

# We Have to Protect the Kids

by Jishnu Das, Benjamin Daniels, and Tahir Andrabi<sup>1</sup>

The hidden paradox of disasters is that even if those who suffer today are the elderly, those who will pay throughout their lives will be the youngest.

## Introduction

In the fading days of the Second World War, a German blockade cut off food supplies to the Western provinces of the Netherlands. A dreadful famine struck. The *Hongerwinter*, or “hunger-winter,” as the Dutch call it, killed between 18,000 and 22,000 people. Yet, even as immediate mortality was concentrated among older men—much as it is in the current Covid-19 pandemic—the long memory of that winter was imprinted in the cells of the unborn, only to manifest years later when they became adults. As the children of the hunger-winter aged, those who were *in utero* during the famine experienced higher mortality rates and a host of health problems later in life, ranging from obesity and diabetes to schizophrenia. Our bodies, it seems, carry the scars of every injury, and the most harmful are those we suffer before our birth.

This fundamental question of what happens to children who have been exposed to terrible deprivation during their formative years has been intensely investigated over the last two decades in multiple countries and for many types of disasters. Unfortunately, like with the Dutch population, the (virtually) universal answer is that children in their mothers’ wombs or under the age of 3 at the time of a disaster will face lifelong disadvantages. Their health will suffer: They will be shorter, their mental health will be worse, and they will have more chronic illnesses. Famines in Zimbabwe, the genocide in Rwanda, crop failures and floods have all left their scars on the bodies and minds of the youngest. These losses in terms of health will be further compounded by a further depletion in their schooling, as measured by test scores. Ultimately, deprivations suffered in early childhood make their way into adult productivity; [Dercon and Porter](#), for instance, have estimated that children who were under the age of 3 during the Ethiopian famine of 1984 lost 5 percent of their earnings in *every year* of their remaining lives.

The hidden paradox of disasters, [often missed](#) in the immediacy of the Covid-19 pandemic, is that even if those who suffer today are the elderly, those who will pay throughout their lives will be the youngest.

## Key Points

- Interruptions to the accumulation of human capital due to disasters and subsequent disruptions to economies and schooling can be severe, even when households receive compensation to tide them over in difficult times.
- A seemingly full recovery for adults and infrastructure, hid deep and lasting scars on children.
- The losses to human capital may well continue to accumulate *further* after children return to school, if they fall behind and are not able to catch up with the curriculum.
- The earthquake also widened inequalities as children whose mothers were more educated, were insulated from learning losses.

<sup>1</sup> This Insight is based on the paper, “Human Capital Accumulation and Disasters: Evidence from the Pakistan Earthquake of 2005”. We are writing this because we believe the issues we raise here require urgent action, but we do caution that the piece has not yet been peer reviewed. It does, however, incorporate valuable suggestions from seminars at Duke University, UC-Davis, Notre-Dame University, UMASS, Boston and LSHTM.

But haven't times changed? After all, when we look at the effect of past disasters on adults today, we are gazing at starlight from a distant past; a time when governments would not, or could not, step in, and the welfare state was non-existent or in its infancy. Perhaps, even as the Covid-19 pandemic and the associated lockdowns destroy economic potential and drive millions out of work, extensive measures put in place by governments, ranging from direct cash to expanded social welfare schemes, will allow people to survive in these terrible times and bounce back when the lockdowns are lifted?

## The Great Pakistan Earthquake of 2005

To examine *that* question, we have to look to more recent times. One illuminating case study is that of the great earthquake that struck the northern reaches of Pakistan (and India) in 2005. At 08:50 in the morning of October 8<sup>th</sup> of that year, just as children reached school, the earth shook with one of the most powerful earthquakes ever to have struck the Himalayan region. Measuring 7.6 on the Richter scale the earthquake left more than 80,000 people dead and virtually all physical infrastructure in the affected regions destroyed. Winter came shortly afterwards, and although relief providers and the government made heroic efforts, many were left to fight the elements in makeshift tents and broken houses jury-rigged with tin-sheet roofs (pictures 1 and 2). Over the next year, the government made a heroic effort to help people rebuild their lives. Schools and roads were rebuilt, health clinics and markets came back up, and critically, every family who had suffered destruction during the earthquake received substantial compensation to help them build their houses again.

