

The University of Sydney's **Brain and Mind Centre** presents

# Beyond Prevention

Which active interventions, at scale will flatten the mental health and suicide curve post-COVID-19?

Join the conversation **#FlattenTheMentalHealthCurve @BrainMind\_Usyd**



*'Flattening the Mental Health and Suicide Curve' facilitator*

# Professor Ian Hickie

Co-Director, Health and Policy, The University of Sydney's Brain and Mind Centre

**@Ian\_Hickie @BrainMind\_Usyd**

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#FlattenTheMentalHealthCurve*





*'Flattening the Mental Health and Suicide Curve'*

The panellists



**A/Prof Jo-An  
Atkinson**

Brain and Mind Centre  
**@BrainMind\_Usyd**  
**@CSART\_world**



**Julie Sturgess**

North Coast Primary  
Health Network  
**@NorthCoastPHN**



**Dr Frank Iorfino**

Brain and Mind Centre  
**@frankiorfino**  
**@BrainMind\_Usyd**



**A/Prof Kenny Lawson**

Brain and Mind Centre  
(collaborator)  
**@BrainMind\_Usyd**



**Matthew Hamilton**

Orygen  
**@orygen\_aus**

*Facilitated by Professor Ian Hickie AM, Co-Director of Health and Policy, Brain and Mind Centre*

**@Ian\_Hickie , @BrainMind\_Usyd**



*Flattening the Mental Health and Suicide Curve* panellist

# Associate Professor Jo-An Atkinson

Head, Systems Modelling and Simulation, The University of Sydney's Brain and Mind Centre

**@BrainMind\_Usyd**

**@CSART\_world**

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THE CONVERSATION

Academic rigour, journalistic flair

COVID-19Arts + CultureBusiness + EconomyCitiesEducationEnvironment + EnergyHealth + MedicinePolitics + SocietyScience + Technology

How to model a pandemic

March 28, 2020 5:41am AEDT

MarzoVector/Shutterstock

145766

Author

Christian Yates

Senior Lecturer in Mathematical Biolo

Science

ContentsNewsCareersJournals

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12K81

Dutch models of COVID-19 are designed to help prevent overloading of hospitals and the need to transfer patients. THOMAS ANGUS/IMPERIAL COLLEGE LONDON

Mathematics of life and death: How disease models shape national shutdowns and other pandemic policies

By Martin Enserink, Kai Kupferschmidt | Mar. 25, 2020 , 6:40 PM

Jacco Wallinga's computer simulations are about to face a high-stakes reality check. **Wallinga is a mathematician and the chief epidemic modeler** at the National Institute for Public Health and the Environment (RIVM), which is advising the Dutch government on what actions, such as closing schools and businesses, will help control the spread of the novel coronavirus in the country.

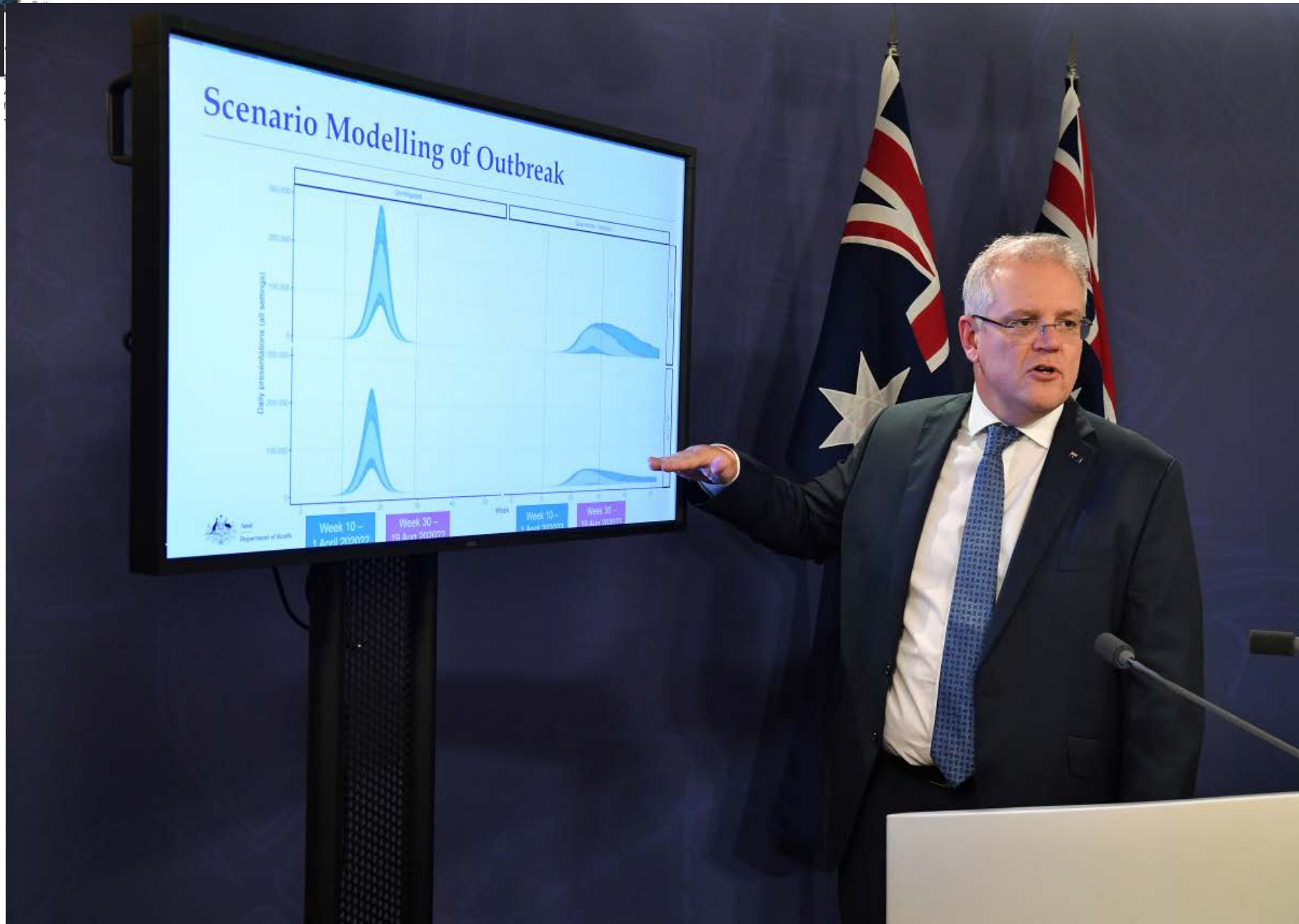
COVID-19 response from Australian privacy regulators

27 March 2020

Tags: statement

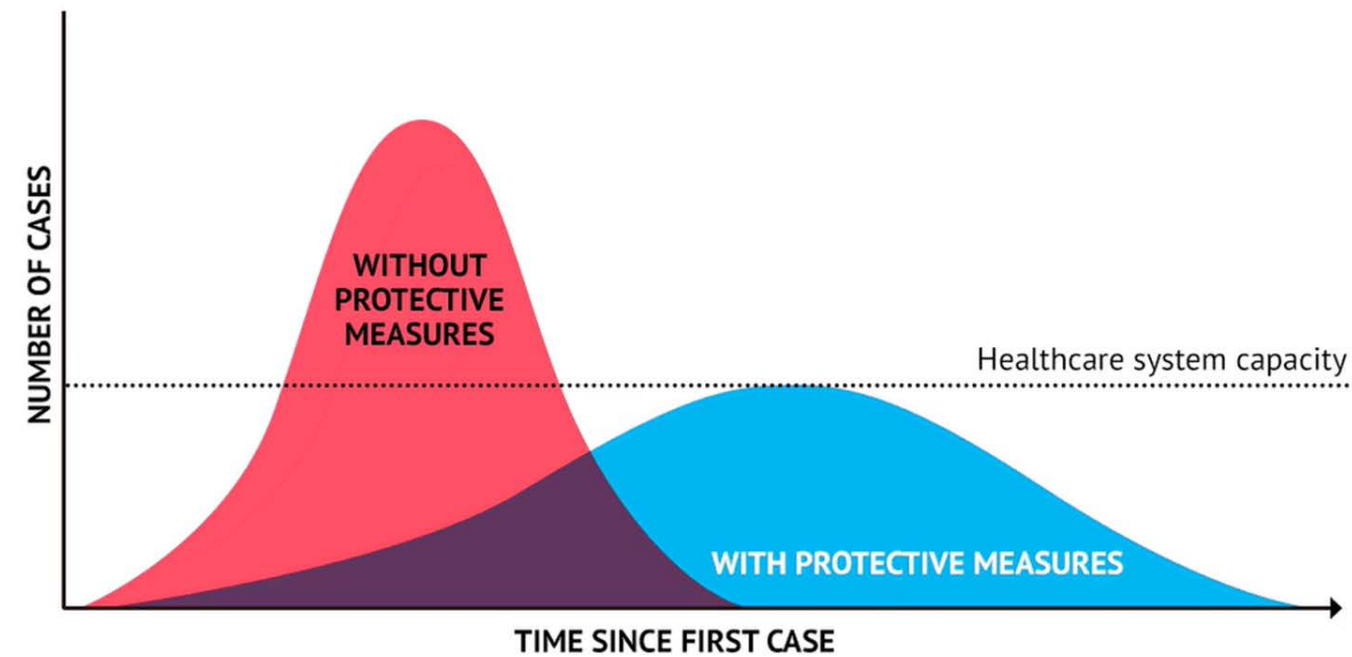
Privacy Commissioners and Ombudsmen around the country appreciate that individuals, organisations and government are facing significant challenges to stop the spread of COVID-19. The use of personal information is part of addressing this public health crisis.

Privacy laws at the State, Territory and Federal level contain mechanisms to permit the exchange of critical information in these circumstances. Those laws also require that personal information is handled in a way that is reasonably necessary to prevent and manage COVID-19 and is protected.





