Conference Report

STUNTING
PAST ▪ PRESENT ▪ FUTURE

7th – 8th September 2017

Conference as part of the ESRC-funded project
'Child Growth: The Long View' (ES/L010267/1)

Organised by: Dr Eric Schneider

LSE Knowledge Exchange and Impact

CEPR Centre for Economic Policy Research

LSE Economic History

E·S·R·C Economic & Social Research Council

Executive summary

Child malnutrition is a very important global health challenge. 155 million children globally suffer from malnutrition and are consequently stunted, much shorter than healthy children at the same age. Reducing stunting was an important target in the Millenium Development Goals and is also a target under Goal 2 of the Sustainable Development Goals. This report summarises recent research on child stunting that was presented and discussed at a conference, **STUNTING: PAST, PRESENT AND FUTURE**, at the London School of Economics and Political Science in September 2017. The conference brought together academics across a wide range of disciplines with policy experts and influencers from the third sector.

There were four key lessons that participants took away from the conference.

First, stunting was present in currently developed countries at the beginning of the twentieth century, which suggests that reductions in stunting were a corollary to the secular increase in mean adult height across the twentieth century.

Second, there needs to be more research on catch-up growth in adolescence to determine whether catch-up growth in height is also associated with improvements in other dimensions of health and human capital that are affected by malnutrition, for instance cognitive deficiencies. If interventions in adolescence can be effective, then it may be possible to mitigate some of the consequences of stunting for already stunted children.

Third, researchers need to be aware of the large degree of spatial variation in stunting within countries and the distinct age pattern of stunting between ages 0 and 5 when trying to understand why children become stunted.

Fourth, participants agreed that more interdisciplinary collaboration is necessary to design experiments and models to capture the multi-dimensional nature of child stunting. ■

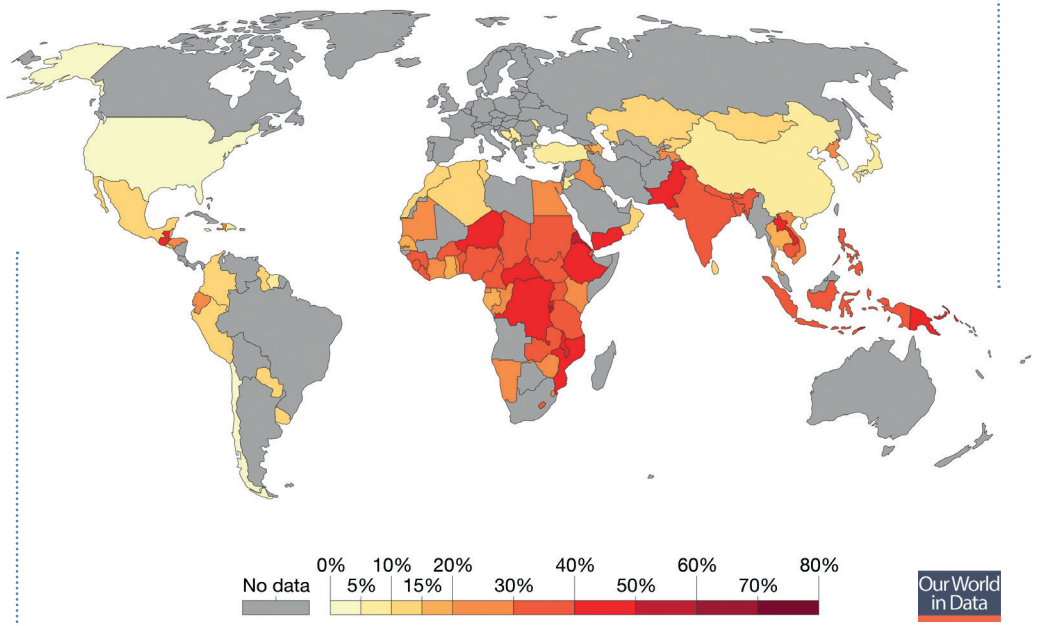
Opposite and above left: The conference was well attended.

Above centre: Tim Cole.

Above right: Tharshini Thangavelu.

Child Stunting: A Global Health Challenge

Child malnutrition is one of the most persistent and pressing global health challenges in the world today. While there has been a reduction in child stunting rates from 39.5 percent in 1990 to 22.9 percent in 2016, 155 million children worldwide still suffer from stunted growth (defined as 2 standard deviations below the median of the age- and gender-standardized WHO growth standards). Accordingly, reducing child stunting is a target under Goal 2 'End hunger, achieve food security and improved nutrition, and promote sustainable agriculture' of the Sustainable Development Goals. Stunting is most common in Africa, South Asia and Southeast Asia (see map).



