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Children in India wait for a meal during the COVID-19 pandemic.

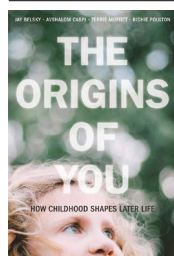
The lifelong studies that hold clues for kids' futures

Decades of data on how childhood affects adult health should help policymakers to plan. **By Barbara Maughan**

The COVID-19 pandemic has disrupted the lives of children around the world. How will this once-in-a-century event shape their development and later years? Biologists and social scientists have some ideas, thanks to a growing body of empirical evidence from long-term research on cohorts of people recruited at birth and studied regularly over decades, with some participants now in their seventies. This work has revealed, for instance, that low birth weight is associated with an increased risk of high blood pressure many decades later, and that level of education has implications for life expectancy. Such findings have shaped early-years interventions in many nations.

Four leaders in cohort studies share insights from their own work in *The Origins of You* (written before the pandemic).

Psychologists Jay Belsky, Avshalom Caspi, Terrie Moffitt and Richie Poulton have between them set up and run three remarkable projects in New Zealand, the United States and the United Kingdom, tracking children from birth into their teens, twenties, thirties or forties. Every few years, participants are assessed on everything from their height, weight and impulsivity to their school results,



The Origins of You: How Childhood Shapes Later Life

Jay Belsky, Avshalom Caspi, Terrie E. Moffitt & Richie Poulton
Harvard Univ. Press
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pay, personality and mood. The authors hope to convey enthusiasm beyond academia for their adventures in science.

Twenty chapters cover examples of these adventures in conversational style, navigating increasingly complex ideas about the studies' concepts, methodologies and content. For example, Nobel-prizewinning economist James Heckman was keen to understand why participants in some Head Start programmes – launched in the 1960s to provide educational and health support for US children from low-income families – fared better in education and employment later in life, even though their early gains in test scores faded with time.

Heckman's hunch was that the long-term benefits might have come about because the programme had improved the children's self-control. He encouraged the authors to look into the matter. Sceptical, the team mined data from the Dunedin Multidisciplinary Health and Development Study, which has followed 1,000 New Zealanders since they were born in 1972–73. The researchers looked for indicators of level of self-control in childhood, and tested how well these predicted aspects of the study participants' later lives.

It turned out that Heckman was right. Even after controlling for factors such as family socio-economic status, worse self-control in childhood predicted a plethora of adverse outcomes: poorer physical health in the early thirties; lower social status and wealth; and increased risks of drug and alcohol use and being convicted of a crime. Importantly, these predictions showed a gradient across the range of early self-control, suggesting that strategies to enhance this quality – from behavioural 'nudges' to parent training programmes – would pay dividends, whatever the individual child's starting point.

Developmental profiles

Each chapter has its own childhood-to-adulthood story, and includes pointers for policy. I was especially struck by studies that focus on particular developmental periods, such as the impact that variations in the timing of puberty can have on early sexual behaviour in teenagers, and on the stability of sexual partnerships even up to a person's forties. Other chapters are designed to clarify the developmental profiles of conditions such as attention-deficit hyperactivity disorder (ADHD), and use data from across developmental periods to chart how they wax and wane with age. Similar analyses are conducted for antisocial behaviour.

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Perhaps the most important theme that emerges is that although clear continuities exist between childhood and later well-being, these links are far from exact. Human development is probabilistic rather than deterministic, and continues well beyond the first decade of life. Many different processes are likely to underlie such long-term continuities. We see here, for example, instances of the ways in which childhood characteristics can 'select' individuals into later environments, so reinforcing early tendencies. Tracked to early adulthood, for example, people who were socially inhibited as toddlers had smaller social circles and less social support than their peers, whereas those who had been impulsive in early childhood often evoked negative responses from family, friends and partners, and in the workplace. Early adversities such as maltreatment, social isolation and bullying can become embedded in our biology, influencing inflammatory processes and stress responses in ways that might, later in life, increase the risk of conditions such as diabetes and poor mental health.

