



## Tracking the Children of the Millennium: Insights from a longitudinal cohort study

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**Abstract:** Longitudinal research can help countries meet the challenges of sustainable development. The examples presented in this Brief serve to demonstrate the unique advantages of having access to longitudinal studies to complement cross-sectional surveys and administrative series. The Brief reviews data from the Young Lives\* cohorts, reflecting on evidence from the 2000-2015 Millennium Development period.

The global commitments made at the turn of the Millennium – to end poverty and hunger, improve access to clean water, sanitation and basic health care, and to expand primary school enrolment – were intended to transform the lives of children. Longitudinal studies that have tracked the lives of children over this period, have lessons to share as the world embarks on new commitments to an ambitious sustainable development agenda.

Drawing on findings from the ‘Young Lives’ study, this Brief illustrates the unique advantages of tracking cohorts of children over time to understand causes and consequences, the dynamics of change and the interaction between complex factors in determining outcomes for children. It offers lessons that can inform timely and effective policy responses to changing circumstances, as well as point to some data needs, for the next 15 years and beyond.

### What can longitudinal data tell us?

*“Because longitudinal surveys can track people over periods and can illuminate many aspects and stages of their lives, including unexpected events, they provide more of a film strip than a single image, capturing evolution over time.”*

(Dunn and Banati, 2015)

What information is needed to disentangle the effects of rapid social and economic change in different contexts? What promotes or impedes child development across

different domains of well-being, at different ages and in different contexts? What is needed to assess the impacts of policies and interventions on the changing lives of children? What are the obstacles to improving the well-being of children even in contexts of economic growth? These questions reflect the need for data and information to respond to the pressing demands of the sustainable development agenda.

Longitudinal surveys – including household panel data and cohort studies – are unique in enabling us to track dynamic development processes. Analysis of the patterns, trajectories and movement is the strength of panel datasets, and can capture changes such as catch-up in nutrition, movement in and out of poverty, and children’s learning trajectories, for example. Describing the patterns over time, rather than measuring the magnitude or dimensions of an issue, is the core function of longitudinal studies. This is particularly important in identifying changes and development opportunities at critical points in the lives of children. Longitudinal data allow researchers to identify links between earlier circumstances and later outcomes and also show the persistence of particular circumstances, thus facilitating evaluation of the differing impacts of continuing circumstances (or one-off changes) on children’s later well-being.

#### • *Identifying when differences emerge*

Longitudinal studies enable analyses of children’s physical, cognitive, or psychosocial developmental trajectories, and, by extension, the timing of when inequalities emerge between children can be distinguished. A range of approaches can be used to identify how early factors shape later outcomes – for example, identifying how long particular groups of children typically stay in school, how different groups of children perform in cognitive tests by particular ages, and so on. Such analysis can make it possible to identify the emergence of inequalities by gender, ethnicity or economic status, and therefore help detect which children most need support, and when. Where information

\*Young Lives is an international study of childhood poverty following the lives of 12,000 children in Ethiopia, India, Peru and Viet Nam over the 15 years of the MDGs. The pro-poor sample, drawn from 20 sites in each country, includes two age cohorts: 2,000 children who were born in 2001-02 and 1,000 children who were born in 1994-95. Four major survey rounds have been completed to date (in 2002, 2006, 2009 and 2013) with a fifth round planned for 2016. The household and child survey is supplemented with in-depth qualitative research with a sub-sample of the children, and by a school survey. The attrition rate between Round 1 and Round 4 is 3.6% for the Younger Cohort and 8.1% for the Older Cohort (5.0% overall). Young Lives data is publicly archived with the UK Data Service (available at: <http://discover.ukdataservice.ac.uk/series/?sn=2000060>).

Young Lives is a member of the Global Longitudinal Research Initiative (GLORI). GLORI is a network of 30 longitudinal studies operating globally. Working with a range of partners from the research and policy communities, GLORI aims to support research that informs policies and public debates on children’s issues. GLORI advocates for better designed, more efficient and coordinated research that can help improve the use of this unique type of evidence in policy and practice. Housed in the UNICEF Office of Research at Innocenti, GLORI works to strengthen the quality and impact of longitudinal studies, improve value for money, standardize the technologies and approaches used and enhance coordination among researchers and institutions.

is available through childhood and into adulthood, this can be used to inform policy debates on topics such as the extent of social mobility, equality of opportunity and the intergenerational transmission of poverty.