## COVID-19 CURVE



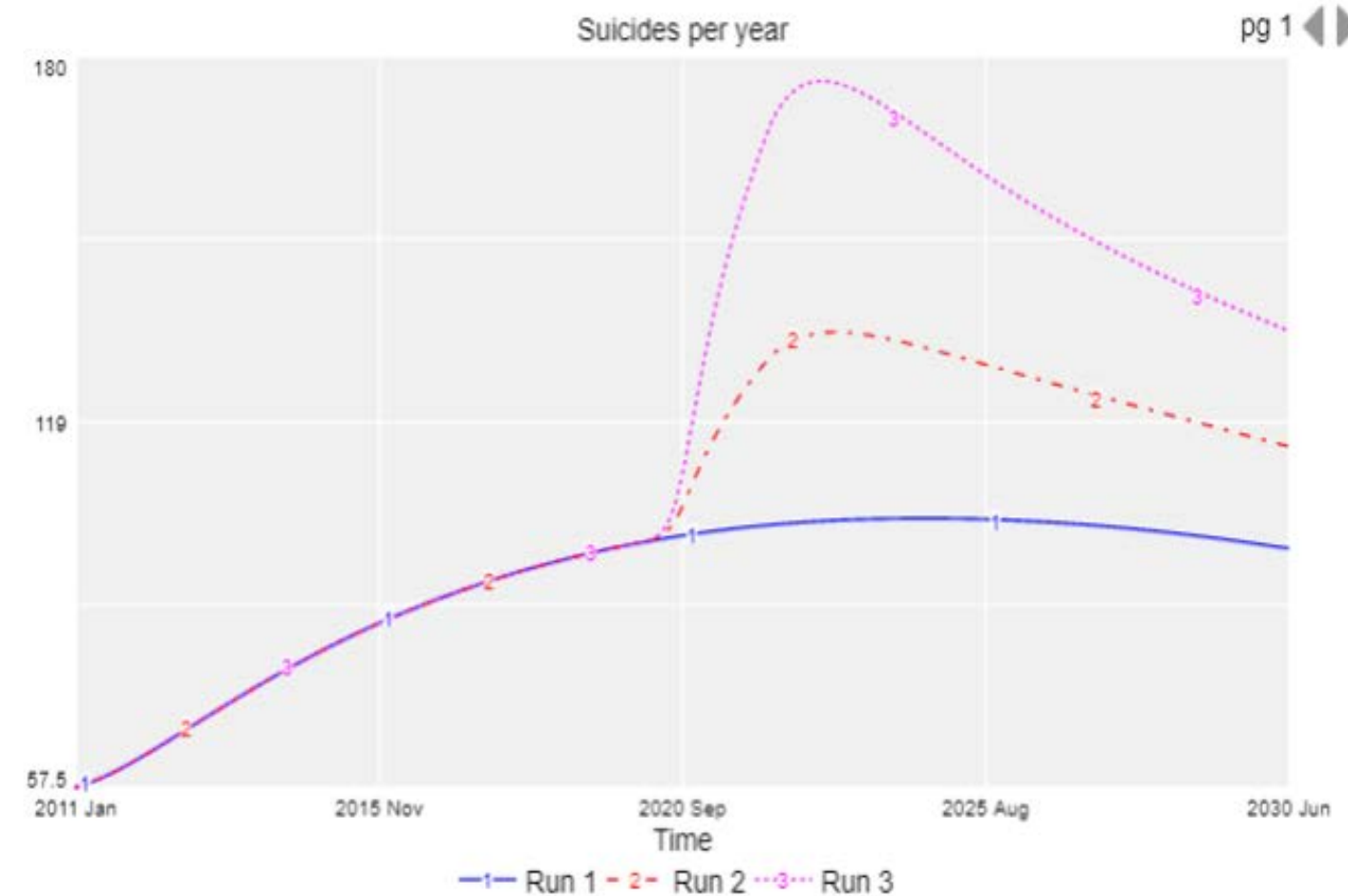
<https://www.smh.com.au/national/how-are-countries-flattening-the-curve-of-coronavirus-20200317-p54b3g.html>

## SUICIDE CURVE

North Coast PHN model

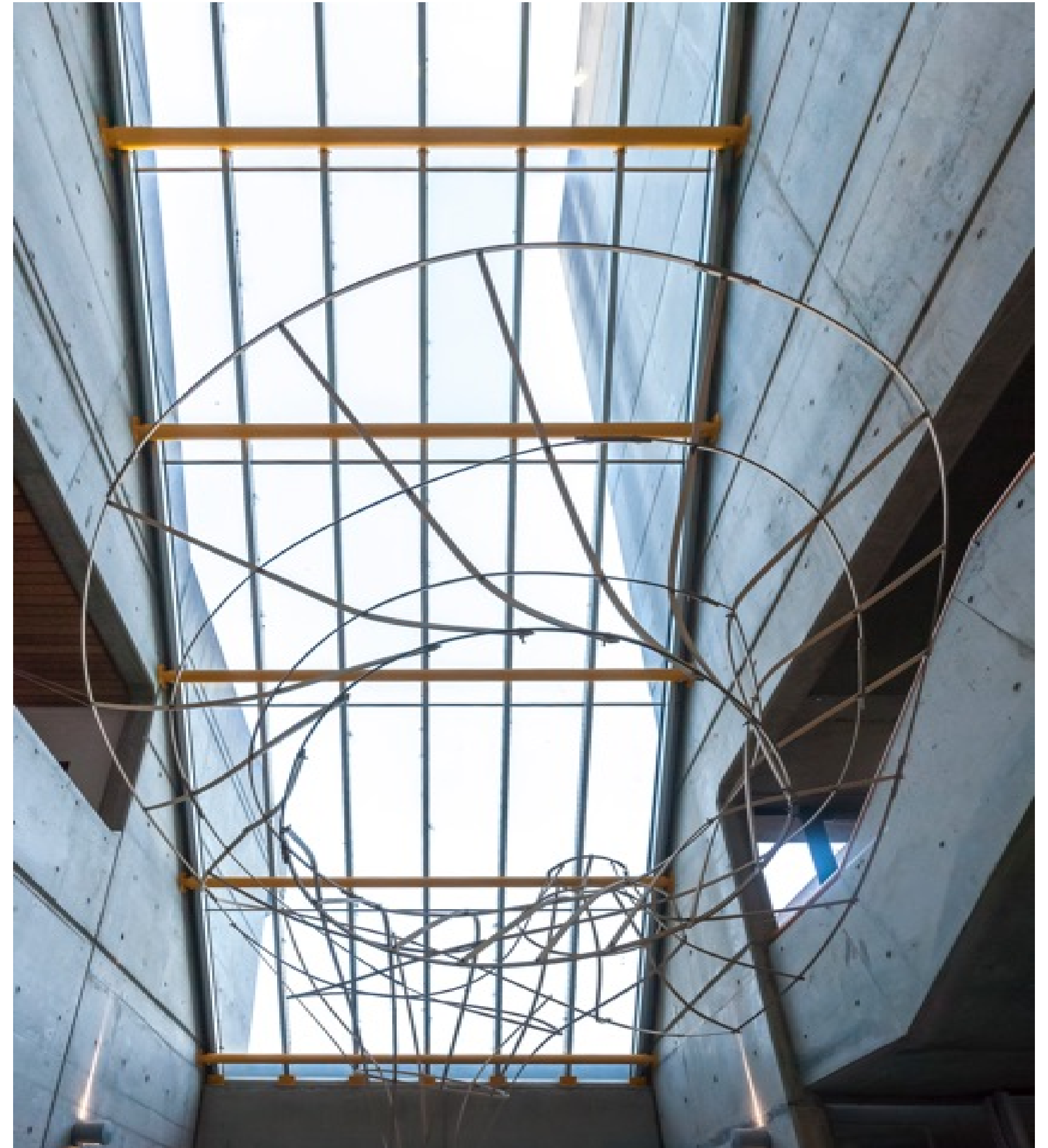
Run 2 - Unemployment rate 11.1% (total population) & 24% youth unemployment

Run 3 - Unemployment rate 15.9% (total population) & 34.8% youth unemployment



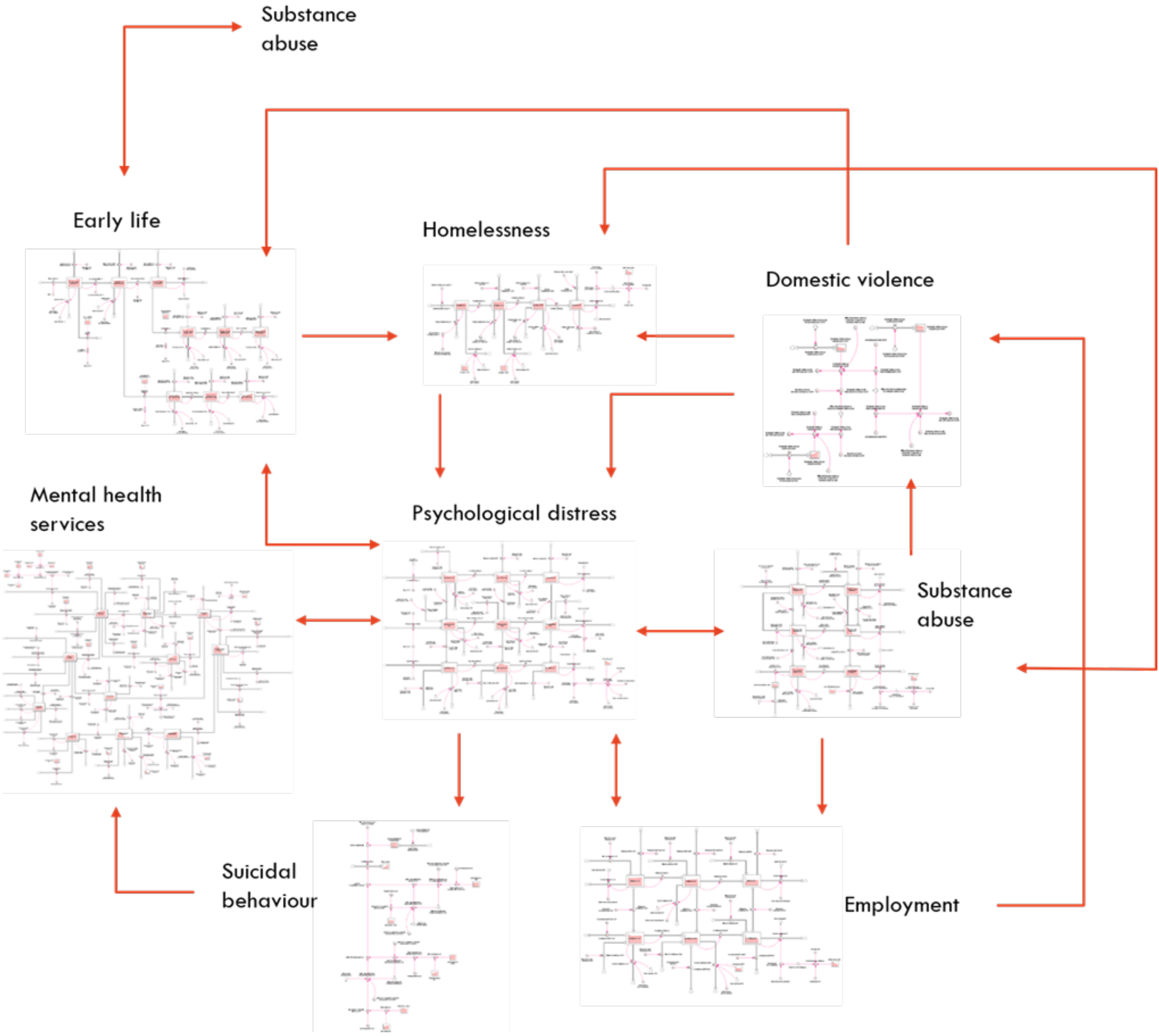
***Bending the post-  
COVID-19 curve for  
suicide***