Source: World Bank – WDI

OurWorldInData.org/hunger-and-undernourishment/ • CC BY-SA

Share of children who suffer from stunting, 2015

Share of children younger than 5 years that fall below two standard deviations from the median height-for-age of the WHO Child Growth Standards. When data for the indicated year is not available the closest observation is shown (within a tolerance of 5 years).

Victora et al. (2010) described the typical pattern of stunting using data from 54 low- and middle-income countries largely drawn from Demographic and Health Surveys (DHS). They found that child birth length in many developing countries was only moderately below WHO standards, but that children grew too slowly relative to the WHO standards up to the age of 24 months. The children then maintained their position relative to healthy children from age 24 months to 60 months, with mean height-for-age Z-scores falling between -1 and -2 standard deviations and a considerable percentage of children falling below the stunting threshold. Thus, most children who face growth faltering become stunted between birth and 24 months, suggesting that interventions need to be targeted at children at these early ages to prevent stunting. This idea has been transformed into the 1,000 days policy initiative, which focuses policy makers' efforts at interventions on the nine months a child is in utero and first two years of life, approximately 1,000 days.

Stunting matters not only because it is associated with misery for the children who experience it, but also because it has long run consequences for the children later in their life. Stunted children perform poorly on cognitive tests, receive fewer years of schooling, have lower incomes as adults, and are more likely to live in poverty (Hoddinott et al. 2013). Reducing stunting can increase the capabilities and welfare of a population many years into the future.

Above: Subu Subramanian

Most children who face growth faltering become stunted between birth and 24 months

In addition to child growth faltering, recent research has highlighted the increase in the global prevalence of childhood overweight and obesity with 6 per cent of children overweight globally as of 2016 (Black et al. 2013; Tzioumis et al. 2016). Not only is overweight becoming more prevalent, but it is also found to co-occur with stunting in the same regions, households and even the same individuals. It is increasing fastest in high income countries, but there is a considerable burden among low- and middle-income countries as well, especially in Africa (Black et al. 2013). Overweight prevalence is less strongly associated with household wealth than stunting, suggesting that the availability of cheap, calorie-dense, micronutrient-poor food sources may be playing a large role. Child overweight is associated with immediate and long run risks to an individual's health. Therefore, the dual burden of stunting and overweight adds to the potential health costs for low- and middle-income countries. ■

Causes of Child Stunting

The causes of child stunting are multidimensional ranging from inadequate nutrition in terms of quantity (calories) and quality (balance of micronutrients) to repeated disease insults from poor sanitation, hygiene and pollution. These causes function at the household, neighbourhood, and national level, making it particularly difficult to design effective interventions.

Household

There are a wide number of household-level factors that may influence child stunting. Among the most important is the food that children are given at a young age. Lack of adequate nutrition clearly matters, but mounting evidence also suggests that sources of animal protein in the diet may be particularly important in preventing growth faltering (Headey et al. 2017). The effects of breastfeeding on stunting are less clear since the majority of growth faltering occurs after weaning. In a meta-analysis, Giugliani et al. (2015) found no significant influence of breastfeeding promoting interventions on length in infancy. Household-level hygiene practices are also important, especially access to piped water in the home and hand washing (Nabwhera et al. 2017). Other researchers have emphasised the importance of intra-household resource allocation and gender bias. Jayachandran and Pande (2017) argue that half the gap between Indian and African stunting rates can be explained by preference for first-born sons at the expense of girls and boys of higher birth order. Finally, there are clear associations at the household level between household wealth or income and child stunting. Stunting is far less prevalent in wealthier households, and this association holds across nearly all of the countries studied by Black et al. (2013), though the gaps between the richest and poorest quintile varied across countries.

Above: Alexis Nestour and Cara Flowers.

Below: Deborah Oxley.

Opposite: Hamish Maxwell Stuart.

