EVIDENCE BRIEF

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Findings of dynamic modelling work conducted by the Sax Institute's Decision Analytics service

Strategies to reduce the burden of osteoporosis in Australia

Summary

- Osteoporosis is a prime cause of minimal trauma fractures (MTFs) and a significant contributor to Australia's disease burden
- We forecast that without further actions to address this, approximately 2 million MTFs will occur over the next 10 years (2019–2029)
- We developed a computer simulation model that can forecast the effect of various public health strategies to reduce the burden of osteoporosis and MTFs
- We found population-level effects of the modelled strategies were offset by population ageing, as well as by the difficulty of reaching all eligible people and patient 'attrition' over time along the care pathway
- Most of the MTFs will occur in people who have not yet been diagnosed with osteoporosis, and falls prevention strategies have the potential to prevent this large source of MTFs
- A secondary fracture prevention program targeting high-risk individuals could be cost-effective if expanded appropriately, including improvements in capturing eligible patients
- The model showed that effects of some strategies grow over decades, and therefore that long-term commitment and implementation are required to maximise possible benefits.

What is the issue?

Osteoporosis – a progressive loss of minerals in the bones – leads to bone weakness and increased risk of 'minimal trauma fractures' (MTFs), which occur after an impact no greater than would be experienced in a fall from standing height. These fractures are costly and debilitating. Despite significant efforts in prevention and treatment, osteoporosis contributes significantly to Australia's burden of disease, which is likely to increase as Australia's population gets older. It is unclear what combination of interventions are likely to be cost-effective at a national level in addressing this burden.

Figure 1: Estimated burden of osteoporosis and minimal trauma fractures

In Australia, **2 in 5 women** and **1 in 4 men** over the age of 50 will experience minimal trauma fracture.[a]

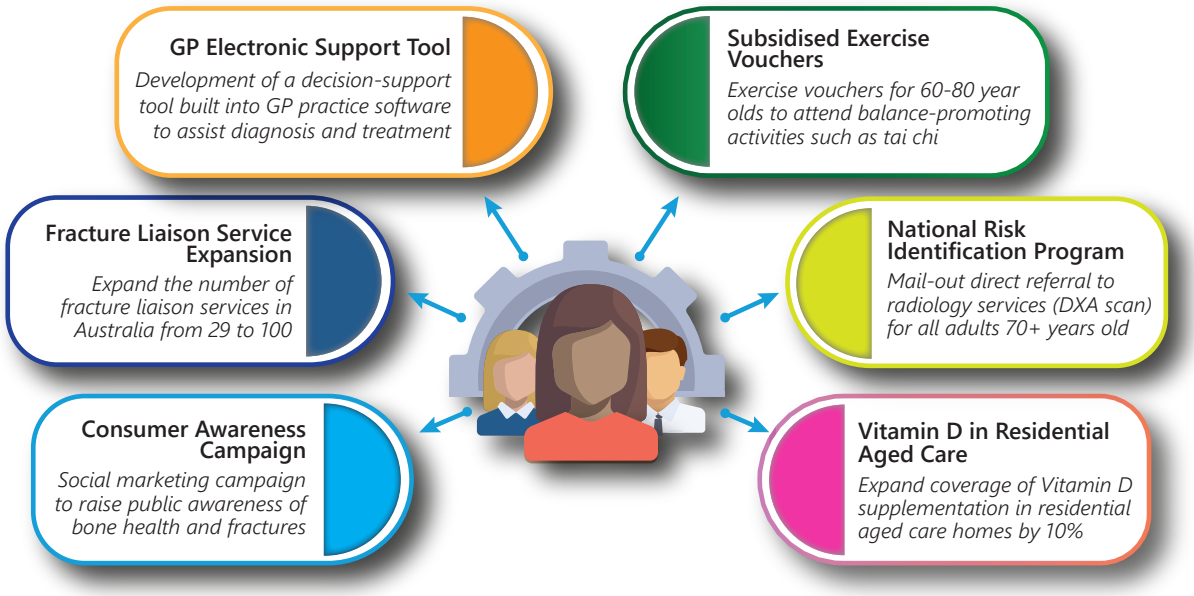
This amounts to over 150,000 minimal trauma fractures every year in this group[b]

[a] Australian Institute of Health and Welfare. Estimating the prevalence of osteoporosis. Canberra: AIHW; 2014
[b] Watts J, Abimanyi-Ochom J, Sanders K. Osteoporosis costing all Australians A new burden of disease analysis - 2012 to 2022 Melbourne: Osteoporosis Australia; 2013

What did we do?

- We developed a computer simulation model using the Sax Institute's Decision Analytics service – a 'what-if' tool that can test the comparative impacts and costs of a range of strategies, in this case to reduce bone fracture risk
- We formed a modelling consortium consisting of policy makers, health economists, clinicians, researchers and topic experts from eight universities and research institutes, five hospitals, two advocacy agencies, and a policy agency
- The modelling consortium contributed to the development of the model and prioritised strategies relevant to the Australian context to be tested by the model **(Figure 2)**
- An Expert Advisory Panel provided oversight to ensure scientific integrity.