***Preliminary results  
from systems  
modelling for the North  
Coast Primary Health  
Network***

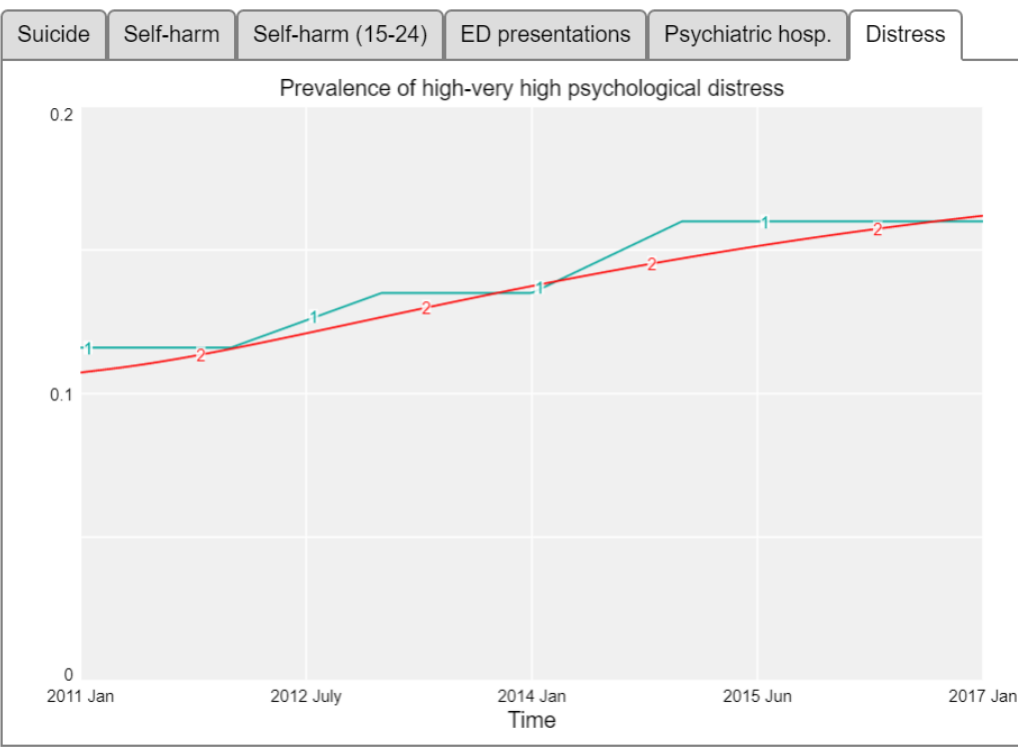
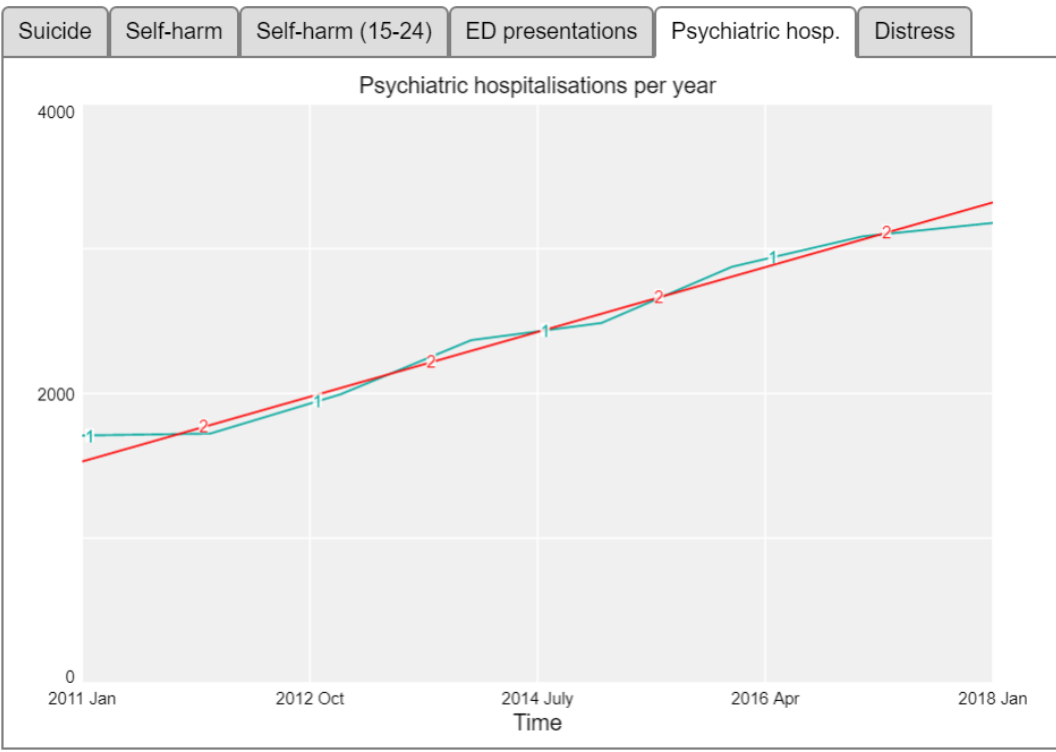
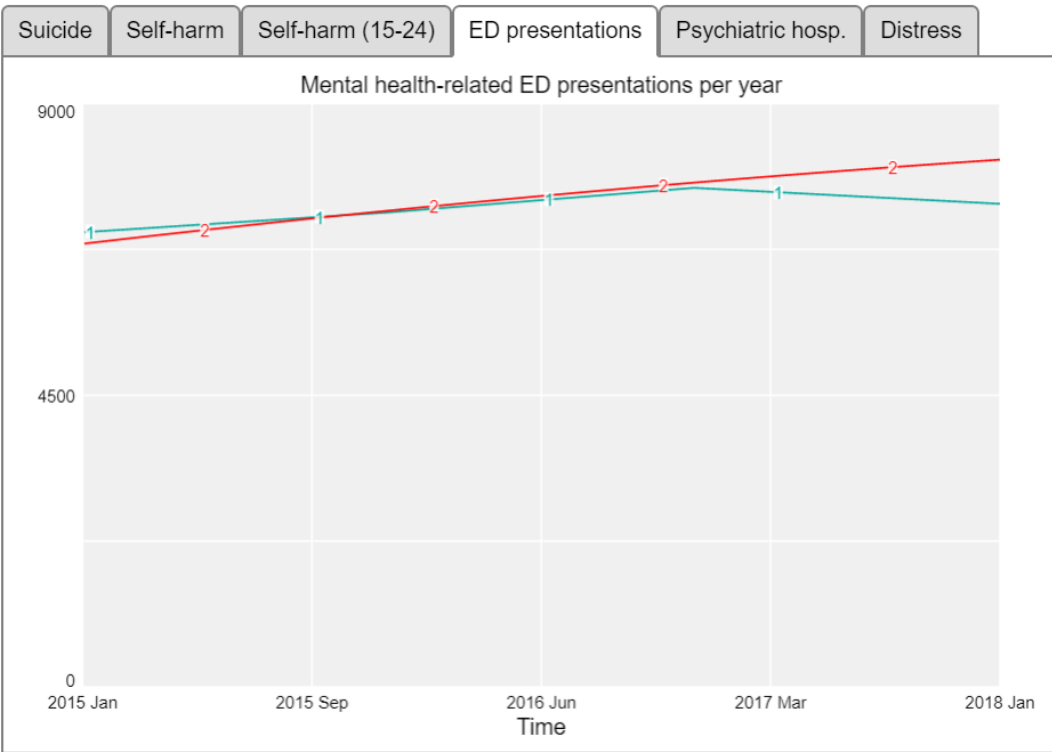
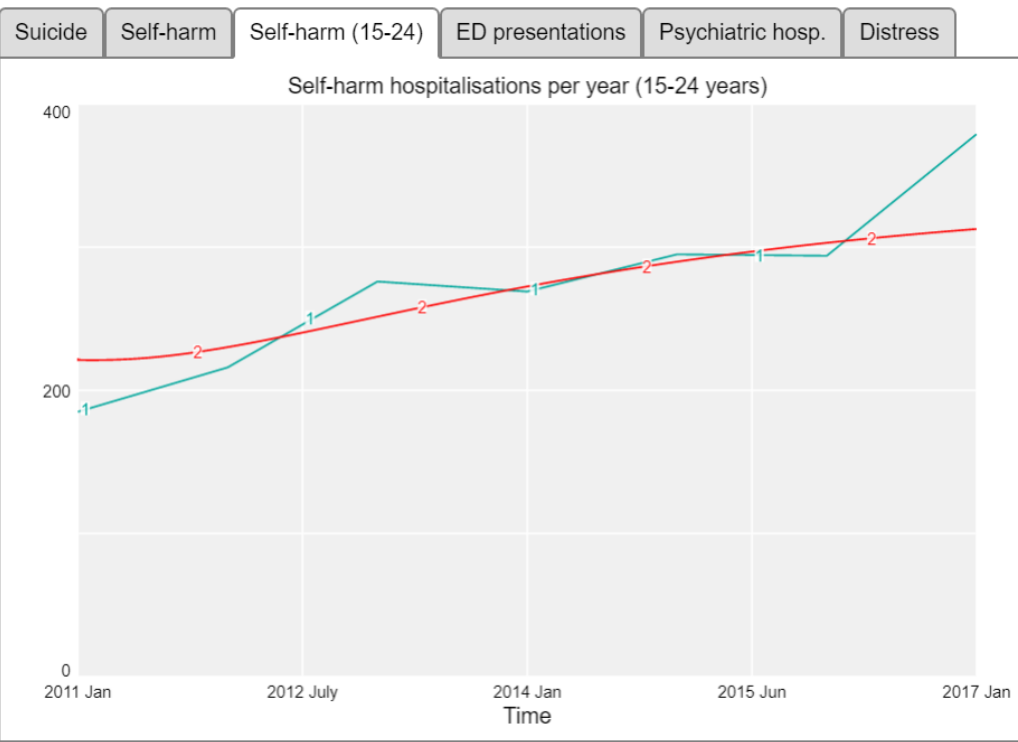
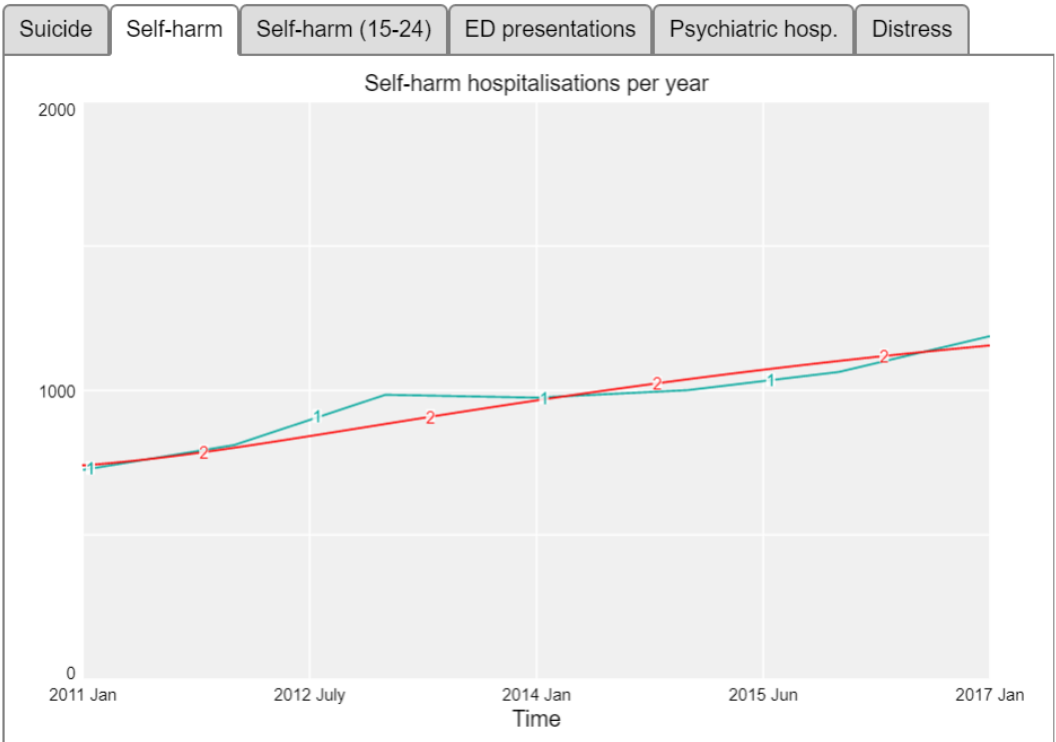
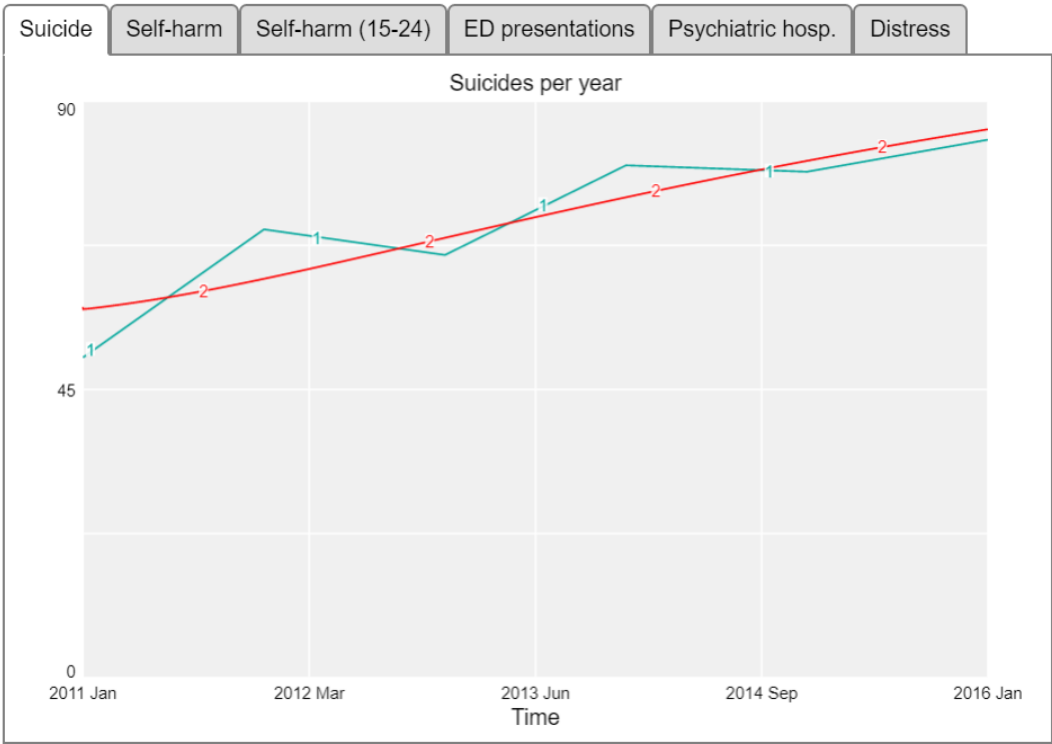