There are clear associations at the household level between household wealth or income and child stunting

Causes of Child Stunting (continued)

Neighbourhood

At the neighbourhood level, environmental pollutants, sanitation infrastructure, and health services are important for child undernutrition. Bailey et al. (2016) show that exposure to neighbourhood-level coal smoke in late nineteenth century Britain substantially reduced adult stature, likely through an increase in respiratory diseases in childhood. In addition, a number of studies show that the lack of toilet facilities and prevalence of open defecation strongly influence stunting by exposing children to pathogens that lead to chronic diarrhoea and malabsorption of the nutrients they consume (Spears et al. 2013; Lin et al. 2013). Spears (2013) argues that open defecation can explain almost all of the excess stunting in India relative to Africa. Headey et al. (2017) also found that access to health services such as medical facilities for childbirth and antenatal health visits reduced stunting.

National

At the national level, there has been spirited debate over the role of economic growth in reducing stunting rates. Economic growth could lead to rising incomes and tax revenue which would allow households to purchase higher quality diets and local areas to implement sanitation reforms. In fact, when looking around the world today, there is a clear negative cross-sectional relationship between GDP per capita and stunting rates with richer countries having fewer stunted children (Smith and Haddad 2002).

However, the relationship between economic growth over time and reductions in stunting prevalence are less clear. Vollmer et al. (2014) find that the relationship is very small or insignificant, while Alderman et al. (2014) caution that measurement error and the small number of GDP per capita growth observations could be biasing the association towards zero. Aiyar and Cummins (2017) argue that the effects of GDP growth are cumulative over the first two years of life and relatively large by age 2. Despite the debate, it is generally accepted that policies targeted at increasing the economic growth rate will not be a panacea for reducing stunting.

Determining the causes of stunting is difficult because studies at different levels of aggregation and with different methodologies often yield disparate results.

These complex and interlinking causes make it difficult to determine the interventions that will be most effective at reducing child stunting. Part of the problem is that studies at different levels of aggregation and with different methodologies often yield different results. For instance, there is a strong negative association between household wealth and stunting in many DHS datasets (Black et al. 2013), but conditional and unconditional cash transfers have mixed effects on improving stunting outcomes (Ahmed et al. 2016; Baird et al. 2017; Carneiro et al. 2017). Likewise, complementary feeding interventions had mixed effects in reducing stunting (Dewey and Adu-Afarwuah 2008).

However, some of this variation highlights that different factors may be more important in some countries than in others. Headey et al. (2017) use regression decomposition analysis to show that the factors associated with improvements in stunting rates varied across countries with wealth, parental schooling, access to healthcare and bednets being the most important factor depending on the country. ■

Aims and Objectives of the Conference

The conference, **STUNTING: PAST, PRESENT AND FUTURE,** sought to advance research and policy on child stunting in three ways.

1. We took a long run and global perspective on child stunting, integrating research on developed countries over the past 200 years.

2. The conference brought together academics from a broad range of disciplines including the fields of economic history, development economics, sociology, epidemiology, nutrition, statistics, physical anthropology, paediatrics and medicine more broadly. These scholars do not always speak to each other, so there was much to gain from bringing people together to discuss child stunting from their different disciplinary perspectives.

3. Finally, the conference promoted knowledge exchange between academics and policy experts and influencers in the third sector and international organisations: 15 participants attended the conference who were affiliated with institutions as varied as the World Bank, WHO, International Food Policy Research Institute (IFPRI), Save the Children, Institute for Fiscal Studies and Transform Nutrition. These experts provided practical expertise to researchers and contributed to a policy plenary session held at the end of the conference where there was an extensive discussion of how the research presented in the conference might influence policy briefings in the future.

The conference was held over two days (7-8 September 2017) at the London School of Economics and Political Science with two keynote lectures given by Professors S. V. Subramanian (Harvard University) and John Hoddinott (Cornell University), 25 paper presentations, a plenary policy session and a closing discussion. The rest of the report discusses some of the key lessons that were raised during the conference's closing discussion.

There was much to gain from bringing people together to discuss child stunting from their different disciplinary perspectives

Lessons from History

One of the strengths of the conference was the presence of a number of economic and social science historians who study child growth in the very long run. They had three major lessons from the history of now developed countries.

