Systems modelling and simulation of strategies to mitigate the 'shadow pandemic' of mental ill-health in Victoria

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What did we do?

The complex interplay of social determinants of mental health, service system factors, population demographics and behavioural dynamics requires an analytic method capable of accounting for complexity and facilitating scenario testing to help decision makers explore the interplay of economic, social protection, and mental health system strategies. A national prototype system dynamics model was developed as a decision support tool to test a range of social protection measures and health system strengthening strategies individually and in combination to better understand the trade-offs and implications of decision options before they are implemented in the real world. This model forecasts the likely short and longer term impacts of alternative scenarios on the prevalence of psychological distress, mental health-related ED presentations, self-harm hospitalisations, suicide deaths, and the proportion of young people (15-24 years) not in employment, education or training (NEET). A summary of the model structure, key assumptions, and validation of its performance against existing real-world data (2011-2018) is provided in the Road to Recovery report released in July 2020. The national model was customised for the Victorian context reflecting its demographic and service dynamics. Appendix A provides a brief, high-level summary of the causal structure and pathways model. The preliminary findings of the Victorian model are reported below with summary statistics for each scenario provided for the period 2020-2025, and graphs showing the impacts over the longer time horizon (to 2031).
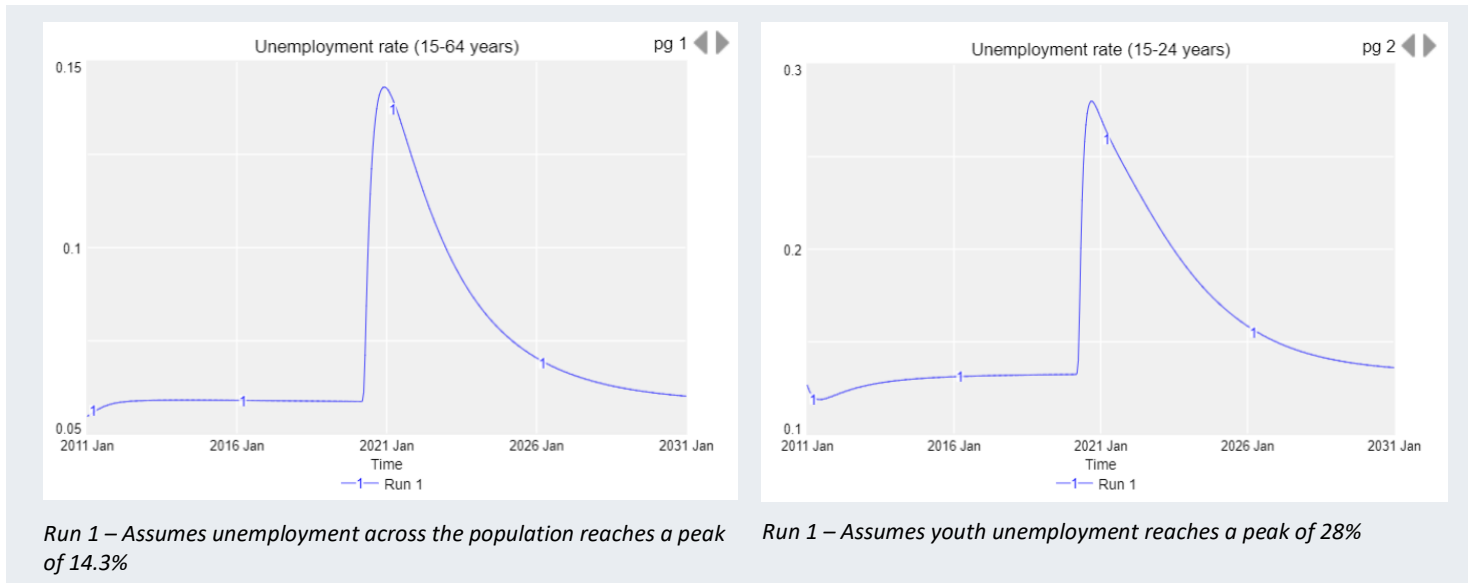
Assumptions:

Economic: The model assumes (effective) unemployment will reach a peak of 14.3% and youth unemployment will reach 28%

Social: The model assumes a 20% reduction in community connectedness resulting from social dislocation unrelated to job loss (e.g., working from home, not participating in sports, reduced social gatherings), that will persist for a period of 12 months.

Demographic: The impact of the pandemic on interstate and overseas migration to Victoria is uncertain. Reports have estimated that Victoria could have as many as 400,000 fewer people by the end of 2022 than was forecast pre-COVID. We have therefore run two scenarios, one that assumes this reported scale of reduction in the Victorian population projections, and one that assumes no decrease in the Victorian population projections.

