed countries.

The long-term benefits of investments in foetal and early childhood health

Together, these studies present compelling evidence to suggest that the benefits of investments in foetal and early childhood health may extend into adulthood and, through mothers, into the next generation.

To what extent can pregnant mothers function as an effective buffer for the foetus against poor environmental conditions? The buffering capacity of mothers may explain why the effects in some studies are small or insignificant. It probably explains the heterogeneous effects documented by Kelly, whereby children of short mothers or mothers who smoke during pregnancy are most affected by the mother contracting influenza.

It may similarly explain Bhalotra and Rawlings' finding of a stronger impact of mother's height on neonatal mortality among mothers of relatively short stature and, for a given maternal stature, the greater sensitivity of neonatal mortality to shocks to income or public health among relatively short women.

The significance of maternal height indicates that it is not only the contemporaneous health of the mother or health during pregnancy that counts but rather the stock of her health. In view of evidence that adult height is sensitive to the early life health environment, this brings into focus intergenerational impacts flowing from the early life of the mother.