Figure 2: Interventions proposed by the modelling consortium and included in the model

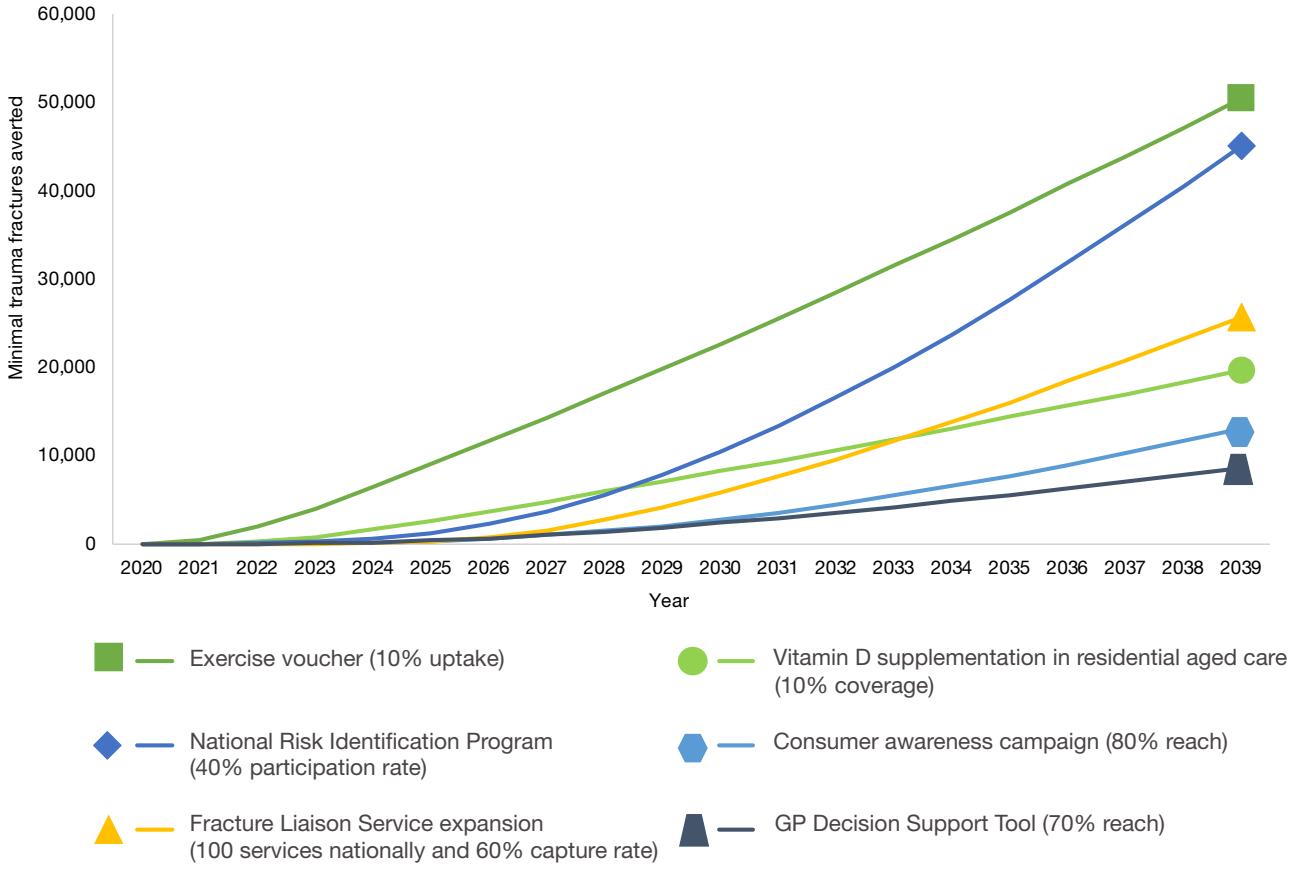


What did we learn?

- The model forecasts that unless something is done to reduce fracture rates, Australians collectively will experience about 2 million minimal trauma fractures (MTFs) between 2019 and 2029
- The model forecasts a 1.6% reduction in MTFs between 2019 and 2029 when all six strategies are implemented; the modest effect is due to population ageing, as well as by the difficulty of reaching all eligible people and patient 'attrition' over time along the care pathway
- When the model end time was extended to 2039, the effect of combining all six strategies increased to a 2.7% reduction in MTFs, because the effect of strategies that increase the use of medications grows over time **(Figure 3)**
- Over half of MTFs occur in people not yet diagnosed with osteoporosis (as defined by their bone mineral density or history of previous MTFs)