Figure 1: *Assumed pattern of (effective) unemployment underlying model outputs.*

Run 1 – Assumes unemployment across the population reaches a peak of 14.3%

Run 1 – Assumes youth unemployment reaches a peak of 28%

What did we find?

Mental health impact of COVID-19

• State-level modelling points to substantial increases in adverse mental health outcomes in Victoria resulting from the effects of COVID-related lockdowns on job loss and social dislocation. Over the period March 2020 to March 2025, under the assumption that current ABS population projections are retained, suicides are projected to increase by 31% (i.e., compared to what would have happened if the pandemic had not occurred), self-harm hospitalisations by 30%, and mental health-related ED presentations by 28% (Table 1).

• The impact of COVID-19 on young people is projected to be greater than that for the Victorian population as a whole. Among people aged 15-24 years, suicides are forecast to increase by 36%, self-harm hospitalisations by 33%, and mental health-related ED presentations by 31% over the same 5-year period.

Table 1: *Projected suicides, self-harm hospitalisations, and mental health-related emergency department presentations over the period March 2020 to March 2025 with and without the COVID-19 pandemic and with and without an assumed population reduction.*

	Without projected change in migration			With projected change in migration		
	No COVID-19	COVID-19	% increase	No COVID-19	COVID-19	% increase
Total population						
Suicides	3792	4983	31	3792	4701	24
Self-harm hospitalisations	29648	38530	30	29648	35850	21
ED presentations	295510	378237	28	295510	352986	19
Population aged 15-24 years						
Suicides	473	642	36	473	587	24
Self-harm hospitalisations	9153	12128	33	9153	11090	21
ED presentations	62062	81302	31	62062	74367	20

Strategies for mitigating the impact of COVID-19

• Employment programs (such as JobKeeper) are the single most effective intervention for reducing the adverse mental health impacts of the pandemic. Keeping these programs in place for 2 years (until May 2022) is projected to prevent 364 suicides, 3159 self-harm hospitalisations, and 28745 mental health-related ED presentations across Victoria, including 58 suicides, 1094 self-harm hospitalisations, and 7106 mental health-related ED presentations among young people (aged 15-24 years) (Figure 2, run 2, red).

• Substantial investment in specialised mental health services capacity, technology-enabled coordination of multidisciplinary team-based care, and intensive post-suicide attempt support is needed to manage the projected surge in demand for mental health care (which will occur even with an extension to employment programs). Combined, these interventions are projected to prevent 228 suicides, 1772 self-harm hospitalisations, and 11589 mental health-related ED presentations over the period March 2020 to March 2025, including 26 suicides, 501 self-harm hospitalisations, and 2153 mental health-related ED presentations among 15-24-year-olds (Figure 2, run 3, pink).

• Mental health awareness campaigns and the expansion of Better Access are projected to have minimal impact on mental health outcomes and may even be detrimental, since they increase demand for already overstretched services, increasing waiting times and disengagement from care. These initiatives need to be combined with drastically increased investment in specialised, community-based mental health services capacity if they are to be effective.

• Effective management of the unfolding mental health crisis in Victoria requires an urgent, coordinated policy response combining economic, social, and mental health services interventions. Our modelling suggests that

the combination of employment programs (extending JobKeeper until May 2022), education programs aimed at increasing post-secondary enrolments by 20%, and significant investment in community-based mental health services capacity, technology-enabled care coordination, and post-suicide attempt care will prevent 580 suicides, 4875 self-harm hospitalisations, and 40356 mental health-related ED presentations over the period March 2020 to March 2025, including 86 suicides, 1629 self-harm hospitalisations, and 9570 mental health-related ED presentations among people aged 15-24 years (Figure 2, run 4, green).