*Pictures 1 and 2: Makeshift shelters after the Pakistan Earthquake*



*Notes: Photos by Das, taken in December 2005 in the Neelum Valley. Shelters after the earthquake reflect differences across households, ranging from a small lean-to to more extensive tents. Note that even when houses were not fully destroyed, people chose not to live in them because of the large number of after-shocks that continued.*

In 2009, two of us (Andrabi and Das) returned to the region, after having been actively involved in the relief efforts in the initial days. Over 6 months, we visited 125 villages scattered throughout the region, and with our team, interviewed more than 120,000 people with a detailed follow-up for 5000. In the detailed follow-up, we measured the heights of children and tested them in English, Urdu, and mathematics at home. We completed careful measurements of poverty and infrastructure in each village in the sample.

We confirmed through our survey that the distance the household lived from the fault line was a key marker of how affected households would have been. At 40 kilometres from the fault line, mortality rates were around 0.1 percent and 20 percent of homes were destroyed in the earthquake, but right next to the fault line, the mortality rate increased 45-fold to 4.5 percent and home destruction, at 95 percent, was virtually universal. Further, it turned out that households were essentially *randomly located* with reference to the affected fault-line. Therefore, by comparing households that were living 'close to' and 'far from' the fault line, four years after the earthquake hit, we could approximate what recovery had been like in the affected regions.

This is what we found.

## Remarkable Recovery

Our first finding was the untold and unheralded success of the recovery effort. Political scientists have [repeatedly pointed out](#) the contradiction of the state in South Asia—it does exceptionally well in times of crisis that require superhuman effort by going into (what they call) ‘mission mode’ but it does terribly at maintaining high-functioning institutions over the longer-term.

The earthquake was no different.

We found that four years later, there was no difference in physical infrastructure among villages that were close to, and far from, the fault line and some evidence of a ‘build-back-better’ programme—households close to the fault line now reported *better* access to electricity and were more likely to be living in a permanent, as opposed to a semi-permanent, dwelling. For a large number of household and adult outcomes (including per-capita consumption expenditure, which is a measure of poverty and adult weight, which is a measure of short-term nutritional deficiencies), there had been full recovery. Although causality is harder to ascribe, massive aid from the government probably helped—the average short-term cash compensation among households living close to the fault line was almost Rs.185,000, or around 1.5 times the regular *annual* expenditures of households.

It is worth emphasising just how amazing this recovery was. The earthquake struck a highly mountainous region, where access is difficult at the best of times. Roads were broken and rebuilding required carrying material from the nearest access point to the villages on foot (pictures 3 and 4). Several villages were in areas troubled by violence and terrorism. Large surveys had to be undertaken to determine who would receive compensation for housing damage and destruction, and property rights (especially within families) were hard to determine. Teams of government inspectors hiked multiple hours to villages, spent nights in every village, and ensured that the new houses that were being built were more resistant to possible future earthquakes. And all of this was managed by a special institution—the Earthquake Recovery and Reconstruction Authority (ERRA)—that had been set up quickly by the government and was later dissolved when the work had been done.

Those of us who had seen this before, in the Uttarkashi earthquake of 1992 or the Bhuj earthquake of 2001 (both in India), knew that governments in South Asia were capable of literally moving mountains, but to see this in the data, told to us by person after person, reminded us of the enormous ability of states to do good under difficult circumstances.