- *Analysing what shapes later well-being*

Background contextual information – such as parental education, socio-economic status, risks experienced, or services received – can be linked to children’s development trajectories. For example, regression analysis enables researchers to ‘control’ for multiple possible relationships at the same time, and so identify underlying associations. Such techniques contribute to identifying how poverty shapes children’s opportunities and development.

The use of data from different points in time reduces the problem experienced in cross-sectional studies of ‘reverse causation’ whereby, for instance, low test scores may falsely appear to result in early school leaving, and not the other way around. Quantitative approaches identify statistical links and who is typically affected. Such knowledge can then inform analysis of qualitative research which seeks to understand the processes and mechanisms that shape well-being/outcomes.

- *Investigating the ‘dynamics’ of well-being*

Cross-sectional research can show how many or which households are poor, and which children are stunted, but cannot show whether households remain poor or

move in and out of poverty over time, or whether children remain stunted. Such dynamics – whether they reveal persistence or change – are important, both because prolonged chronic poverty may matter more than short-term dips in and out of poverty, and because they show how earlier factors shape which households become poor. Identifying which groups become poor also enables analysis of the associated risk and resilience factors. For example, analysis has shown that some children can recover physically from early malnutrition, while others falter in their growth. This analysis has also linked relative height gain among children who were previously stunted with better-than-expected performance in cognitive tests.

- *Triangulating research approaches to inform policy*

The key for evidence-based policy is not to see observational or intervention approaches as competing methodologies, but rather to employ each to triangulate data, and to use one to inform the other. Multi-purpose observational longitudinal studies enable a range of research questions to be addressed, and so can make more experimental strategies, which aim to strengthen causal analysis, more effective by identifying new areas worthy of study in greater detail.

A weakness of observational studies is that not everything is measured, and so analysis risks so-called ‘omitted variable bias’. The risk of producing misleading results is

### What is a longitudinal study?

A longitudinal study starts with the identification of questions to be examined in the lives of a given group of people. The sample may be random or selected to represent people with certain characteristics, and respondents may be followed up every few months or every few years, or there may even be decade-long gaps between the questionnaires. Such studies can provide a glimpse into both the life histories of the individuals who make up a segment of the population, and the broader patterns of change that make up the social landscape.

Each survey round is called a ‘wave’ and frequency often depends on availability of funding. A study’s overall length may be a few years or can extend over several decades. Individuals may be studied from before birth (during the mother’s pregnancy) through to adulthood, when their own babies may join the study. The longer a study endures, the greater its value in terms of the comparisons available through each wave of the study. However, as years pass, it becomes increasingly challenging to track the original respondents and to maintain their involvement. Attrition may result mainly from migration or failing to maintain participants’ interest.

**Cohort studies** are a type of longitudinal study and include individuals who have something in common (e.g. age or a health condition) and are followed to explore the ways they develop and the factors affecting their development as they age.

**Cross-sectional studies** in which different individuals with the same characteristics are compared, usually at one point in time, provide a

snapshot that allows comparison between different population groups, but they are unable to make any statements of cause-and-effect. Longitudinal studies track the same people and can therefore establish sequences of events, and potentially suggest cause-and-effect, although not necessarily prove causality.

Most longitudinal studies are **observational**, which means that they observe the state of the world while minimising intervention in it. Statistical techniques are then used to identify underlying relationships, and where possible to strengthen causal inferences (for example using quasi-experimental techniques or natural experiments). **Experimental or evaluative designs**, which track children who benefit from a government programme or intervention, come closer to causal inference where they contain an otherwise similar non-intervention control group.

**Impact evaluations**, including randomized control trials, are well-known experimental models, designed to evaluate the impact of an intervention.

Some of the disadvantages of longitudinal studies are that they take a lot of time (so results are slow to accumulate) and they can be very expensive. However, the richness of longitudinal datasets can be exploited through the wider research community (beyond the team responsible for data collection) and by encouraging data to be publicly archived and openly available. (Adapted from Dunn and Banati, 2015)

reduced by collecting a wide range of relevant background indicators and analysing them with statistical techniques, such as regression analysis, that control for multiple factors. Additionally, effective use of experimental techniques or qualitative research enables us to examine worthy areas in greater detail.