# High level overview of the causal structure and pathways of the model



# Model Validation

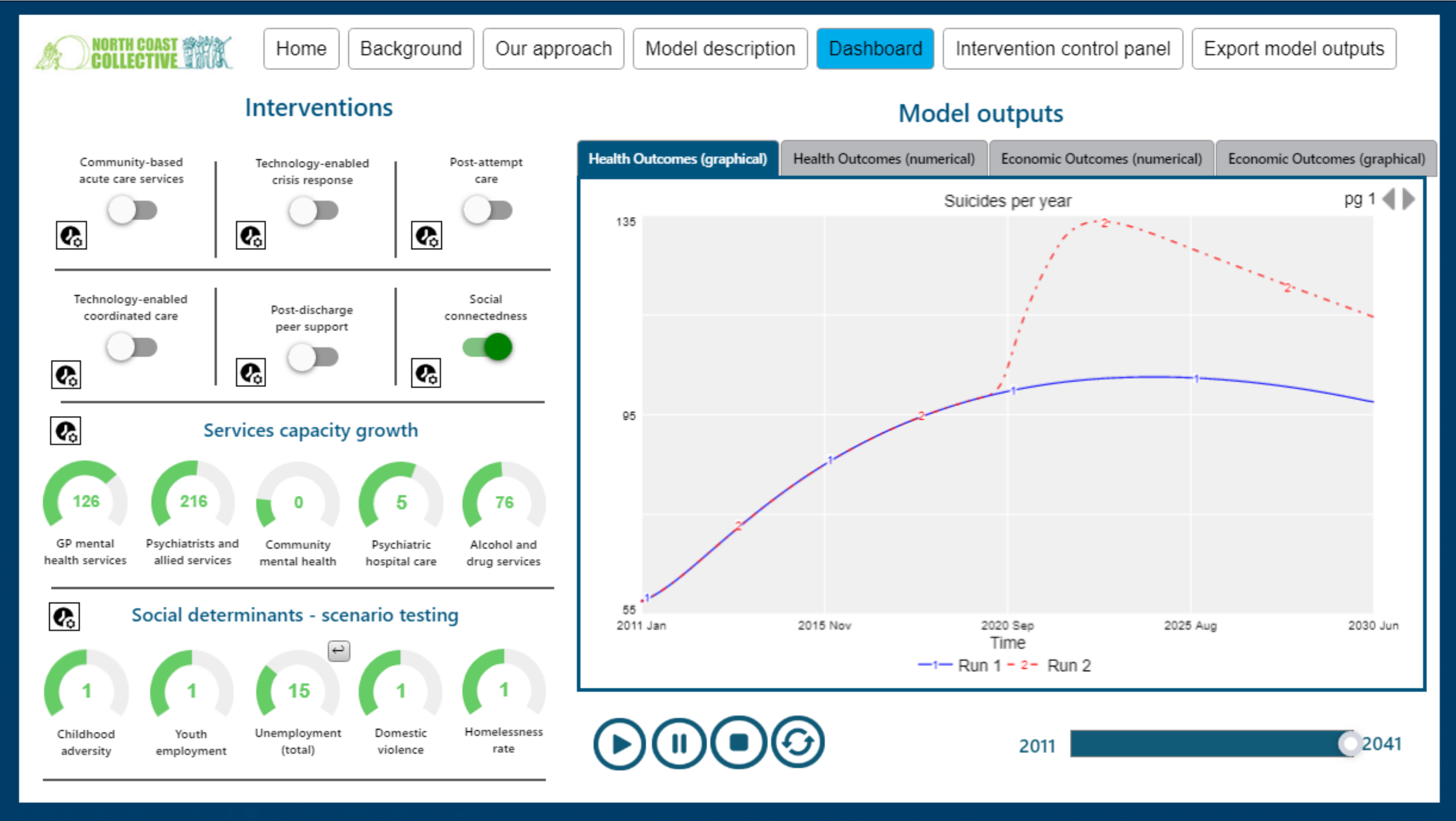




# Baseline (pre-COVID era):



Post-COVID: Scenario 1 (Conservative) - Unemployment rate 11.1% (total population) and 24.0% youth unemployment with 10% reduction in social connectedness





# Mitigating strategy: 20% increase in services capacity growth rate (i.e. a 6.5% increase per year in pre-COVID-19 mental health GP, psychiatrist & allied services capacity, and a 2% CMHC services capacity)

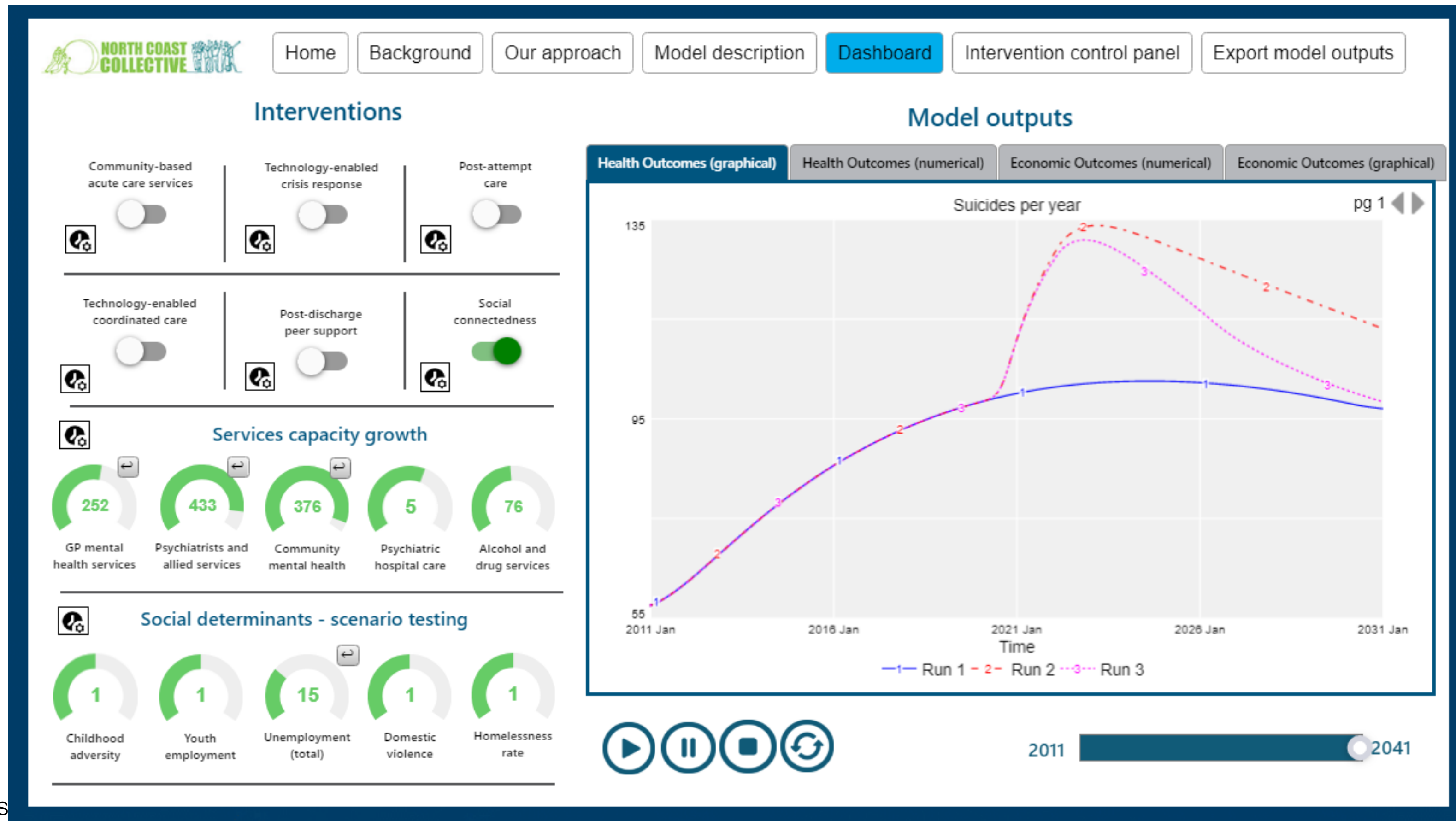


# Mitigating strategy: 50% increase in services capacity growth rate (i.e. an 8% increase per year in pre-COVID-19 mental health GP, psychiatrist & allied services capacity, and a 5% CMHC services capacity)