*Pictures 3 and 4: People carrying tin sheeting to rebuild after the earthquake*



*Notes: Photos by Das, taken in December 2005 in the Neelum Valley. People carrying tin sheets to construct roofs. Many villages were accessible by jeeps prior to the earthquake, but landslides and other hazards disrupted this transport for up to one year. This particular village was a 2-hour walk from the road when walking without a load.*

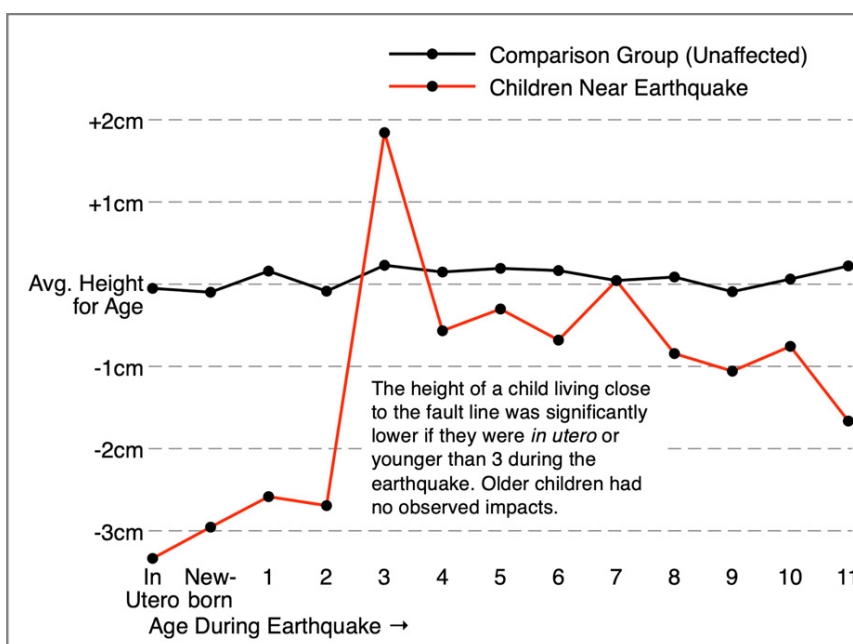


## Deep scars

Unfortunately, this seemingly full recovery hid deep scars.

Figure 1 shows the heights of children in our sample, plotted against their age at the time of the earthquake (they were four years older in 2009 when we measured their heights). We have shown, for each age-group, the average height-for-age in the sample in the group that lived farther from the fault-line (black line) compared to those who lived close to the fault-line (red line). Children close to the fault line who were *in utero* at the time of the earthquake are three centimetres shorter than those who lived farther away, and although this disadvantage narrows for children who were older, it does not disappear unless they were three years or older at the time of the earthquake.

Figure 1: Children living close to the fault-line were significantly shorter 4 years later, if they were *in-utero* or under the age of 3 at the time of the earthquake