Longitudinal data can be used to complement the monitoring data provided by government statistics and to provide information to help policymakers and practitioners understand the causes and consequences of poverty and inequality for child outcomes and then to weigh up the policy options facing them in fast-changing societies.

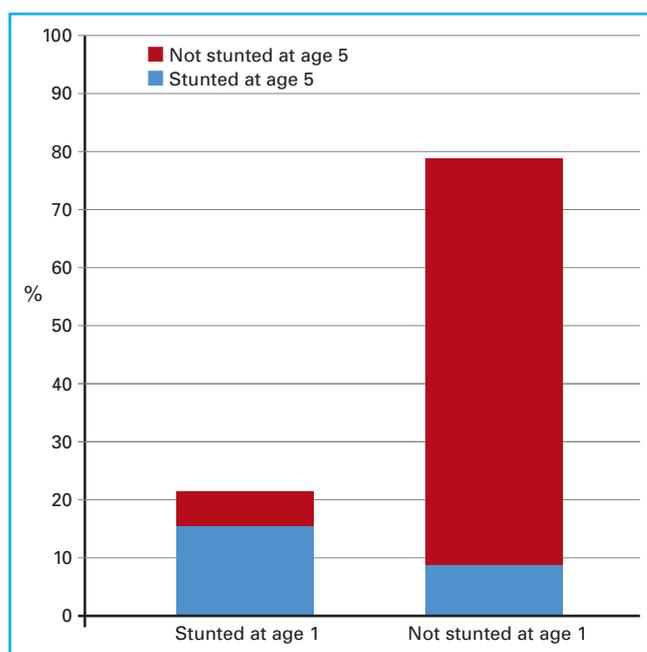
### Three illustrations of unique findings from longitudinal data

- *Understanding dynamic processes: Recovery from early childhood nutritional deprivation extends to other development domains*

More than 200 million children under 5 years fail to reach their potential in cognitive development because of poverty, poor health and nutrition, and lack of early stimulation (Engle et al., 2007). However, by tracking the same children over time, Young Lives has demonstrated that 'catch-up growth' is possible among children who experienced stunting in infancy.

In all four study countries, Ethiopia, India, Peru and Viet Nam, some children were able to recover from stunting, while others – often the poorest – faltered in their growth. In Ethiopia, half of the children who were stunted at the age of 1 were no longer stunted when they reached the age of 5. By contrast, in Andhra Pradesh State in India, one in five children who were not stunted at age 1 were showing signs of stunting by the time they were 5.

**FIGURE 1 - Changes in height-for-age between age 1 and 5 years, Viet Nam**



Source: Lundeen et al., 2014.

Importantly, analysis has shown that the gains of post-infancy recovery from stunting may also extend to other areas of children's development. Children who recovered from stunting at an early age also showed improvements in cognitive development. Children who were stunted at age 1 but who had recovered by age 8 had better cognitive outcomes than children who remained stunted. These findings point to new opportunities for policy interventions that could not have been established without an understanding of the dynamics.

Potential for this 'catch-up' development has important implications for public policy and the timing of interventions. They highlight the importance, not just of prevention and early childhood interventions, but also of remedial policies that support children's nutrition into middle childhood. While tackling poor nutrition in early childhood (the 'first 1,000 days') remains the key priority and the most efficient moment for intervention, there is a growing body of evidence provided by longitudinal studies that nutritional deprivation at birth can be at least partially compensated for by appropriate interventions in later childhood, such as school feeding programmes.

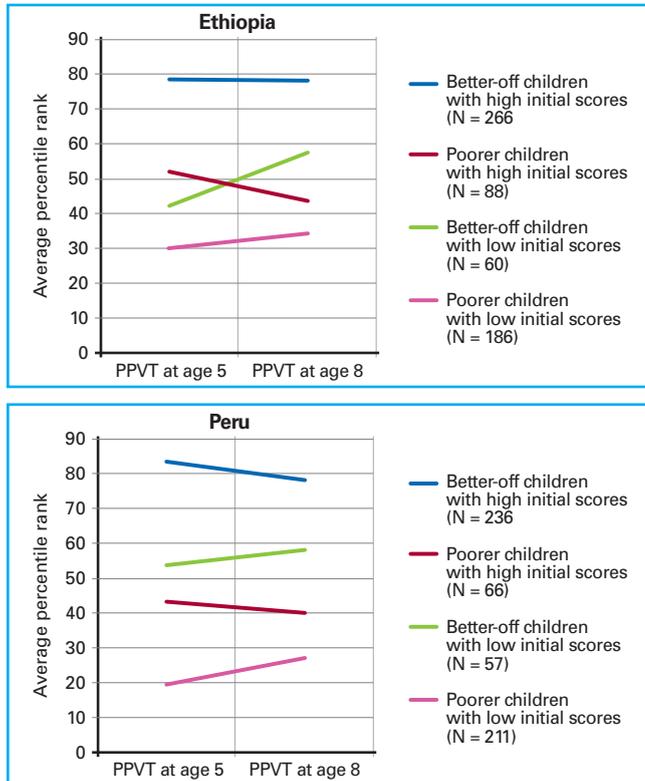
- *Capturing trajectories: Understanding disparities in learning performance*