Figure 2: *Simulated impacts of recommended combination of employment, education, and health system strengthening strategies on prevalence of psychological distress, mental health-related ED presentations, self-harm hospitalisations, and suicide deaths across all ages and among youth (2020-2031).*
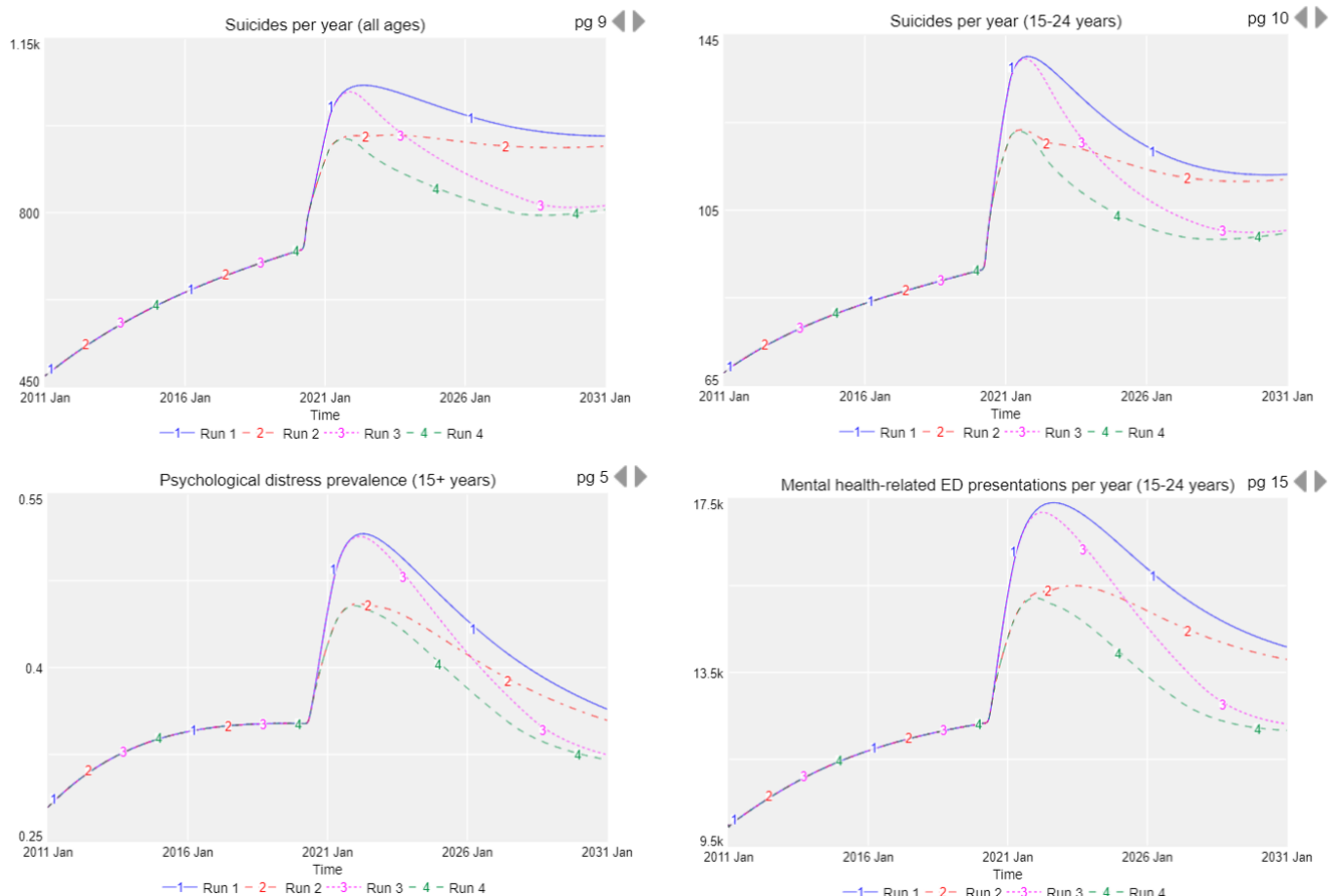
Run 1 – Baseline scenario (no assumed reduction in population)
Run 2 – Employment programs for 2 years (until May 2022)
Run 3 – Expansion of specialised mental health services capacity (8-10% annually) + technology-enabled coordination of multidisciplinary team-based care + and intensive post-suicide attempt support
Run 4 – Employment programs for 2 years (until May 2022) + Education support programs – increasing enrolments in post-secondary education and vocational training by 20% + expansion of specialist community-based mental health service capacity + technology enabled coordination of team-based care + post-suicide attempt assertive aftercare (commencing 2021)
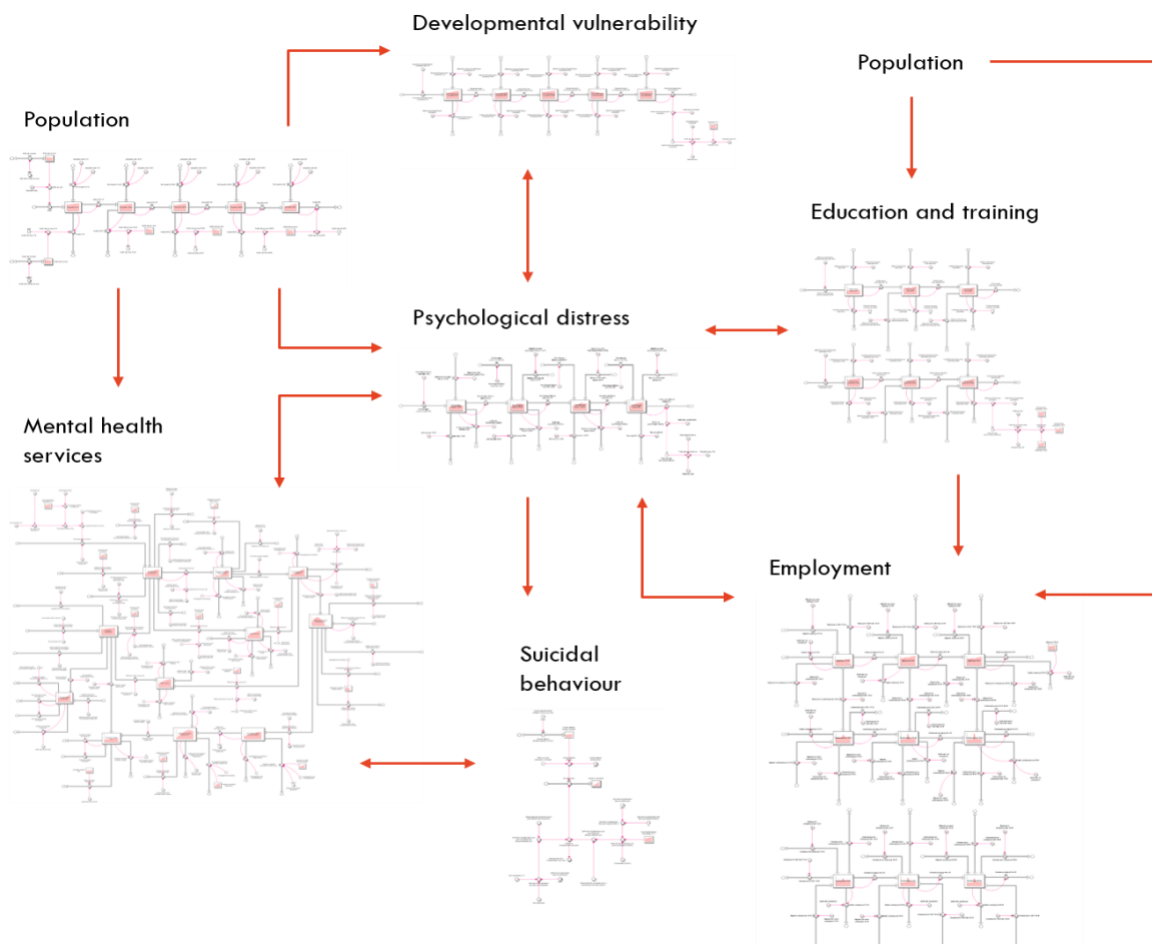
Next steps:

