Predicting our children's futures

PHOTO: CHRIS MARSHALL

The University's COMPASS team has created a virtual cohort of children and is using a simulation tool to model proposed policies. Pauline Curtis looks at the impact this collaboration between Social Science and Statistics could have on our children's futures.

What would happen to New Zealand children if more people owned their own homes, started their families at a later age, or were single parents? How might higher rates of preschool attendance or breast-feeding to a later age influence their lives, and would the effects be the same for all members of society?

These are the kinds of questions researchers at The University of Auckland are examining, and it's much more than an academic exercise. The team of social scientists, statisticians and computer scientists is creating a simulation tool that may be used by policymakers to predict how policy changes will affect the early lives of New Zealanders. And since experiences during our early years have such an impact throughout our lives, the potential implications are huge.

Critically, the work has the buy-in of policy experts in the Ministries of Health, Education, Social Development, and Justice. "Given the government's current interest in improving the wellbeing of children through programmes like the vulnerable children's green and white papers, it's a really good time to develop and use this model," says Dr Pat Tuohy, the Ministry of Health's Chief Advisor Child Health and a longstanding member of the research team's advisory group. "The project is well placed to provide information to policymakers on the possible outcomes of changing policy settings, and the model could become a very valuable tool to explore 'what-if' scenarios."

The project is led by sociologist Professor Peter Davis (pictured). It is part of a wider programme of work at the Centre of Methods and Policy Application in the Social Sciences (COMPASS), which Peter also set up and leads. He says that COMPASS – now a team of nine – is unusual in the way it binds social science and statistics together. Unlike most cross-disciplinary collaborations, which exist only for the duration of a project, COMPASS is an established group that has worked together on a series of projects for at least ten years.

Peter explains that in the early life simulation work "we're using information about children's backgrounds [such as] experiences in the early years, peer group influences, family discipline and dynamics, and housing environment, and looking at how those factors affect their health, education, and behavioural outcomes. Some of these factors in children's lives cannot be changed, but others can – like whether or not they go to early childhood education."

Research fellow Dr Barry Milne – who meets regularly with the team policy advisors – says the project is now well advanced and, reflecting on the results to date, perhaps the most important finding is that there is no "silver bullet" to produce a dramatic change in children's lives. Instead, many interrelated factors are at play, and "that's what policy experts would expect – that you need to work in lots of areas to have a moderate impact. It's a useful lesson as well as a reflection of the real world."

It's this very complexity that makes a simulation tool so valuable. By running a simulation – effectively a virtual social experiment – it is possible to measure the impacts of a proposed policy change. "Policy can have intended as well as unintended consequences, and the modelling tool allows us to look at both the direct and indirect impacts," Barry explains. The model can also be used to find the combination of changes needed for a desired outcome, such as fewer child hospital admissions, improved reading scores or lower levels of conduct disorder.

For instance, in a scenario suggested by policy experts who work with the research team, the model showed that raising parents' education levels significantly increased children's reading scores. But the effect more than doubled when other factors were added into the mix – increasing mothers' emotional responsiveness, increasing children's birth weight and duration of breastfeeding, and reducing welfare dependence.

In another scenario, reducing harsh punishment, keeping children's parents and place of residence constant, and increasing parents' education levels, together produced a significant reduction in conduct problems, and the effect was greatest for children in the lowest socioeconomic groups.

The way the model predicts how a change will affect children's lives is generally in line with past research; in fact, comparing the results with published studies is one way of testing the model's validity. It is the ability to quantify the outcomes, test a number of scenarios, and see how the social factors combine and interact that makes the model such a powerful tool.

In some cases, a simulation suggests that a social change will have little effect. For example, having both parents in the workforce does not appear to alter measures of children's health service use, educational performance or likelihood of getting into trouble. Barry cautions, though, that the model is still being refined, and in its current form may underestimate some effects. "The results might also reflect that different things work for different kids, and when averaged out the overall effect is small."

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One enhancement the team is now working on is the ability to run scenarios for subgroups of the population. "It's also important to note that a small impact for an individual child may have large effects when multiplied across many children. For instance, if you could halve GP visits for every child, and multiply that out by all children in New Zealand, there would be a big cost saving."

The model is initially based on information from the Christchurch Health and Development Study (CHDS), which has followed 1,265 children born in Christchurch in 1977 throughout their lives. By analysing data from these real people, the COMPASS team has generated a synthetic data set – a virtual cohort of children. The virtual children's lives have been built up to 13 years of age using statistical rules to decide what happens from one year to the next. They have "typical" biographies as well as a degree of variation from the norm.

Critically, the lives of the virtual children initially match those of real people in the CHDS. "When you run a simulation you should be able to reproduce the real data – that's how you know it's working," Peter explains. They also meet the test of being generally consistent with other real-world data, such as from another long-term study in Dunedin, and with published social research. "But you also shouldn't have a model that's too tailored, because then it would be too specific to the Christchurch study and not of general significance," Peter adds. Long-term, the aim is to build a model that represents all children in New Zealand, and the next step will be to bring in data from the Dunedin research as well as more recent studies of Māori and Pacific families.

Peter explains that the project had a long establishment phase and securing five years of funding, through a grant from the former Foundation of Research, Science and Technology (FoRST) was critical for the work to succeed. "We're at the stage where we have expanded from [looking at] the first five years of life into the teen years, and from an initial focus on health outcomes to education, justice, and social welfare. And we're now bringing in data from these other longitudinal studies. We'd hope to have cracked it on health in Christchurch in the first five years of life, and all of a sudden now we're in a position to expand out into these other areas and into the later years."

Also crucial to the project's success has been COMPASS's stability. "Continuity of personnel, contacts, and data means that you can do things that wouldn't otherwise be possible," Peter says. He observes that a highlight of his career – an influential study on patient safety in New Zealand hospitals – took ten years to plan and complete. "You need to make sure the [research] infrastructure is there for the long haul." He notes that COMPASS will still be around when he leaves, and hopes the team will continue to grow as researchers from other fields tap into its expertise.

Peter says the single greatest achievement of the modelling work to date has been "pulling together a group of people from policy agencies who are enthused about what we are doing, and turn up every couple of months to talk with us about how the tool is developing. We have an engaged community, and we're on the brink of having people who are real users for our policy modelling work, and that has never happened before in New Zealand, and is pretty rare internationally too."