It is widely recognized that poorer children tend to do less well at school than better off children. But the reasons underlying this, and thus the relevant policy responses, are poorly understood. Does household disadvantage (such as low income or illiteracy) undermine children's learning? Do poor children attend poor quality or less effective schools? Or are poor children treated less well within schools? And when do learning disadvantages emerge? The combination of potential factors will vary among countries and contexts. Longitudinal research can help to unpack these factors.

Figure 2 illustrates how children who performed well on cognitive tests at age 5 were performing at age 8 (Dornan and Woodhead, 2015). The lines track the performance of children from different socio-economic groups and show how poorer children who scored well initially, lost ground between the ages of 5 and 8 (largely even before they started school) and inequalities continued to widen through the school years. This highlights the fact that it is not enough to create a level playing field in the early years, since factors that drive inequality persist throughout childhood. It also identifies the importance of household wealth as an important determinant of school performance in the early years, with the gaps in learning starting even before children begin school.

A similar pattern of widening inequalities during the school years can be found in all four countries studied, with some exception in Viet Nam. The different learning trajectories among the Young Lives children highlight the ways school systems add value to children's learning. For example, maths test scores indicate that for every year at primary school level, children in Viet Nam are learning at a greater rate than in the other countries, which may be due to more equitable teaching practices and resourcing of schools.

**FIGURE 2 - The link between household wealth and children's learning trajectories**



Note: High wealth is defined as in the top quarter of the distribution (and vice versa for low wealth). Children were assigned to ability groups based on Cognitive Development Assessment (CDA) test scores at age 5. High scores are those in the top quarter; low scores are those in the bottom quarter of CDA test results. The CDA tests children's understanding of concepts of quantity. Progress is measured on the Peabody Picture Vocabulary Test (PPVT) of receptive vocabulary at ages 5 and 8.

• *Understanding cumulative disadvantage: why do girls marry early?*

Despite worldwide commitments to eradicate early marriage, estimates suggest that one in three girls in developing countries marry before 18 (UNFPA, 2012). In all the Young Lives study countries, young people say they think it is better to delay marriage until their mid-20s (from age 21 or 22 in India to 25 or 26 in Peru). But many girls in the sample were in fact married or had their first child while still in their teens – in contradiction to their earlier aspirations. What might explain this outcome?

Cross-sectional data point to many factors that increase the likelihood of early marriage, including household poverty, domestic responsibilities, educational and employment opportunities and gender or social norms. However, cross sectional studies cannot show how such factors interact or accumulate over time to affect girls' lives in different contexts.

Alongside quantitative surveys, in-depth qualitative data add richness to research by exploring children's own experiences and the circumstances of their daily lives (Morrow and Crivello, 2015). Combined with the detailed information gathered in the household and child surveys, this gives a unique dataset to study children's biographies

over their life-course. In this way, children's experiences of poverty can be situated in relation to the people around them, and the socio-cultural context, institutions, services and policies that shape their lives and opportunities. Importantly, this includes children's own views on what has contributed to their current situation and their well-being, their aspirations and goals, as well as their expectations for the future.

For example, at age 14, Haymanot, a girl from rural Tigray in Ethiopia, was attending school and doing well. She and her sister also worked on the Government's Productive Safety Net Programme, as their mother was too sick to work. But after her sister also became ill, and a combination of famine, drought and sickness ran down the household assets, Haymanot dropped out of school in Grade 5. She was sorry to leave, but was also suffering repeated bouts of illness, exacerbated by the hard work she was doing in a stone-crushing factory.