The model will be updated as revised estimates of migration, unemployment, underemployment, participation, psychological distress and presentations to emergency care are released over the coming months. We recommend much more frequent and well-structured tracking of real-time psychological distress, suicidal thoughts and behaviours, self-harm presentations to Emergency Departments, deaths due to suicide and other related accidents and injuries – nationally and regionally. This would facilitate indicative monitoring of progress of the strategies implemented, permit comparisons against projected impacts of the model, and contribute to refinement of the model to strengthen forecasts over time.

Appendix A

Model summary:

The core model structure included: 1) a population component, capturing changes over time in the size and composition of the population resulting from births, migration, ageing, and mortality; 2) a psychological distress component that models flows of people to and from states of moderate to very high psychological distress (Kessler 10 [K10] score 16-50); 3) a developmental vulnerability component modelling exposure to childhood adversity and its effect on the risk of developing mental disorders in adolescence and adulthood; 4) a post-secondary education sector that captures participation in education and vocational training; 5) an employment sector that captures workforce participation, unemployment and underemployment across the population; 6) a mental health services component that models the movement of psychologically distressed people through one of several possible service pathways involving (potentially) general practitioners, psychiatrists and allied mental health professionals (including psychologists and mental health nurses), emergency department and psychiatric inpatient care, community- and hospital-based outpatient care, and online services; and 7) a suicidal behaviour component that captures self-harm hospitalisations and suicide deaths. Figure 9 presents a high-level map of the core model showing the (causal) connections among sectors. The model is stratified by age-groups (15-24 years, 25-44 years, 45-64 years, 65+ years), and by major cities versus regional areas to enable exploration of differential effects of strategies on these populations.

Figure 3*: A high-level overview of the causal structure and pathways of the system dynamics model*