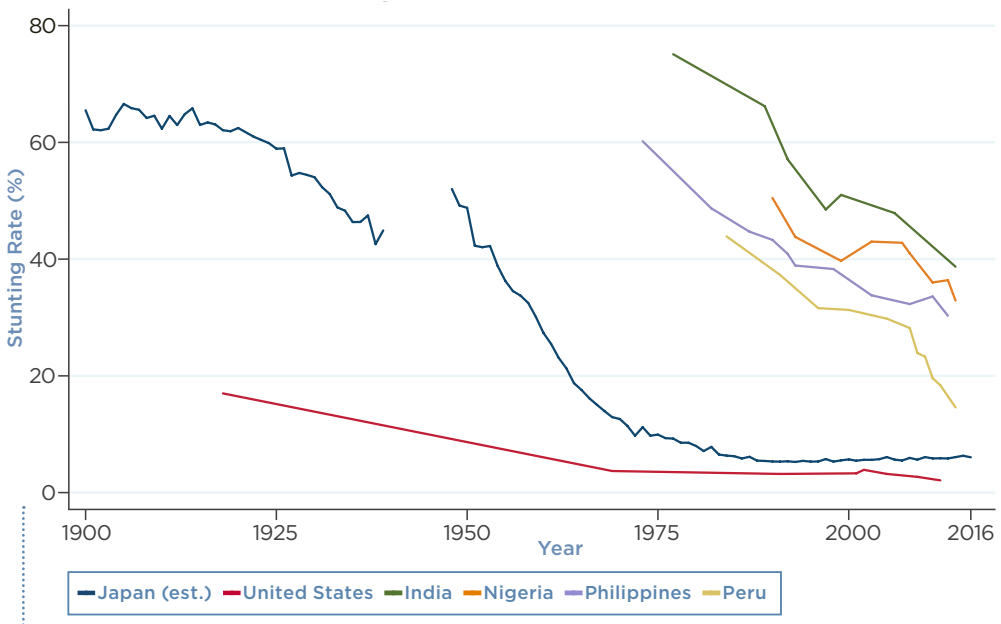
First, stunting is not solely a modern phenomenon. Analysing a number of historical sources for children under 5 or just above, it is clear that stunting could be just as prevalent in developed countries in the early twentieth century as it is in developing countries today (see chart). The best historical data are drawn from Japan and the United States. Japan had stunting rates above 60% in the early twentieth century, and although there was some improvement before World War II, the stunting rate only declined rapidly to a very low level after the war. In the United States, stunting was always less prevalent with only 17% of children stunted in 1918, but adults were especially tall in the United States in the late nineteenth century compared to other populations, so some of the reduction in stunting had already occurred (NCD Risk Factor Collaboration 2016).

Second, the reduction in stunting prevalence is best understood as a part of the secular increase in adult stature and the change in the growth pattern observed over the past 150 years in most developed countries (Cole and Mori 2017). The sharp decline in the stunting rate in Japan was the mirror image of the 14.6 to 16 cm increase in mean adult height and a reduction of around two years in the average age of the pubertal growth spurt. Thus, historical studies of the secular increase in height can reveal the types of changes in economic conditions that might lead to reductions in the stunting rate today. The historical literature has tended to emphasise reductions in child morbidity and improvements in nutrition and particularly milk consumption as being important for improving adult stature (Hatton 2014; Baten and Blum 2014).

Above top: Phuong Nguyen.
Above bottom: Akib Khan.

Lessons from History (continued)

Stunting rates around the world



Sources: USA – Roberts (2018) and World Bank Data Bank; Japan – Schneider and Ogasawara (2018); Others – World Bank Data Bank.

Third, the chart showing historical stunting rates highlights that reducing stunting is a long-run process taking decades. Japan eradicated stunting on a national scale between 1948 and 1986 with stunting prevalence falling from 53.0% to 5.7% over that period of nearly 40 years.

During that same period, life expectancy at birth increased 21.3 years and GDP per capita increased at an average annual rate of 5.8%. If it took nearly 40 years to eliminate stunting with such favourable economic and public health conditions, then we must be realistic about the amount of time and policies required to eradicate child stunting in developing countries today. ■

Above: Linda Adair.

Research on Adolescence

Another lesson from the conference is that we need more research on catch-up growth in adolescence and its consequences for later outcomes.

The traditional 1,000-days narrative suggests that children stunted under the age of five are unable to experience catch-up growth, but many scholars including economic historians, nutritionists and epidemiologists have noted that it is possible for children to experience catch-up growth between early childhood and adulthood. Steckel (1987) observed a catch-up growth greater than two standard deviations between ages five and adulthood among slaves in the US South (Schneider 2017). Prentice et al. (2013) show that modern children also experience catch-up growth between early childhood and adulthood and argue that adolescence should be considered another critical window for interventions (see also Stein et al. 2010). This fits well with research presented at the conference that highlighted adolescence as a sensitive period for children (Depauw and Oxley 2017; Schneider and Ogasawara 2017).