Haymanot then married when she was 15, and was optimistic about her new improved family situation: she could support her mother with better food, and she no longer needed to work so hard. However, her husband subsequently divorced her, and Haymanot and her baby had to return home to live with her mother. Disadvantage accumulated over time for Haymanot, yet there were key intervention points – at school, or through access to healthcare for her mother – at which being able to access some support could have improved her situation and indeed reduced the chances that she would marry young.

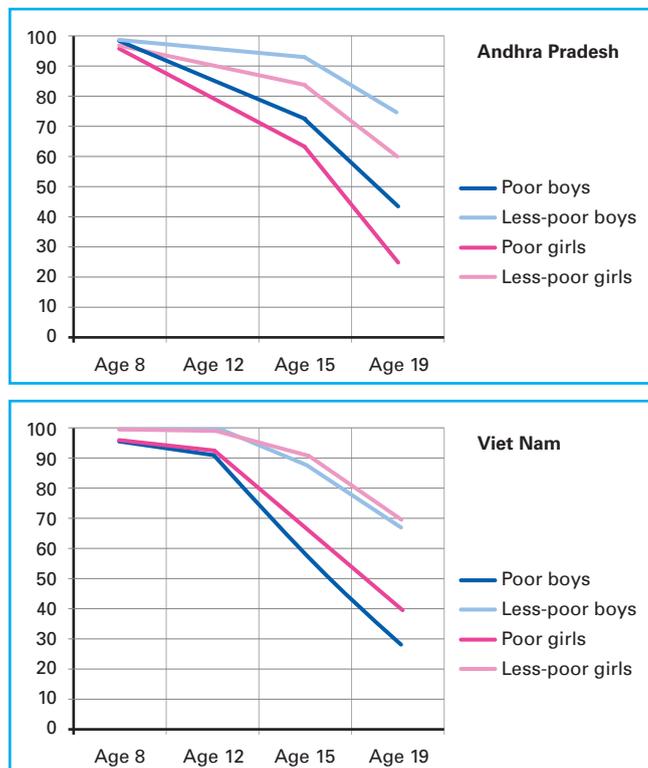
Following children over time shows that gender differences emerge at particular points in time, interact with other forms of disadvantage, and accumulate. Education is one key area where poverty and gender interact to affect outcomes. Figure 3 illustrates differences in school enrolment widening by age: in both India and Viet Nam, poverty is the main predictor for children leaving school early. In India, girls have consistently lower enrolment than boys controlling for income, while in Viet Nam the reverse is true – girls are slightly more likely to remain in school.

**Looking forward to the Sustainable Development Goals (SDGs): lessons and implications**

Understanding the opportunities, challenges and resources available to children, their families and communities is key to policy design and the delivery of appropriate services and support. This is particularly true during periods of rapid and complex change – where social, economic and political forces interact with environmental and technological change to shape children's lives and their futures.

The range of issues being incorporated into the new sustainable development agenda requires a deeper understanding of complexity and the interactions between changes across different domains of children's lives, thus promoting coherent multi-sectoral or cross-cutting responses that can deliver on a wide range of outcomes.

**FIGURE 3 - Gaps in school enrolment grow with age (Andhra Pradesh and Viet Nam)**



This may occur, for example, through comprehensive social policies that provide social protection and appropriate services to ensure the needs of all children are met and their rights protected.

The examples presented in this Brief serve to demonstrate the advantage of longitudinal data to complement cross-sectional surveys and administrative data (such as a national census) in order to support country responses to the challenges of the new Global Goals agenda. Understanding enduring change and equitable progress by analysing the dynamics of development processes in a given cohort is a unique advantage of this type of study design. Findings such as potential recovery from stunting, or the impact of repeated or persistent experiences of poverty, could not have been captured by annual cross-sectional estimates. Secondly, this type of research is able to uncover time-specific complementarities to inform coordinated policy responses across goals and targets, and

improve the overall effectiveness of SDG-focused reform. The SDG targets span a number of interlinked sectors and life periods. And longitudinal data can help analyse these complex interconnections in a way which is not possible with sector-specific approaches or cross-sectional data.

Given the critical developmental moments that occur throughout children's lives, tracking the life course through a cohort study can identify critical periods for investment in the key inputs that help to provide a foundation for their healthy physical, emotional and intellectual development, and thus shape their future choices and opportunities. Such analyses have the potential to inform the timing and sequencing of interventions.

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