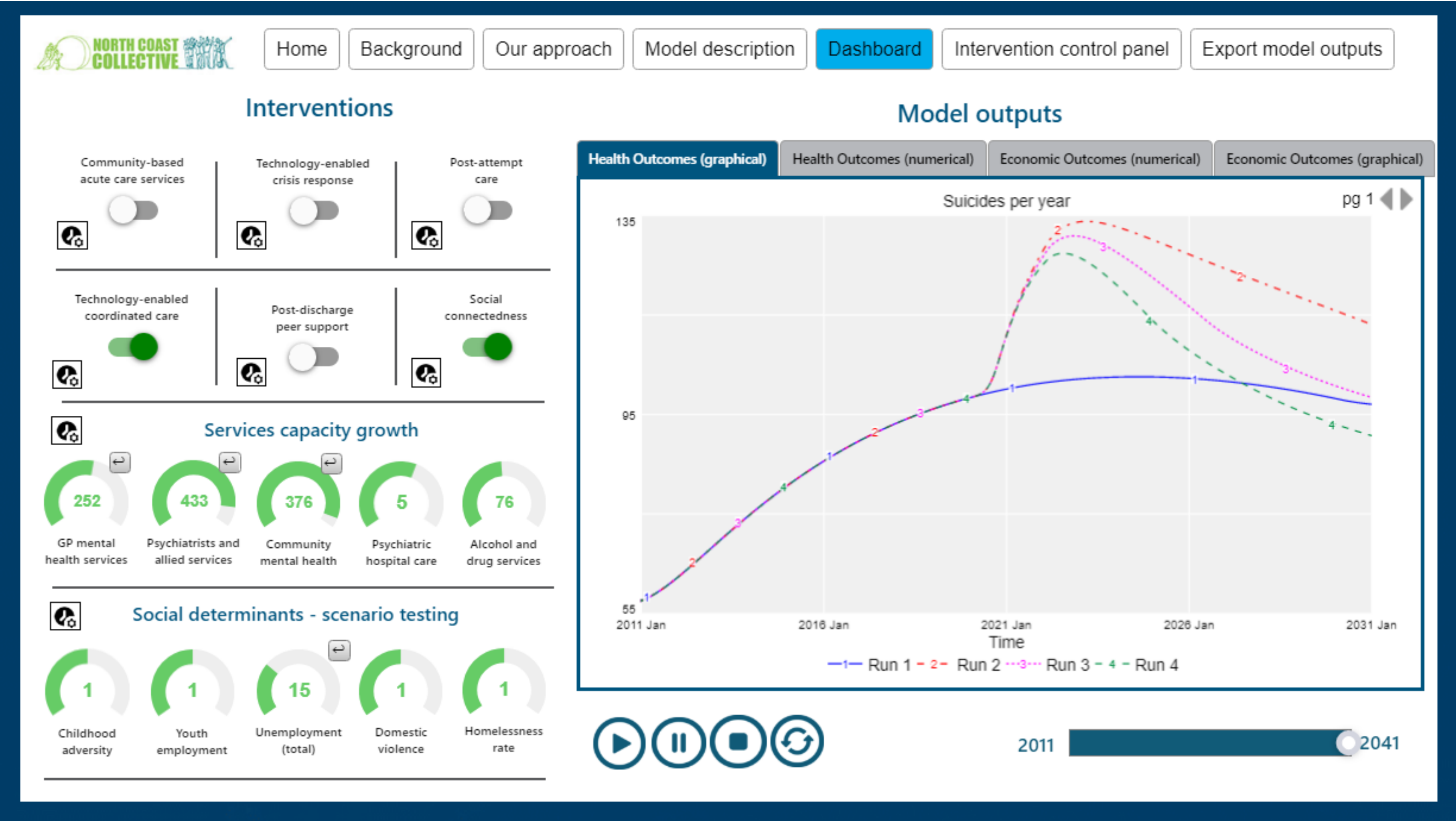




# Mitigating strategy: A doubling of services capacity growth rate (i.e. a 11% increase per year in pre-COVID-19 mental health GP, psychiatrist & allied services capacity, and a 10% CMHC services capacity)

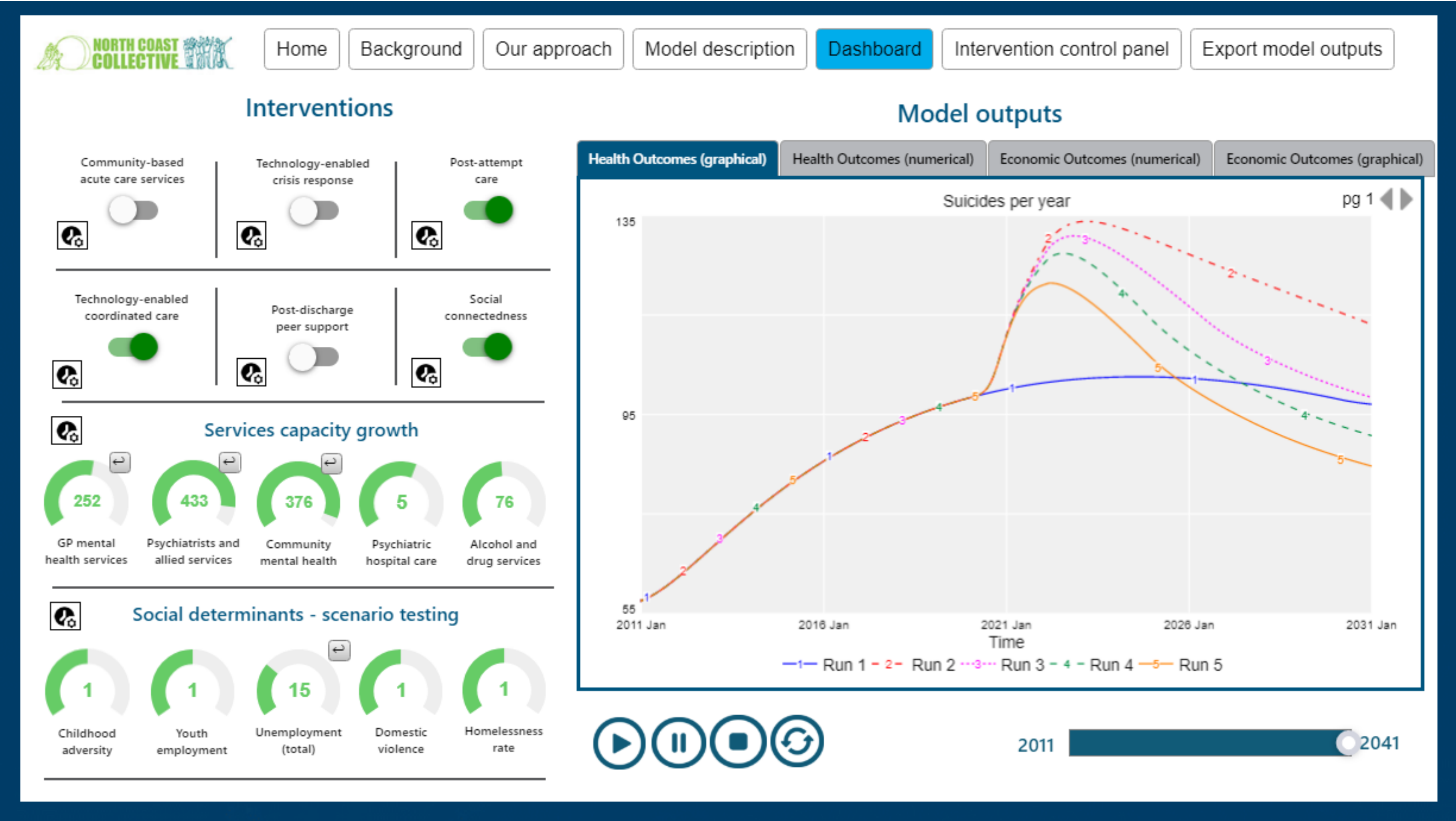


Mitigating strategy: Doubling services capacity growth rate + technology enabled coordinated care

