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 cardiovascular disease in Australia

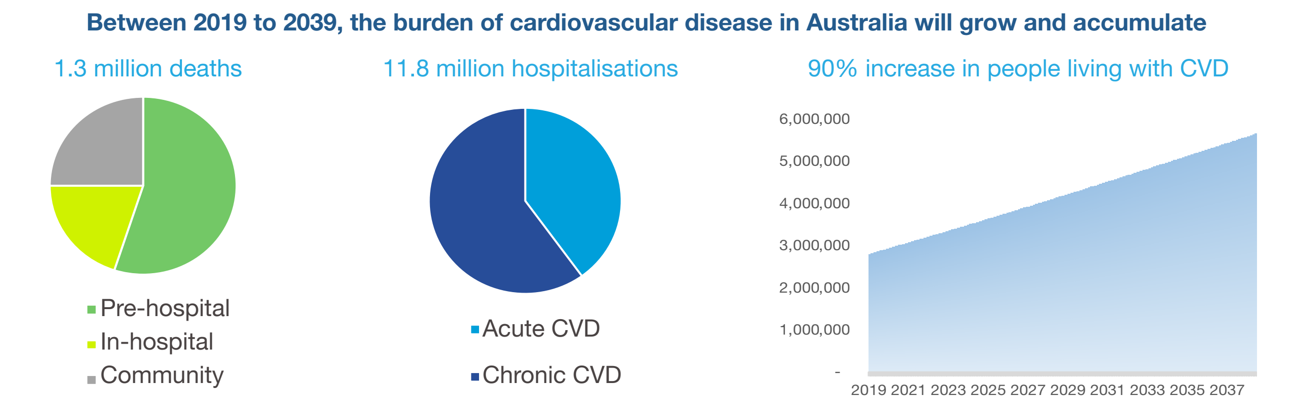
Key messages

- We developed a computer simulation model that can forecast the effect of various public health strategies designed to reduce the burden of cardiovascular disease
- We forecast that unless something is done, the number of Australians hospitalised for and dying from cardiovascular disease (CVD) each year will almost double over the next 20 years
- We found that strategies targeting the critical period between when people have an acute CVD event (e.g heart attack and stroke) and when they arrive at hospital are the most effective in reducing deaths
- Improving survival after acute CVD events alone without addressing underlying CVD conditions, however, increases the number of CVD-related hospitalisations in the long term
- While recurrent CVD contributes to the majority of the disease burden in Australia, primary prevention at an early stage produces greater long-term health and economic benefits
- The effects of a strategy (or strategies) are often not linear or additive, highlighting the risk in making simplistic assumptions when anticipating impacts
- The sectors that pay for and benefit from public health strategies can differ, and this calls for multiple levels of collaboration to effectively reduce the further rise in CVD-related disease burden.

What is the issue?

CVD is the leading cause of death in Australia. The treatments and prevention of CVD have advanced considerably, contributing to an 82% decline in the death rate since 1980. The rate of decline has slowed in recent years, probably due to Australia's ageing population and an increase in prevalence of a range of risk factors, placing future gains at risk. Finding effective and cost-effective combinations of strategies that will drive further success requires a collaborative approach as well as sophisticated systems modelling tools able to account for dynamic individual- and system-level influences.

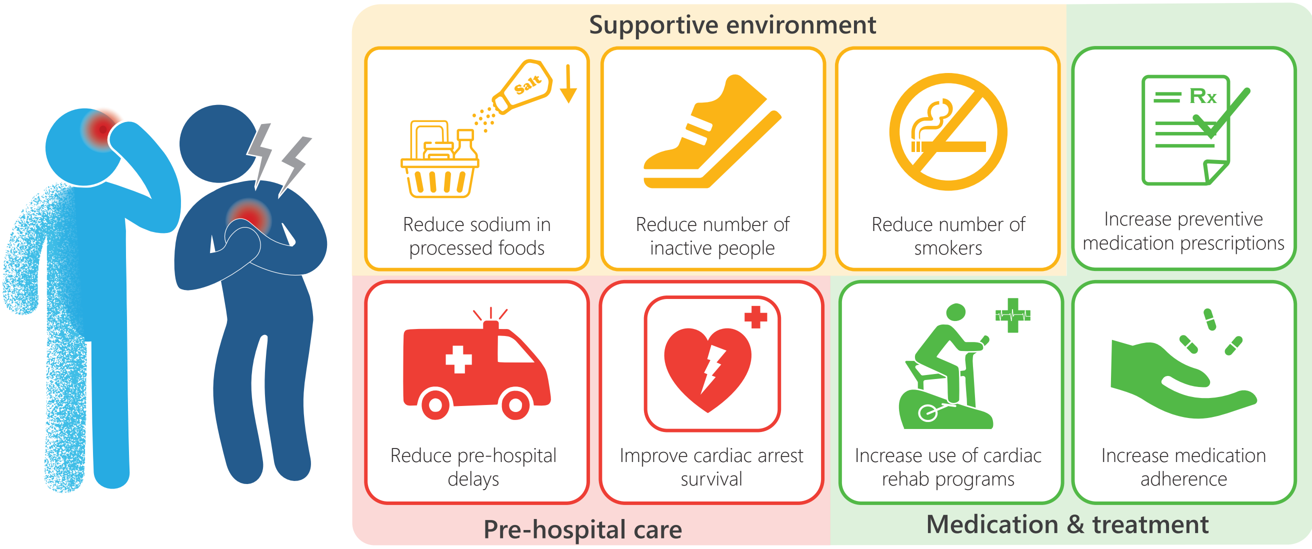
Figure 1: Burden of cardiovascular disease forecast estimated by the model



What did we do?