But we also see that change is possible throughout life, and that some individuals are resilient even in the face of quite severe early adversity. Teasing out the factors that contribute to strengths, whether they lie in the family, the neighbourhood, society or genetic inheritance, can be especially valuable in pointing to targets for intervention – such as investment in school meals or education.

Long game

Alongside the specific findings, what shines through is the power of the longitudinal method. The three projects that are explored here form part of a larger body of studies, mostly initiated since the Second World War, tracking individuals across their lives. Their findings are now revolutionizing our understanding of the determinants of health and social capital, and, in the case of the long-est-running studies, of ageing and decline.



A child takes part in a 1940 development study.

Each represents an extraordinary investment – by researchers, participants and, of course, funders – in documenting lives in real time.

It's true that essentially 'observational' studies might not give the tight purchase on causality that could be achieved by an experiment. Instead, they offer something in many ways richer and more valuable: insights into the processes that shape human development. Given the tricks that memory can play, issues of this kind cannot be studied retrospectively. We need to observe lives as they unfold. And as this book shows, the value of such data increases exponentially with time, illuminating issues undreamt of when the studies began.

For those new to cohort literature, *The Origins of You* is an engaging introduction. For those familiar with this work, it is a chance to hear the authors thinking aloud, debating the best approaches and pondering what to study next. We can be certain that those conversations will now include how best to use these rich longitudinal resources to understand the effects of COVID-19.

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The poisonous history of chemotherapy

A Second World War disaster drove a crusade for cancer treatment argues Jennet Conant. **By Heidi Ledford**

On 2 December 1943, German forces attacked the Italian port town of Bari. The onslaught cost at least 1,000 lives and sunk 17 ships. One was carrying 2,000 bombs loaded with deadly mustard gas.

The gas – which was actually in liquid form – mixed with oil from the sinking tankers to create a deadly slick that clung to sailors' skin as they swam to safety. Many who made it to the local hospital were greeted with blankets to wrap around their poison-soaked clothing, sealing their fate as they awaited care. The agony set in hours or days later. Stunned nurses found themselves with wards full of swollen, blistered patients, temporarily blinded.

The Great Secret brings that harrowing night to life, and then follows the military physician who fought to uncover the truth about the chemical weapons. His efforts contributed to the development of chemotherapy, seeding the cancer-research juggernaut that dominates drug discovery to this day, argues writer Jennet Conant in her latest history of war-era science.

That hard-working and brilliant physician is the first of the book's two heroes. Stewart Alexander, an American expert on chemical weapons, is called in to explain the mysterious ailments plaguing the Bari survivors. The possibilities offer a harrowing tour through the chemical arms race of the early twentieth century. Could it have been chlorine or mustard, the causes of the chemical massacres of

the First World War? Or was it lewisite, a blistering agent that quickly penetrated the skin? Or one of the new blends such as 'Winterlost', a combination of nitrogen mustard and lewisite that featured a low freezing point to ensure effectiveness at the frigid Russian front?

Chemical secret

The deadly cargo in Bari's harbour was a fiercely guarded secret. The Geneva Protocol had banned the use of chemical warfare in 1925, but the shipment was there in case of the need to retaliate if Hitler had resorted to chemical weapons. Alexander struggles to treat his ailing patients while battling military officials who are intent on keeping the incident quiet.

Alexander is struck by how the mustard-oil mixture obliterated his patients' white blood cells. He scrambles to make sense of data from different treatments given in different hospitals, with different standards of care and no control groups. (There are uncomfortable parallels with the flurry of uninterpretable observational studies and uncontrolled clinical trials during the first months of the COVID-19 pandemic.)

Alexander had seen similar effects of such agents in animal studies before the war. These had conjured up hopes that the chemicals could be used to rein in cancerous blood cells in leukaemia and lymphoma. Flood the body with toxic substances, the theory went, and the disease could be snuffed out or at least beaten back. Alexander's detailed report of