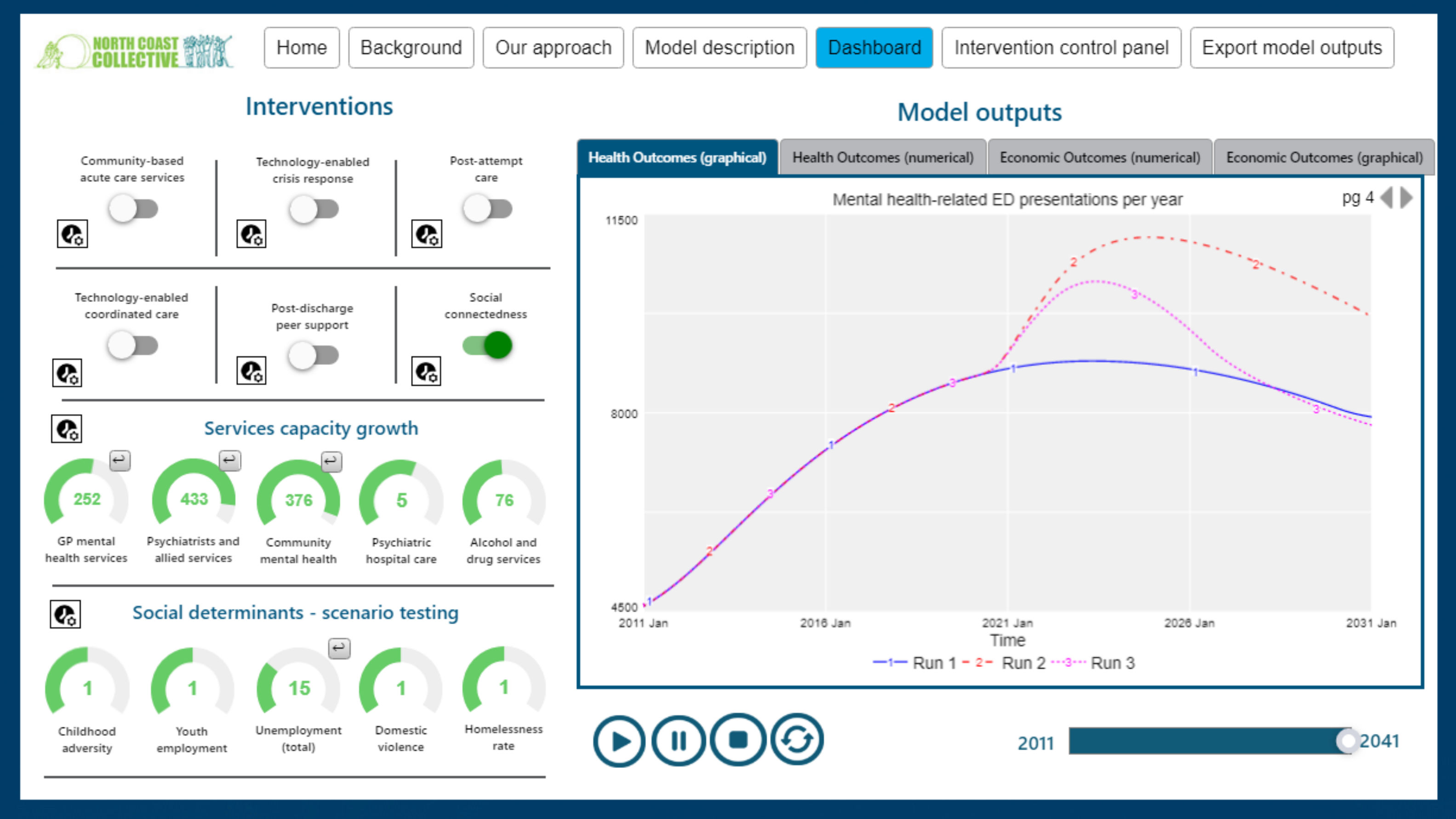




Mitigating strategy: Doubling services capacity growth rate + technology enabled coordinated care + post-attempt after care

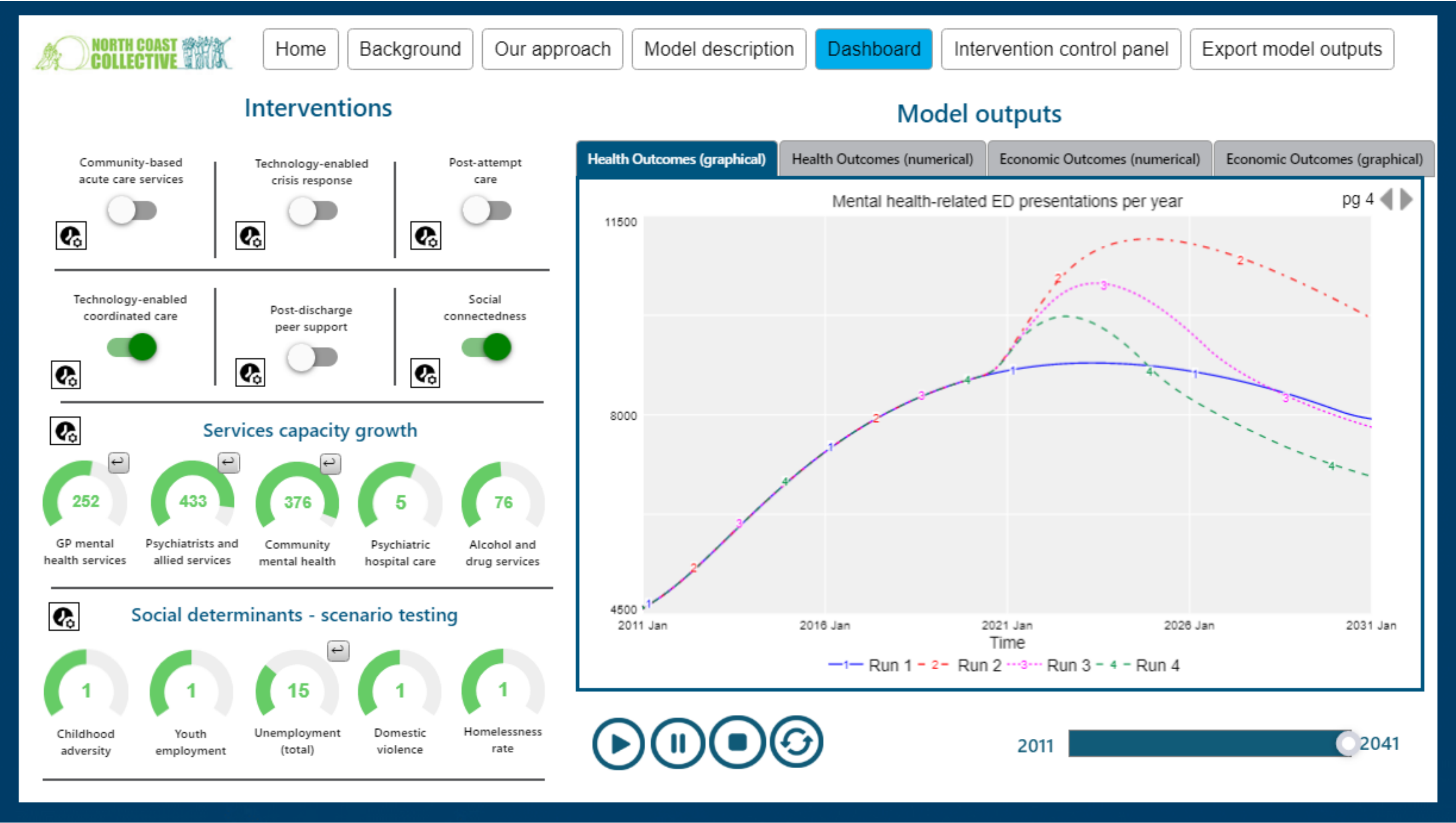


# Mitigating strategy: A doubling of services capacity growth rate – impact on ED presentations

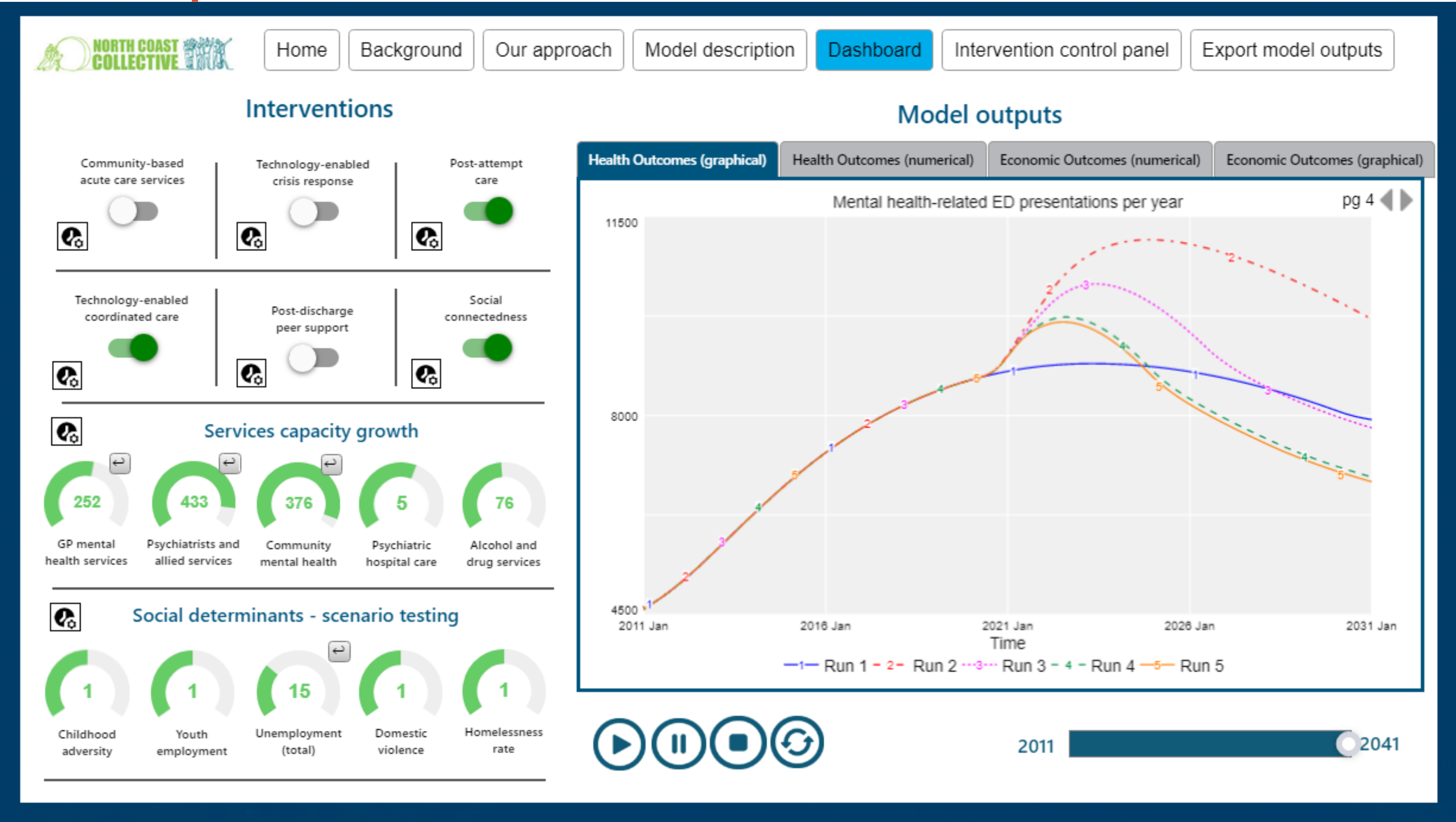




Mitigating strategy: 100% increase in services capacity growth + technology enabled coordinated care – impact on ED presentations



Mitigating strategy: 100% increase in services capacity growth + technology enabled coordinated care + post-attempt care – impact on ED presentations