- We brought together a modelling consortium consisting of policy makers, health economists, clinicians, researchers and other experts related to CVD
- Working closely with the modelling consortium, the Sax Institute developed a computer simulation model – a 'what-if' tool that can test the comparative impacts and costs of a range of strategies, in this case to reduce hospitalisations and deaths due to CVD
- The modelling consortium contributed to the development of the model and prioritised a series of strategies (shown in **Figure 2**) relevant to the Australian context to be tested by the model
- An Expert Advisory Panel provided oversight to ensure scientific integrity.

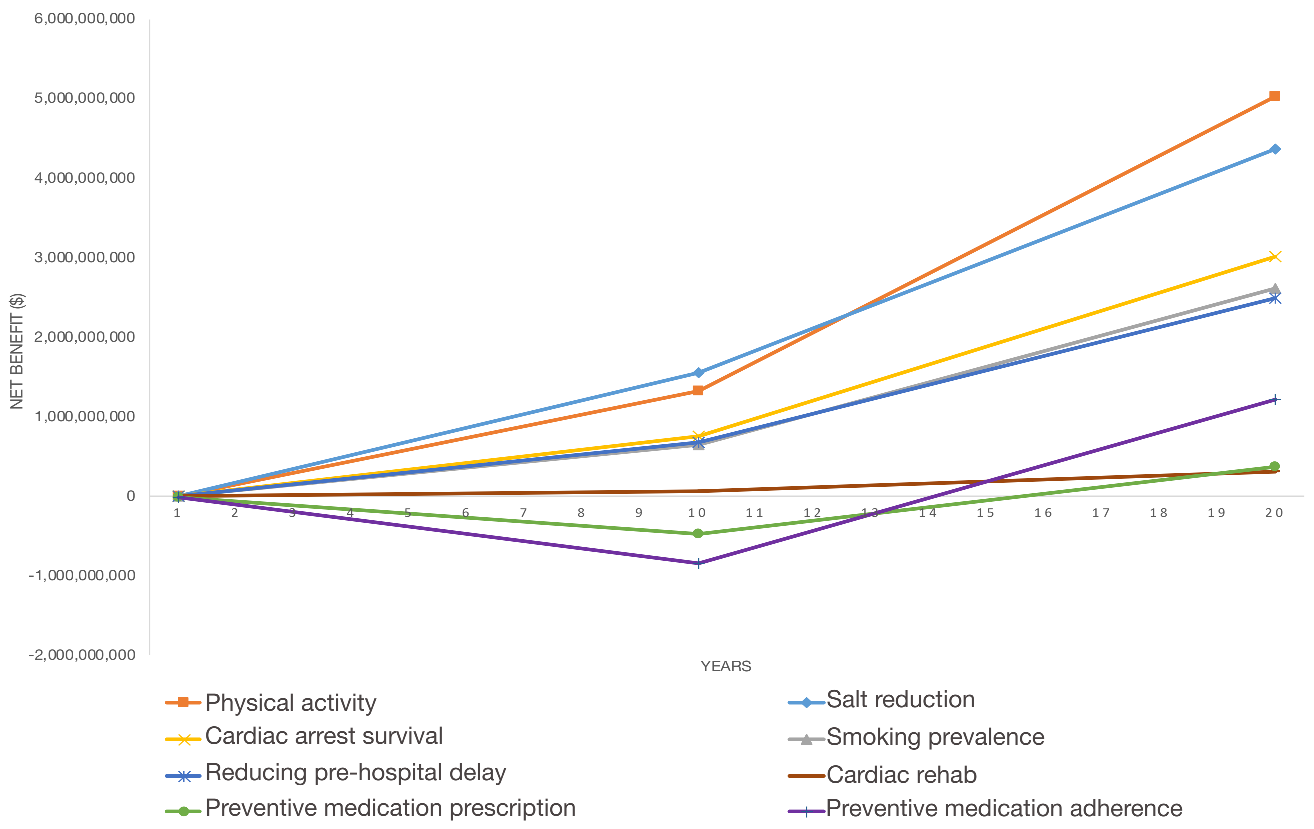
Figure 2: Strategies proposed by the modelling consortium and included in the model



What did we learn?