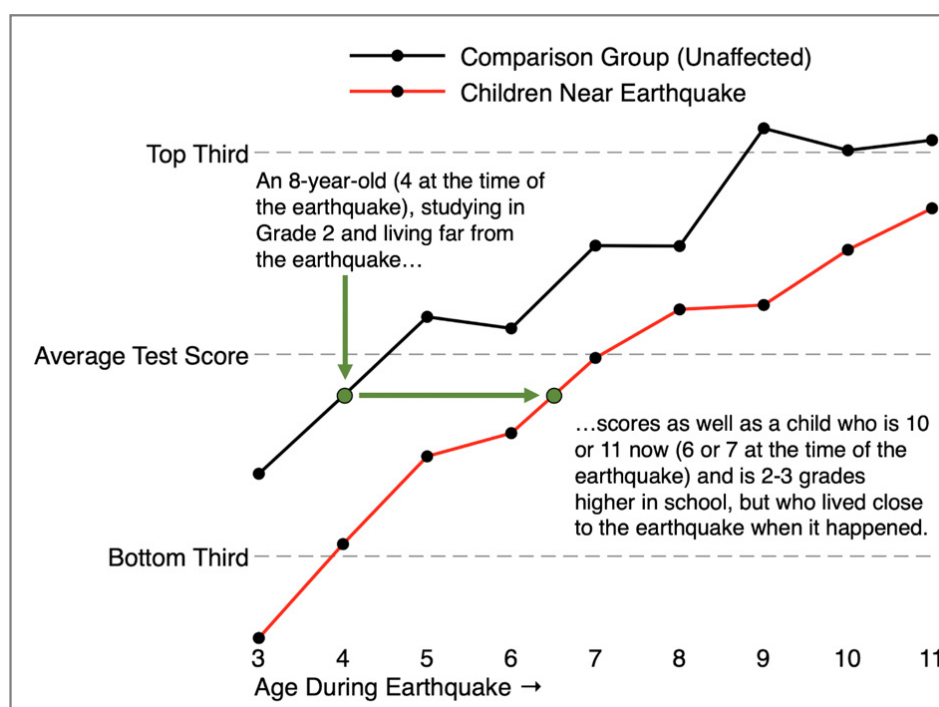
Notes: This figure plots the estimated predicted standardised heights of children aged 3 to 15 at the time of the survey, who were *in utero* through age 11 at the time the earthquake struck. It adjusts estimates for proximity to the earthquake (<20km) at each age, the distance to the epicenter of the earthquake, the local slope of the village, the nearest potentially activated fault, and the district the child lived in, their gender, and household income levels. Standard errors are not shown for the control group estimates for clarity (N=1,393); they are shown for the affected group as vertical gray bars (N=2,703).

These are not small effects: This means that children who were *in-utero* at the time of the earthquake and living close to the fault-line were only at the 16<sup>th</sup> percentile of the height distribution compared to those who lived farther away. If these differences continue to adulthood, young men/women who lived close to the earthquake will grow to be just 5'4"/4'11" tall, compared to the average man/woman who is 5'6"/5'2" tall in these data. We shall discuss below what this implies in terms of adult earnings, but we note that in the U.S., every 1 inch of a height deficit translates into decreased adult earnings of 2 percent.

Turning to education, the signs are initially more encouraging. First, there was no evidence of a decline in enrolment for earthquake affected areas. We will discuss below that the earthquake led to school closures lasting 14 weeks on average, so these data suggest that children being out-of-school for a substantial period of time does not lead to higher drop-outs in this region. Second, there were no gender effects on enrolment either. Much has been written about gender bias in education in Pakistan, and two of the four districts in our survey are in Khyber Pakhtunwa where gender bias is quite severe. Although there is a difference in enrolment rates for girls and boys, there is no evidence that being out of school exacerbated these differences further. Third, we also do not find any difference in grade attainment by age. Thus, children remained in the same grade and were promoted at the same rate as their counterparts in unaffected regions.

Test scores, however, tell a different story. Figure 2 shows that even though children were just as likely to be enrolled in school, learning levels had diverged significantly. We have plotted test scores of children between the ages of 7 and 15 at the time of the survey (so, they were between 3 and 11 at the time of the earthquake), again separated by whether they were ‘affected’ (living less than 20km from the fault-line) or ‘unaffected’ (more than 20km from the fault line). In both groups, test scores rise as children grow older—children learn as they grow.

Figure 2: Children of all ages had lower test-scores if they lived closer to the fault-line



Notes: This figure plots the estimated predicted standardised test scores of children aged 7 to 15 at the time of the survey, who were 3 through age 11 at the time the earthquake struck. It adjusts estimates for proximity to the earthquake (<20km) at each age, the distance to the epicenter of the earthquake, the local slope of the village, the nearest potentially activated fault, and the district the child lived in, their gender, and household income levels. Standard errors are not shown for the control group estimates for clarity (N=781); they are shown for the affected group as vertical gray bars (N=1,671).