Adolescence should be considered another critical window for interventions

It is important to explore whether adolescence could potentially be a critical period for interventions because there are many children who are already stunted. If it is possible to help these children with targeted interventions in adolescence, then we may be able to mitigate some of the long-run consequences of stunting on stunted children over the age of five, potentially improving their life-long health and earnings potential.

However, while growth velocity does increase during the adolescent growth spurt, it is not clear that there is room for catch-up in other dimensions of health and human capital during adolescence. For instance, we do not know whether catch-up growth in adolescence can overcome the cognitive deficits associated with early-life stunting, nor do we know how catch-up growth may affect adiposity and diabetes risk (though see Stein et al. 2016). More research is needed to test the direct effects of catch-up growth in late childhood and adolescence on adult outcomes in order to understand the extent to which adolescent interventions could be a useful policy for weakening the effects of stunting on population health and economic development. ■

There is enormous spatial variation in child malnutrition and in the conditions children face in different regions

Left: John Hoddinot and Zewdie Aderaw.

Experimental and Statistical Considerations

Finally, there were some experimental design and statistical considerations that were raised throughout the conference. First, it is important to note that the age-pattern of stunting is nonlinear. As mentioned above, children tend to fall behind the modern growth standard in the first 24 months of life and then maintain their position relative to the standard.

Alderman and Headey (2017) show that the association between wealth, income and parental education and stunting is stronger in children aged 24-60 months than 0-23 months. In addition, Aiyar and Cummins (2017) suggested ways of capturing this changing age-pattern to test the influence of economic growth on the stunting rate, and Headey et al. (2017) suggested decomposing changes in the stunting rate into improvements in birth size versus size at ages 2 and above. Thus, treating the under 24 month group separately from the over 24 month group is important to understanding the causes of growth faltering.

Above top: Eric Schneider.
Above bottom: Derek Heady.

In addition, participants highlighted a tension between using the observational data available to try to understand the policies that have worked in specific contexts and running RCTs to test the efficacy of specific interventions. Both empirical strategies have their strengths and weaknesses. Studies based on observational data are relatively cheap to conduct, but they may suffer from omitted variable biases and the results may be inconsistent across studies. If designed and implemented correctly, RCTs provide a simple and clear way of testing the effectiveness of an intervention.

However, RCTs are costly to execute both in terms of resources and time, and RCTs may lack external validity when an intervention is moved to a very different context within or outside of a particular country (Deaton and Cartwright 2018). In addition, the heterogeneity in the experimental design of RCTs can make it difficult to aggregate evidence on intervention effectiveness across studies.

Above left: Zewdie Aderaw and Henry Doctor.
Above right: Sarah Baird.

Researchers also need to be aware of the significant heterogeneity in stunting in our datasets. There is enormous spatial variation in child malnutrition and in the conditions children face in different regions. Development has not been uniform within countries, and so it is important to analyse stunting at the sub-national level as well (Subramanyam et al. 2011; Gausman et al. 2018). Likewise, there is huge individual-level variation in many datasets that is lost by simplifying the data to a single stunting rate in a given area. Focussing on aggregates may lead us to misunderstand which children are at risk for undernutrition and ignore the underlying individual-level heterogeneity. ■

Benefits of Interdisciplinary Research

In the closing discussion, conference participants were very grateful to have met researchers and policy experts with whom they would not normally cross paths. There are often substantial barriers to communication between disciplines because researchers publish in different journals, attend different conferences, and do not always collaborate with each other. However, these cross-disciplinary interactions were not merely an intellectual curiosity. We agreed that a more interdisciplinary perspective could improve research on stunting because the causes of stunting are multi-dimensional. Thus, in order to construct complete models or design experiments, researchers need to consider medical, economic, social, and cultural drivers of stunting that could influence their model or experiment. Without considering these wider determinants, research will be biased: observational studies may suffer from omitted variable bias and randomised controlled trials (RCTs) conducted on a small-scale basis may not be valid in all contexts. To promote more interdisciplinary exchange of ideas, many presenters contributed their presentations to a shared folder so that participants in other disciplines could return to their ideas and follow up on references. ■

Above: Bansi Malde, Anastasia Alaysheva, and Catherine Porter.

References

References are available on the conference website at the following link: https://goo.gl/UcxU1N

Acknowledgements

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Further Information

Please get in contact with Eric Schneider if you would like more information about the conference or would like to be added to the mailing list. We hope to hold additional conferences in the future and would welcome new participants.

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