- Despite a downward trend in CVD death rates over the last 40 years, the model forecasts that due to Australia's ageing population, over the next 20 years we will see an 80% increase in annual CVD-related hospitalisations and an 80% increase in annual CVD-related deaths
- A total of 11.8 million hospitalisations and 1.3 million deaths due to CVD will occur over the next 20 years in Australians over 40 years of age
- Strategies targeting the pre-hospital stage of acute CVD events (improving cardiac arrest survival and reducing pre-hospital delays) are the most effective in reducing deaths (8.7% lower than the base case of business-as-usual) yet they result in a 1.4% increase in hospitalisations as the underlying CVD risk is left unaddressed
- Strategies to build a supportive environment (salt reformulation, increasing physical activity and reducing smoking prevalence) are effective in preventing both hospitalisations and deaths due to CVD — by over 4% in both measures compared to the base case, resulting in billions of dollars in the economic benefits within and beyond the health sector

Figure 3: Economic net benefit in the health sector of strategies over 20 years

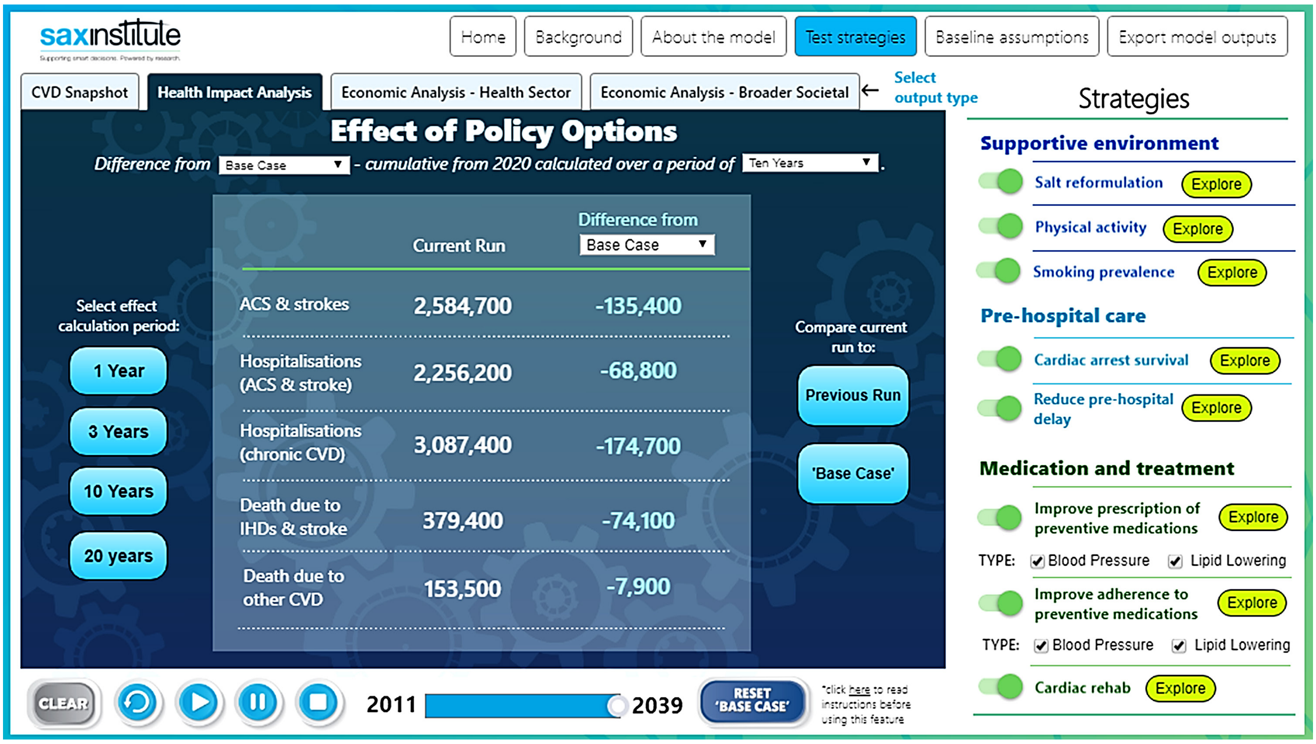


- Strategies to increase the use of preventive medication and treatment result in an increase in medical cost, largely paid by the Australian government and consumers, yet savings from fewer hospitalisations occur at the state government level
- When strategies to prevent secondary CVD are prioritised over strategies to prevent primary CVD, they are less effective in producing health benefits and are less cost-effective
- Since it takes time to roll out strategies and for strategies to generate benefits, the effects of strategies over time are not linear; for example, for them to generate benefits within the health sector may take more than a decade to become positive as the initial investments pay off in health benefits (**Figure 3**)
- Because of the interaction between components of the systems, the effects of combining strategies are often not additive; for example, combining strategies targeting the supportive environment and pre-hospital care prevents more deaths yet fewer hospitalisations, compared to simply adding effects from individual strategies.

How the model works as a decision support tool

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

Figure 4: Example of the model interface



About the Decision Analytics approach

The model described in this Evidence Brief 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. It can also be used to facilitate the cross-sectoral collaboration that will be essential for implementing and delivering the benefits of strategies implemented.

Due to the complex, dynamic nature of the problem of CVD, it can be challenging to anticipate likely impacts of strategies over time. System dynamics models help address this challenge by simulating strategies before being implemented in the real world. Moreover, the model can be updated as new data and evidence become available and extended to include additional interventions or further operational detail.

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