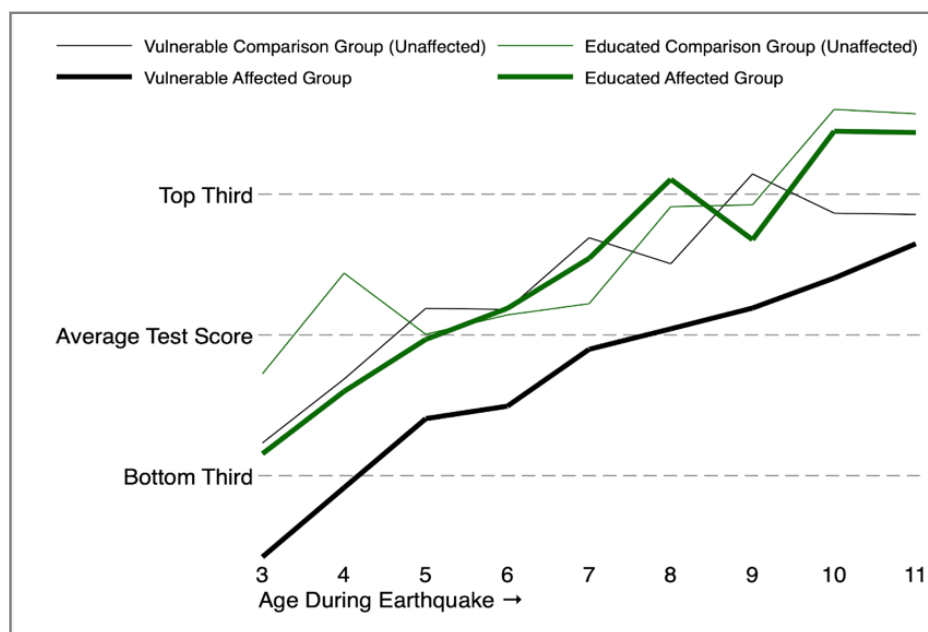
However, at every age, children who lived closer to the fault line were doing worse than those who lived farther away. These gaps were large and represented the learning-equivalent of around two years of schooling (or 0.4 SD) on average at all school-going ages. Consequently, a child who was in Grade 2 and living close to the earthquake scored as well on our tests as a child living far from the earthquake in Grade 4. Although these differences vary slightly by each grade in the figure, our multivariate regression specification shows that there is no statistically significant change in the size of the gap depending on the child’s age and, on average, children lost between one point five and two years of learning as a result of the earthquake at all school-going ages.

Further, much like the current pandemic where policymakers believe that school closures will disproportionately affect the poor and less educated, we also found that some families were able to protect their children. Our measure of disadvantage is whether the child’s mother has completed primary schooling (five years). In our data, 81.5 percent of children have mothers who have not, and they come from households who are disproportionately poor, with lower expenditures and assets.

When separated by these two groups in Figure 3, the test scores reveal a striking pattern: The children of mothers who were somewhat educated (labelled “Educated Affected Group”) were *fully protected from the disruption of the earthquake*, so that *all* the losses were felt by those whose mothers had no education (labelled “Vulnerable Affected Group”). The earthquake not only increased inequality across villages that were more and less affected, but it also sharpened the divide between the have-nots and the have-slightly-mores within the affected villages themselves. A

difference of 0.67 grade-levels in test scores between the children of educated/non-educated mothers among villages far from the fault line increased further to 1.8 grade-levels for children living close to the fault line.

Figure 3: Children of educated mothers were protected from lost learning when exposed to the earthquake



Notes: This figure plots the estimated predicted standardised test scores of children aged 7 to 15 at the time of the survey, who were 3 through age 11 at the time the earthquake struck. It adjusts estimates for proximity to the earthquake (<20km) at each age by maternal education status, the distance to the epicenter of the earthquake, the local slope of the village, the nearest potentially activated fault, and the district the child lived in, their gender, and household income levels. Standard errors are not shown for the control group estimates for clarity (N=1,064); they are shown for the affected group as vertical gray bars (N=1,322).

