

## RESEARCH SUMMARY

### Childhood forecasting of a small segment of the population with large economic burden.

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This paper shows that 20% of a New Zealand population are responsible for a disproportionately large burden of each of eight social and healthcare costs (see table 1 below). The analysis has been performed on the Dunedin Longitudinal Study of the 1972-73 birth cohort of around 1000 people. Follow-up assessments of subjects were carried out periodically at the ages of 3, 5, 7, 9, 11 up to 38 years. Children who scored poorly in early life stress (four risk factors scored in children age 3 to 11) had a high correlation with the 22% of the cohort that contributed to three or more of the high-cost groups of economic burden. The study also narrowed down one risk factor (poor brain health by the age of 3 years) that is an early statistically significant predictor for high-cost economic burdens (except injury insurance claims) 35 years later. The authors speculate that early intervention strategies in the risk population segment may have a massive economic and health benefit.

**Table 1. The economic burdens associated with the high cost 20% of the cohort by the age of 38 years.**

|    | <b>Economic burden</b>        | <b>% of total cost</b> | <b>Total of units for cohort of 940</b> |
|----|-------------------------------|------------------------|---|
| 1. | Social welfare benefit months | 80                     | 24,997                                  |
| 2. | Fatherless child years        | 82                     | 2,755                                   |
| 3. | Tobacco smoking pack years    | 68                     | 5,760                                   |
| 4. | Excess obese kilograms        | 98                     | 2,924                                   |
| 5. | Hospital bed nights           | 77                     | 8,958                                   |
| 6. | Prescription drug fills       | 89                     | 66,811                                  |
| 7. | Injury insurance claims       | 52                     | 6,919                                   |
| 8. | Criminal court convictions    | 97                     | 2,141                                   |

#### Methods and Results

The individuals from the Dunedin study were questioned at age 38. Data was obtained from 940 personal interviews, from government administrative databases and electronic medical records. The following 8 economic burdens were measured for each person (for totals, see Table 1 above):

1. The number of months of receiving social welfare benefits per person over their lifetime.
2. Fatherless child years. There were 669 parents in the cohort and they had one or more children (1,418 live births). Child years were the years from 0-11. Fatherless child years were years spent without their biological father (there were a total of 2,755 fatherless years from 10,946 child years or 25%).

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3. Tobacco smoking pack-years: the unit of a pack year is 20 cigarettes smoked per day times 365. The pack years per person were the number of packs of cigarettes times the number of years smoked.
4. Excess obese kilograms (kg). Total number of kg above a body mass index of 30 (the cut-off for obesity).
5. Hospital bed-nights. Total nights stayed in hospital.
6. Medicines prescribed. Number of prescriptions collected.
7. Injury Insurance claims. Number of claims for compensation from accidents and injuries as adults (age 21-38).
8. Convictions for crime from age 15-38 (excluding traffic offenses).

The four childhood risk factors were:

1. A score for the average occupational status of the child's parents during their childhood; unskilled (1) to highly skilled (6).
2. A score of 0, 1 or 2 (meaning 2 or more) for evidence of childhood maltreatments including maternal rejection at age 3, physical abuse, sexual abuse, receiving harsh discipline at age 7 to 9 or two or more changes in the child's primary care-giver.
3. Average IQ of child measured at ages 7, 9 and 11.
4. Average score of child age 3 to 11 for poor self-control including hyperactivity, inattention, lack of persistence, impulsive aggression and impulsivity.

The components of the index for brain health at 3 years were:

verbal comprehension, language development, motor skills (from a 45 minute visual assessment) and social behaviour (a score for frustration tolerance, resistance, restlessness, impulsivity and lack of persistence at reaching goals).

Statistical tests: the data was analysed by several methods. One is illustrated here. Area under the curve (AUC) was used to answer the question of whether the four childhood risk factors or the brain health at three years could be used to predict the outcome for an individual child. They looked at the probability of correctly classifying any randomly selected pair of cohort members in which one person belongs to a high cost group and the other does not. It could be somewhere between 0.5 (complete chance) and 1.00 (perfect prediction). Values of 0.6 to 0.7 are fair prediction, 0.7 to 0.8 good, 0.9 excellent. The researchers found that childhood factors only modestly predicted which cohort members belonged to any particular single high-cost group (AUC values from 0.6-0.78) but classification improved dramatically when predicting who belonged to multiple high-cost groups (AUC value 0.87). The brain health at three years predicted which members belong to multiple high-cost groups at a higher statistically significant level (AUC = 0.79) than a 2 high-cost group (AUC = 0.68) or 1 high cost group (AUC = 0.62).

Conclusions:

It has been known by professionals that some individuals use more than their predicted share of services. However, in this paper, the authors have shown that the same group of individuals feature in multiple service sectors, and these high need/high cost individuals were able to be identified by the age of three, with reasonable accuracy. Tackling the effects of childhood disadvantage through early-years support for families and children could benefit all members of a society by reducing costs.

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