## **In summary:**

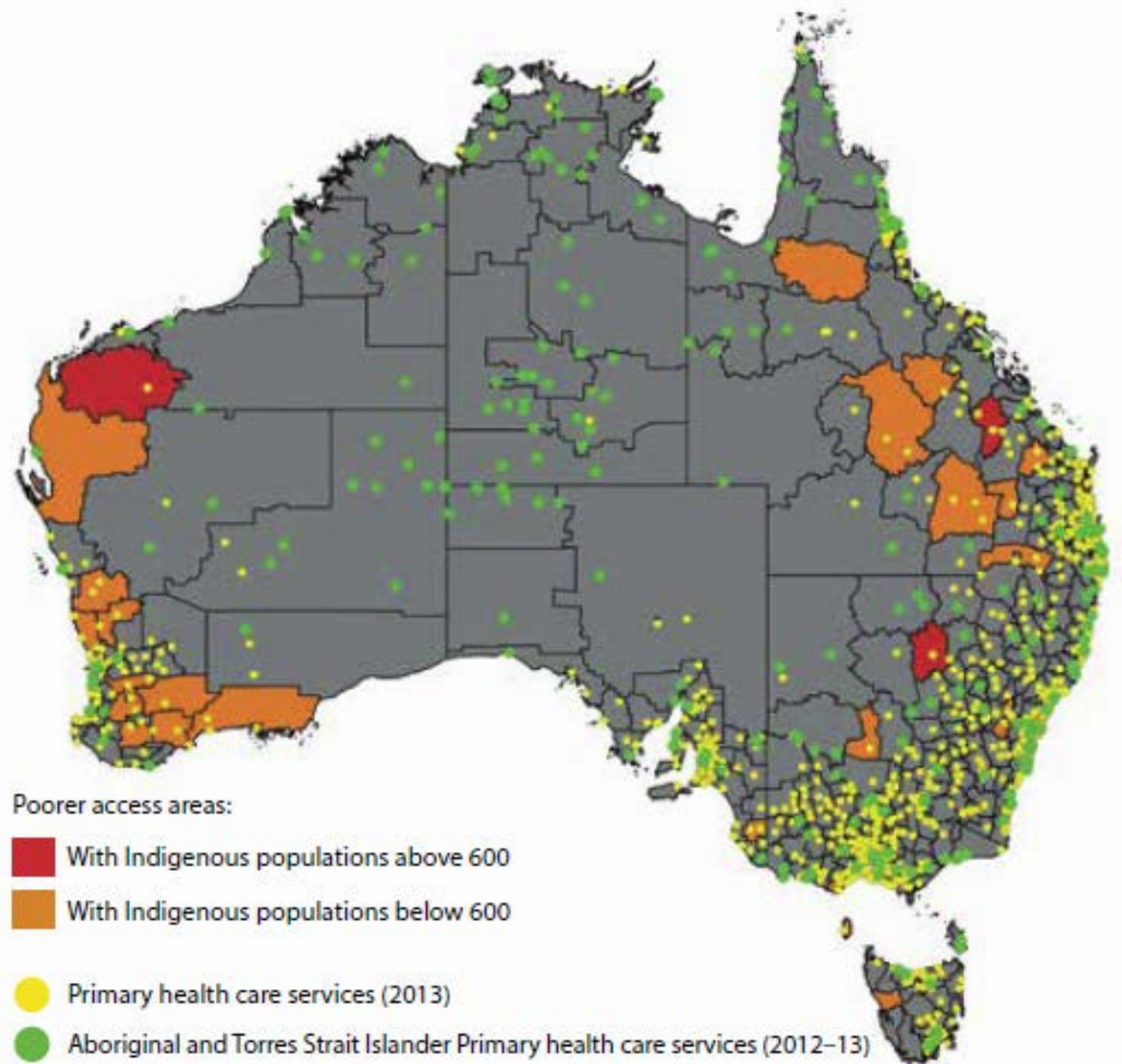
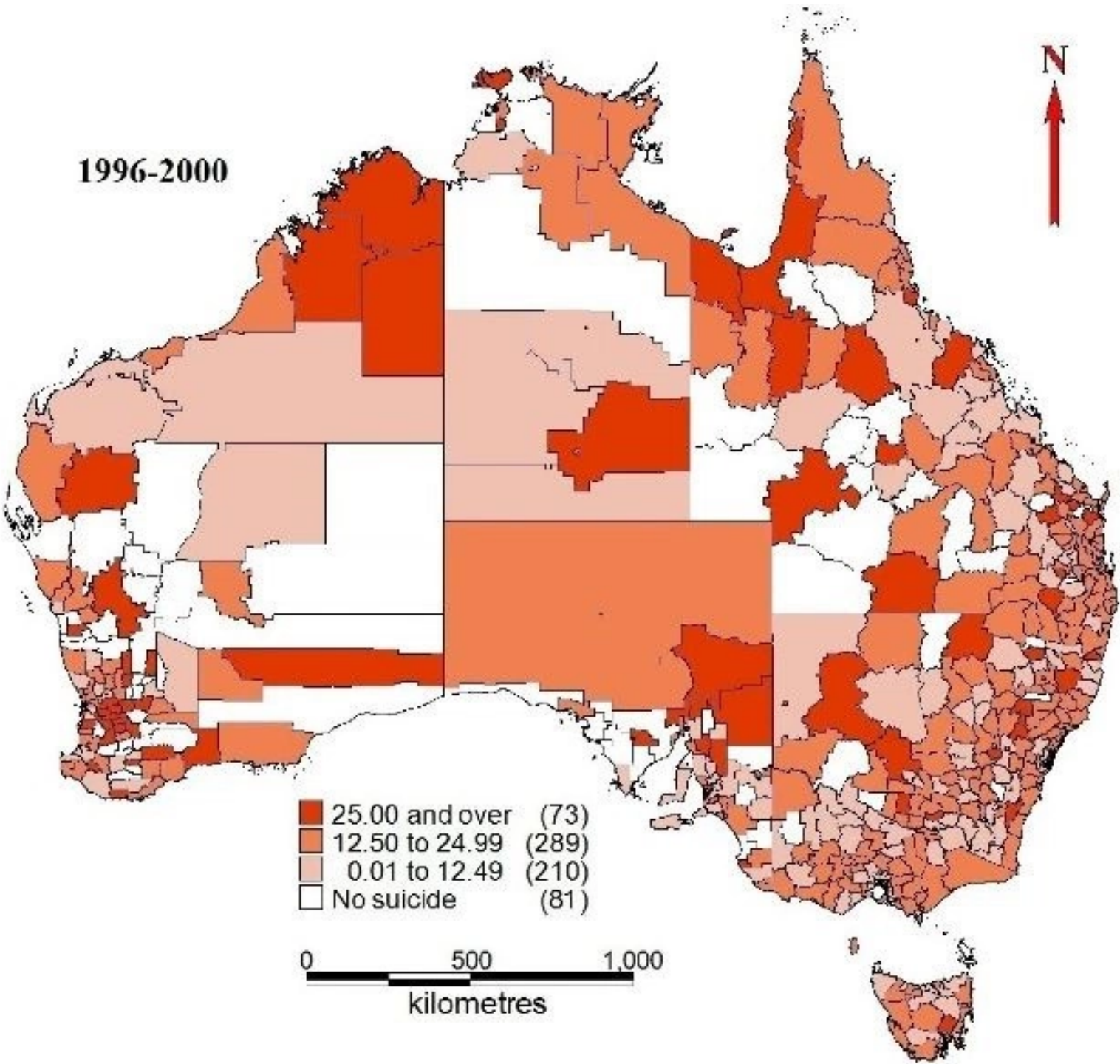
**Proactive, strategic investments in mental health programs and services will play a vital role in supplementing efforts to increase community connectedness and the social and economic supports required to help flatten this curve.**



THE UNIVERSITY OF  
**SYDNEY**

# REGIONAL VARIATION IN IMPACTS REQUIRES REGIONALLY SPECIFIC DECISION SUPPORT TOOLS

Suicide rates across LGAs and unincorporated SLAs, 1996-2000.







**Thank you for listening!**

*A special thank you to Dr Adam Skinner for his significant contributions to this work.*



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*Flattening the Mental Health and Suicide Curve* panellist