We note two further results. First, we do not find the same pattern of mitigation when it comes to child height. It seems that households with more educated mothers can mitigate education, but not biological, shocks. Second, like for enrolment, we do not find that the earthquake affected girls differently than boys either in terms of height or test scores; in specifications where we look for differential effects, the coefficients are typically small and always statistically insignificant.

## What do these effects portend for the future?

One question we can ask is how these childhood disadvantages will translate into productivity in adulthood. We do not know, but we can make some educated guesses under two (brave) assumptions: (A): that the disadvantages we see in our sample continue to adulthood in relative terms (so a child who is at a given height percentile in childhood will remain there in adulthood), and (B): that estimates on the relationship between wages, schooling, and height from Pakistan are relevant to this sample.<sup>2</sup>

We can then use two estimates from the literature.

- [Montenegro and Patrinos](#) have computed the returns to schooling over time and in many countries, and they show that the return to one year of schooling is remarkably stable at around 10 percent for each year.
- [Bossaiave and others](#) have looked at the association between height and wages in Pakistan, conditioning on cognitive scores. Depending on their specifications, the effects vary from 0.8 percent to 3 percent of earnings for every centimetre; an average of 2 percent is close to what is typically found in the literature.

<sup>2</sup> Neither is innocuous, Assumption (A) in particular reflects the complex interaction between household behaviour and biology. The differences that we see in childhood may be attenuated if there is 'catch-up' growth later on. Or they could be accentuated: Assumption (A) assumes that household behaviours neither compensate nor reinforce early disadvantages, this disregards the ample evidence that households tend to amplify, rather than dampen early disadvantage.

So, if the loss of test scores has the same effect as an equivalent loss in schooling attainment<sup>3</sup>, children between the ages of 3 and 15 at the time of the earthquake will have 1.5 fewer years of schooling and will therefore earn 15 percent less *every year of their adult lives*. In addition, children who were in-utero or under the age of 3 will earn 6 percent less per year. Based on a full census that we conducted in the 125 villages in our study, we estimate that at the peak, the affected cohort will constitute nearly 35 percent of the labour force between the ages of 18 and 60 (when the youngest among them is 18). At that peak, total earnings in each village will be a full 5 percent lower due to the earthquake in every year as this affected cohort progresses through their productive lives. This in itself is an under-estimate of the true effects as those who were very young will likely have to endure worse health outcomes all their lives.

A second question we can ask is whether the effects will be anything like this with the current Covid-19 pandemic. Again, we cannot tell, but one insight comes from looking at school closures during the earthquake. Parents told us that the average disruption due to closed schools was 14 weeks, and only 10 percent had to suffer a disruption lasting more than 6 months. Interestingly, there is a dose-response in the data, with children who suffered a longer length of closures reporting lower test-scores. Note though, that if closures were the only channel through which children obtain learning losses, we would have expected losses to the tune of 2 months, whereas actual losses range from 18 to 24 months. In fact, a formal mediation analysis that we undertook suggests that school closures account for at most 10 percent of the test score declines we observed. Therefore, it *must* be that learning *trajectories* diverged and when children returned to schools in affected areas, they learnt less in each year after re-enrolling in school.

This in turn, implies three things. First, had we measured learning losses as soon as schools re-opened, we would have probably found losses of 2 months (assuming zero learning during the period of closure) and this would have been a lower bound of the true losses that we see after 4 years. Second, an intriguing possibility is that the inability of the schooling system to have a large number of children repeat a grade might have slowed learning down if teachers felt compelled to teach according to the grade-level curriculum. There is now an influential body of research showing that Teaching at the Right Level is critical for learning and that over-ambitious curricula adversely affect learning. A story consistent with the data is that the initial shock to learning interacted with a pedagogical system that rewarded curricular-based lessons, thus exacerbating the problem. Third, with the current pandemic, school closures are expected to last between 8 and 12 weeks in many low-income countries. If so, we would expect the effects to be similar, or even larger.