- This large source of MTFs can be reached by falls prevention through community-wide exercise and vitamin D supplementation in residential aged care
- Vitamin D supplementation in residential aged care is cost-saving and is likely to deliver benefits within a relatively short time
- Programs designed to increase medication adherence and persistence (that is, the number of people who take their medications as prescribed) will contribute significantly to more efficient use of resources
- The impact of a hospital-based secondary fracture prevention program, that is, Fracture Liaison Services, could be enhanced by increasing their capacity and simultaneously improving their ability to identify eligible patients
- Improving population bone health and delaying the average age of developing osteoporosis by one year was forecast to have a greater effect than any other single intervention included in the model
- The full benefits of a large program that encourages identification of osteoporosis will take more than 10 years to manifest
- Such a program should be combined with other measures to ensure follow-up (for example, measures to encourage medication initiation and adherence to improve cost-effectiveness)
- The model shows the need to explore new interventions to reduce the burden of osteoporosis and fractures, and highlights the importance of assessing the likely impacts of strategies in a simulation model before implementing them in the real world.

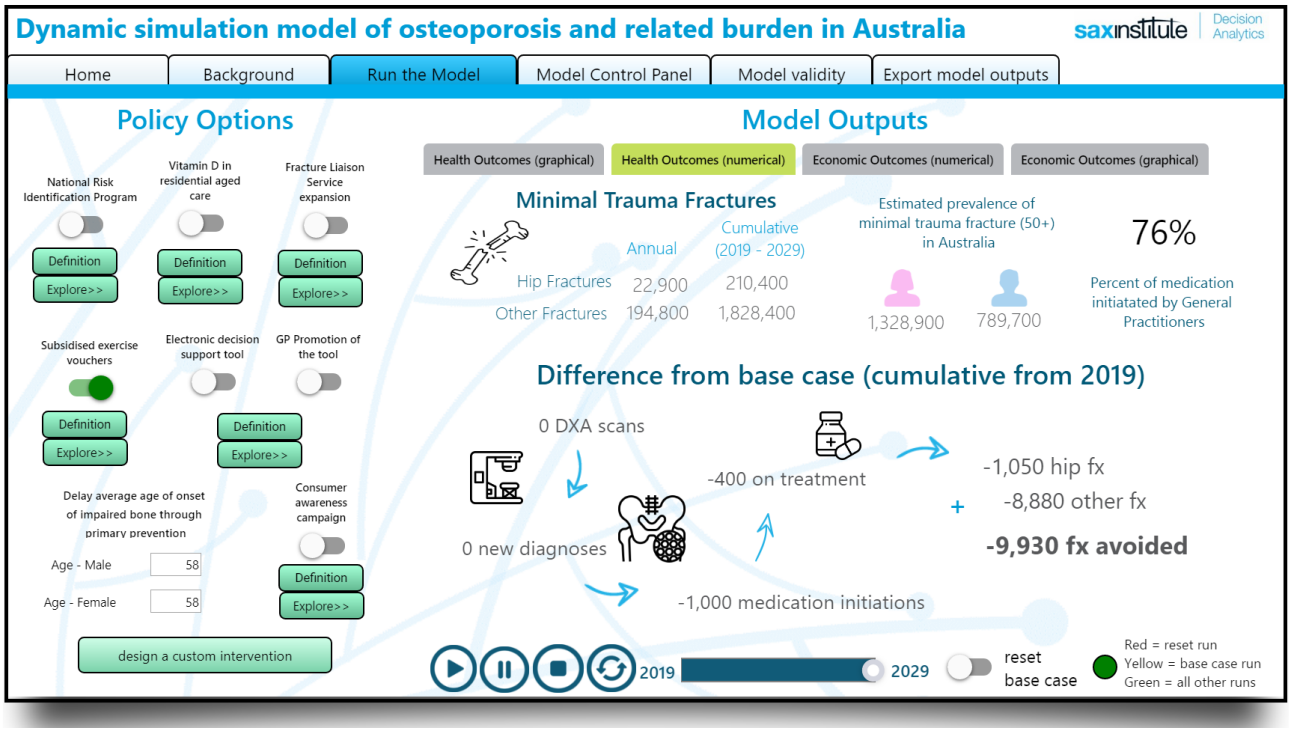
Figure 3: Forecast cumulative number of minimal trauma fractures averted, by intervention, 2019–2039



How the model works as a decision-support tool

In the model's interactive interface, effects of different strategies, including different ways of designing and delivering them, can be easily tested **(Figure 4)**. This way, the model acts as a tool to support decision-making processes.

Figure 4: Example of the model interface



About the Decision Analytics approach

This computer simulation model is a decision-support tool that can be updated as new data and evidence become available or extended to include additional interventions.

It can be used by national decision makers to determine the best and most cost-effective intervention combination as well as the optimal targeting, timing, scale, frequency and intensity of screening, treatment, and population health strategies, before they are implemented in the real world.

This project was commissioned by Amgen Australia and conducted independently by the Sax Institute.

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