

ARTICLE: Childhood forecasting of a small segment of the population with large economic burden

A research team led by Avshalom Caspi and Terrie E. Moffitt at Duke University reports that a small segment of the population accounts for a disproportionate share of costly service use in a society's health-care, criminal-justice, and social welfare systems, and that these adults can be identified as young as age 3 years by pediatric tests of brain health. These findings are based on a study that followed birth cohort of 1,000 children born in one city, from birth to midlife. The strong connection between early-childhood development and costly adult outcomes underscores the need for preventive health and education programs for children and families.

PUBLICATION SOURCE (and embargo date): Nature Human Behaviour, published online Monday, 12 December, 2016 at 16:00 London time (GMT) / 11:00 New York time (EST).

FINDINGS:

(1) Using nationwide government administrative data bases and electronic medical records, we found that a small number of individuals accounted for a disproportionate amount of costly services in different health-care, criminal-justice and social-welfare systems. These findings about the concentration of social costs resemble the Pareto principle (named after the Italian economist, Vilfredo Pareto), which maintains that 80 percent of the 'resources' in a given system are attributable to 20 percent of the 'users'.

(2) Across multiple different service sectors, we identified a high-need/high-cost group in the cohort of 1000 individuals we studied. This group made up only 22% of their age cohort, but they left a big footprint on costs of service delivery. By midlife, this small group was convicted for 81% of the crimes charged to the cohort; had filled 78% of all prescriptions for pharmaceutical drugs; accounted for 77% of the years in which their children were growing up fatherless; had received 66% of the cohort's welfare benefit payments; occupied 57% of their cohort's nights spent in a hospital bed; smoked 54% of the cohort's tobacco cigarettes; carried 40% of the cohort's kilograms of obese weight; and made 36% of injury insurance claims.

(3) The high-need/high-cost group of adults could be identified as young as age 3 years on the basis of their 'brain health,' a summary index derived from a brief pediatric examination that included a neurological evaluation and assessments of verbal comprehension, language development, motor skills, and social behaviour.

WHY ARE THESE FINDINGS IMPORTANT?

(1) The new findings suggest that the importance of childhood risks for poor adult outcomes has generally been underestimated. It is not news to service-delivery professionals that some individuals use more than their share of services. What is news is that the same group of individuals features in multiple service sectors and that these high-need/high-cost individuals can be identified as young children, with reasonable accuracy.

(2) To know whether early-years intervention can lift health and social wellbeing and reduce taxpayer costs we need to know how strongly early-years risk factors are tied to adult outcomes in the population. The strong connections uncovered in this study between brain health and economically burdensome outcomes encourage nations to invest in their so-called grey-matter infrastructure.

LIMITATIONS:

(1) We are aware of the potential for misusing these findings, for stigmatizing and stereotyping. But there is no merit in blaming a person for economic burden following from childhood disadvantage. Instead, ameliorating the effects of childhood disadvantage through early-years support for families and children could benefit all members of a society by reducing costs.

(2) Our research is based on only one cohort in one part of the world, and needs to be replicated.

SUPPORTING DETAILS:

PARTICIPANTS: Participants were members of the Dunedin Longitudinal Study, an investigation of the health and behavior of a representative cohort of 1037 consecutive births between April 1972 and March 1973 in Dunedin, New Zealand. This birth cohort's families represented the full range of socioeconomic status in the general population. Follow-ups have been carried out at ages 3, 5, 7, 9, 11, 13, 15, 18, 21, 26, 32, and most recently 38, when 95% of the living cohort members took part.

DOCUMENTARY FILM: We invite you to view a new documentary about the Dunedin Study, called "Predict My Future: The Science of Us," available via Curiosity Stream (<https://app.curiositystream.com/video/1268>).

MEASURING ECONOMIC-BURDEN OUTCOMES: We drew on personal assessments with study participants and on New Zealand's multiple nationwide administrative data bases to measure the cumulative distributions of economically burdensome outcomes in 8 social and health sectors.

1. Social welfare benefit months. We obtained information about receipt of social welfare from the New Zealand Ministry of Social Development (MSD). (*The cohort accumulated 24,997 months of welfare payments.*)

2. Fatherless child-years. We recorded information about the proportion of time that all the offspring of all the cohort members lived without their biological father. (*In the cohort, 669 parents produced 1,418 live births. These offspring lived a total of 10,946 child-years of which 25% (2,755 child-years) were spent in households without their biological fathers.*)

3. Tobacco smoking pack-years. We calculated the number of pack-years smoked, where pack-years = (number of cigarettes smoked per day × number of years smoked) / 20). (*The cohort smoked 5,760 pack-years, the equivalent of 42,076,800 cigarettes.*)

4. Excess obese kilograms. We measured excess weight as the total number of kilograms beyond a BMI > 30, the recognized cut-off for obesity. (*The cohort carried 2,924 kilograms of excess weight.*)

5. Hospital bed-nights. We obtained information about admission events (and overnights) in hospitals from Ministry of Health records. (*The cohort accumulated 8,958 hospital bed-nights.*)

6. Prescription drug-fills. We obtained information about prescription drugs filled by pharmacists, from the national Pharmaceutical Management Agency (PHARMAC) database. (*The cohort filled 66,811 prescriptions.*)

7. Injury insurance-claims. We obtained records of insurance claims for accidents and injuries from the Accident Compensation Corporation (ACC), the sole national provider of comprehensive, no-fault personal injury cover for New Zealanders. (The cohort made 6,919 claims.)

8. Convictions for crime. We obtained information about criminal convictions by searching records available to the New Zealand Police containing details of all New Zealand convictions and Australian convictions communicated to New Zealand Police. (*The cohort had 2,141 convictions for adult crimes (excluding routine traffic offenses), beginning at age 15.*)

MEASURING EARLY CHILDHOOD DEVELOPMENT: At age three years, each child in the study participated in a pediatric examination that included a neurological evaluation and assessments of verbal comprehension, language development, motor skills, and social behaviour. This yielded a summary index which we call “brain health.”

UNDERSTANDING THE STATISTICS REPORTED IN THE PAPER: Our website hosts a video about ROC curves that we prepared while working on the article:
<http://www.moffittcaspi.com/content/tutorial-roc-curves-and-area-under-curve>.

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MAIN FUNDING SOURCES: US National Institute on Aging (NIA) grants AG032282, AG048895, AG049789, UK MRC grant MR/K00381X, UK ESRC grant ES/M010309/1, New Zealand Health Research Council and New Zealand Ministry of Business, Innovation and Employment (MBIE). Additional support was provided by the Jacobs Foundation and the Avielle Foundation.

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