## What is to be done?

Every unhappy disaster is unhappy in its own way, so it is hard to say with certitude that what we have learned from past disasters will translate in exactly the same way to the Covid-19 pandemic. Perhaps things will be better because these children will enter labour markets where everyone will have suffered (somewhat) similarly. Or, perhaps not: the world has never experienced a sharp shutdown of the type we are seeing now, and the very fact that this has affected everyone means that it is hard to compensate for losses in one area with ‘business-as-usual’ incomes from another. The very fact that more than 2 million children will have been born in India at the time of a complete lockdown, or that educated urban parents can access online classes while the vast majority cannot, puts us in an entirely different realm.

What can we do?

We first emphasise that we have to start thinking of the children. We recognise that governments and stakeholders are fully occupied in dealing with the immediacy of the Covid-19 pandemic, as they should be. Therefore, it falls to others—those who work in education, those who work on child health, and those who work on brain development among children to get ready for when the lockdown lifts. We **must** have programmes that are ready when children come back to school, we **must** have thousands of trials that can help the community come to a rapid consensus on what is working (and what is not) in countries around the world, and we **must** make governments and aid agencies recognise that the trade-off between investing in human capital and immediate aid is a false one. Simply put, countries will not be able to pay off their debts if we cannot rapidly bring our schooling systems out of this ‘medically induced coma’.

Second, we cannot tell whether this disaster is different until we start to systematically track the children who are most at risk. All the previous work tells us that children who are in their mother’s wombs at this time or under the age of 3 will

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<sup>3</sup> This is what the World Bank’s Human Capital Index and Learning Adjusted Years of Schooling assumes. Note that this is akin to assuming that the entire benefits of schooling years are manifested in measured test scores. If, for instance, schooling also increases socioemotional skills, and these skills are poorly correlated with test scores, the assumption is incorrect.

be subject to severe health deprivation, which will affect them all their lives. Our work on the earthquake suggests that *all* school-going children will suffer in terms of their learning.

Although these effects will take a lifetime to become noticeable, there are key leading indicators that governments can start to track immediately. In countries with well-developed and integrated health systems, the length of the gestation period, infant height, and birth weight are viable surrogate measures. Where these data are harder to come by, infants need to be surveyed as soon as possible and tracked till we can determine the extent of deprivation they have suffered. Similarly, 'back-to-school' tests at the beginning of fall will immediately tell us whether children (and which children) have lost human capital during the pandemic, and tailor educational programmes accordingly. However, the learning losses that we see when children come back to school may be a lower bound on the losses they will suffer if pedagogy continues as usual and children are moved up the grade-levels to accommodate newcomers. Therefore, tracking systems need to be put in place for a longer duration, perhaps up to 5 years or more.

Third, the fact that study after study shows that severe deprivations in early childhood (and for test scores, throughout the schooling years) have longer-term effects, this does not imply that the losses cannot be mitigated. [Gunnsteinsson and co-authors](#) have shown that children who were part of a Vitamin-A trial when a typhoon struck in Bangladesh were fully protected in terms of their height losses. And, in Aceh after the Tsunami, so much aid came in that children who lived close to the ocean (and were therefore the worse affected) were able to fully catch-up (and even outgrow) children who lived farther away. The fact that parents are now at home with their children means that the relative price of childcare has decreased, opening up further opportunities for successful programmes that rely on early stimulation in the home. There must be an equivalent effort among researchers to immediately catalogue and document the programmes that can affect child development following an event such as this in a cost-effective manner.

## Conclusion

Times are tough and everyone has their immediate needs front and central in their minds. But the debt that countries take on now to help their populations is built on the promise of a better tomorrow. That debt will fall on the children who are in their early years and in school today. If their future productivity is curtailed by anything close to the amount these studies suggest, the loss to our productive capacity tomorrow will be far worse than what we are experiencing today. We have to intervene in an unprecedented fashion to support the continued growth and learning of these children. If there was ever a time to focus on our kids, it's now—their futures depend on it.

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