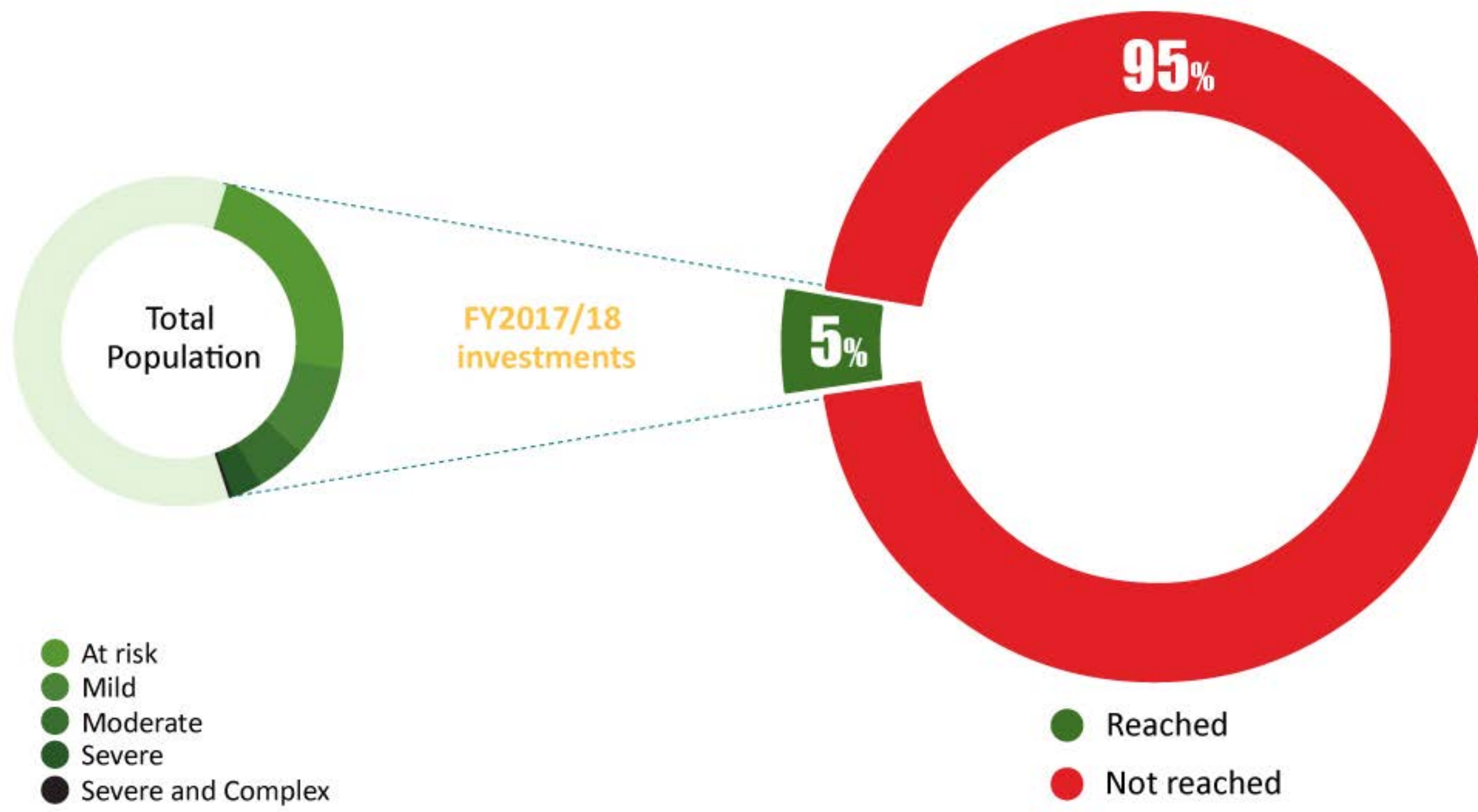
# Julie Sturgess

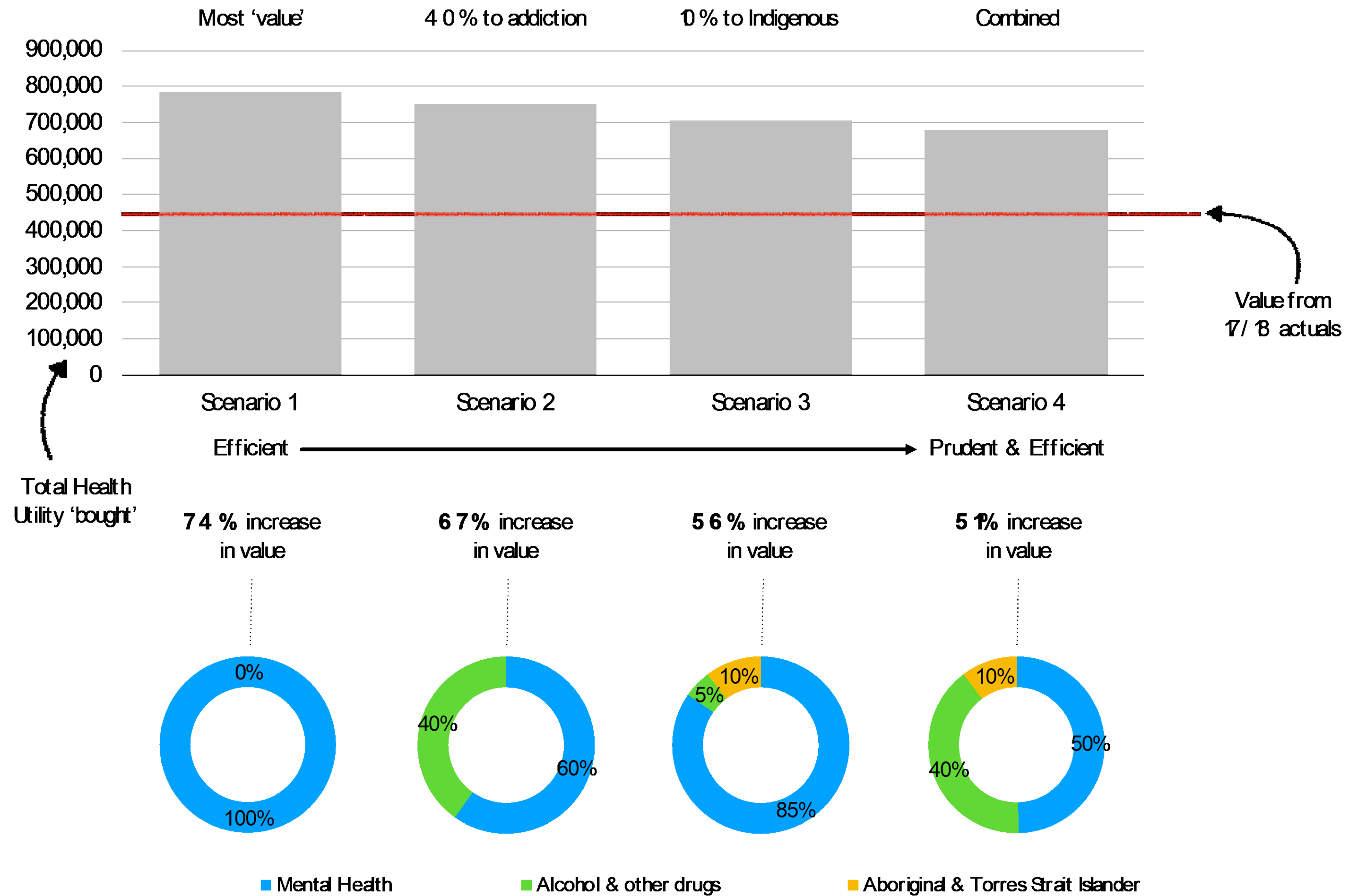
Chief Executive Officer, Health North Coast, North Coast NSW Primary Health Network

**@NorthCoastPHN**

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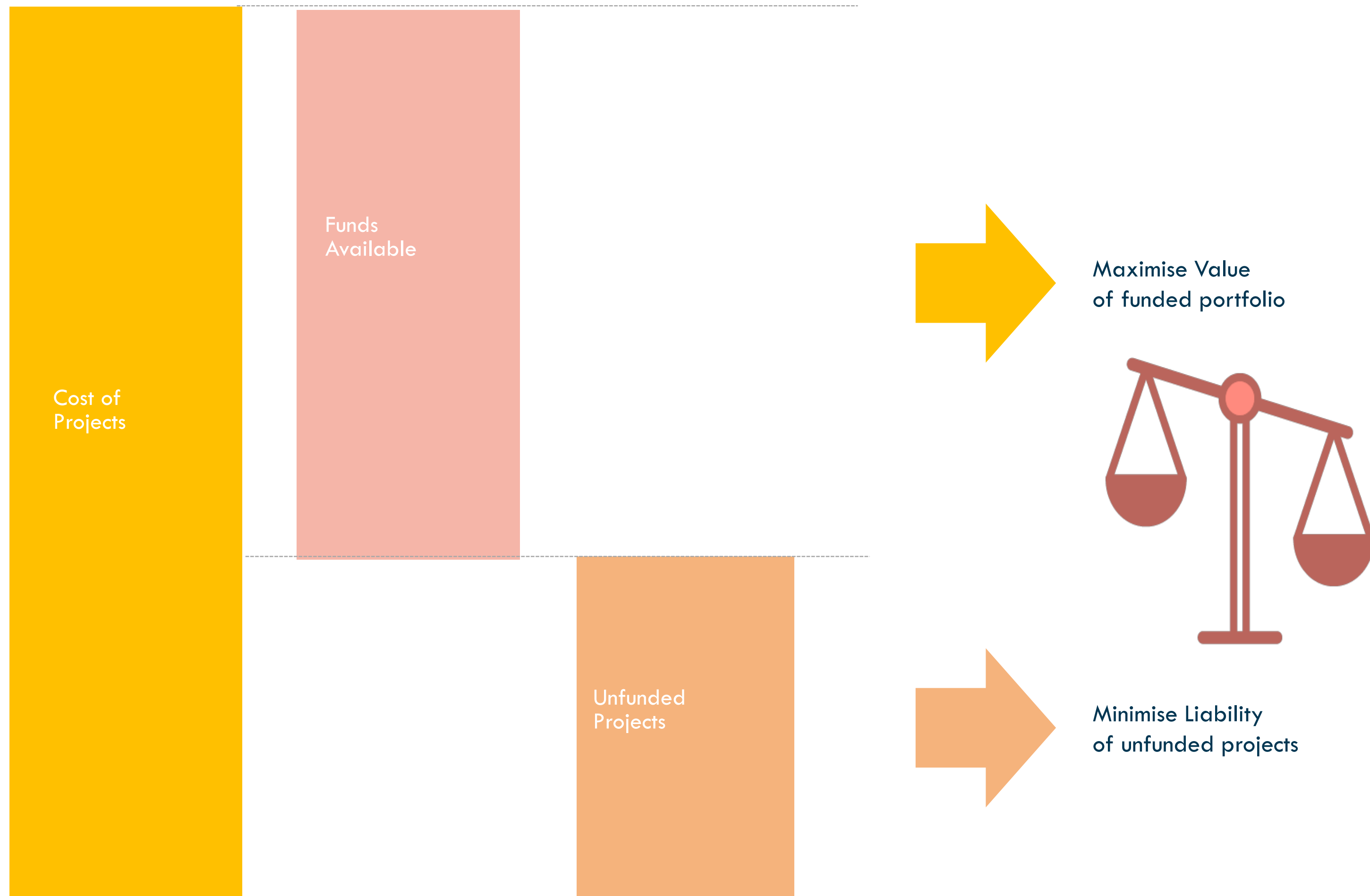






1. **Define the Burden** of Mental Health
2. Link **Inputs to Outcomes** - Systems Dynamics Modelling (SDM)
3. Determine the best **Strategic Intervention** – use the SDM
4. Select the best Individual Interventions – **Optimisation**
5. **Forecast the change** in Burden – use SDM
6. Monitor/Manage **performance**





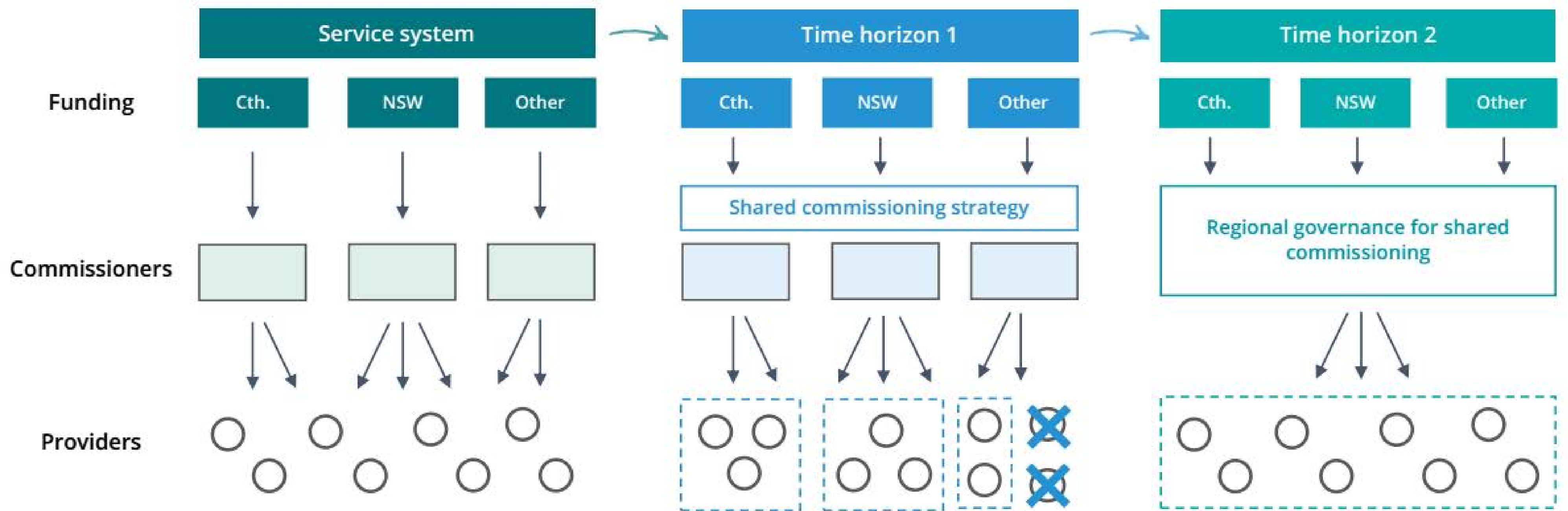
# North Coast Collective – Established October 2018

## **In its initial phase - a regional collaboration between**

- North Coast Primary Health Network
- Northern NSW Local Health District
- Mid North Coast Local Health District

## **Vision to create a system that:**

- Is better connected
- Puts the needs of carers and consumers at its centre to give them better lives
- Addresses the social determinants of health by working hand in hand with cross sectoral partners to better address health priorities





*Flattening the Mental Health and Suicide Curve* panellist

# Dr Frank Iorfino

Postdoctoral Research Fellow, The University of Sydney's Brain and Mind Centre

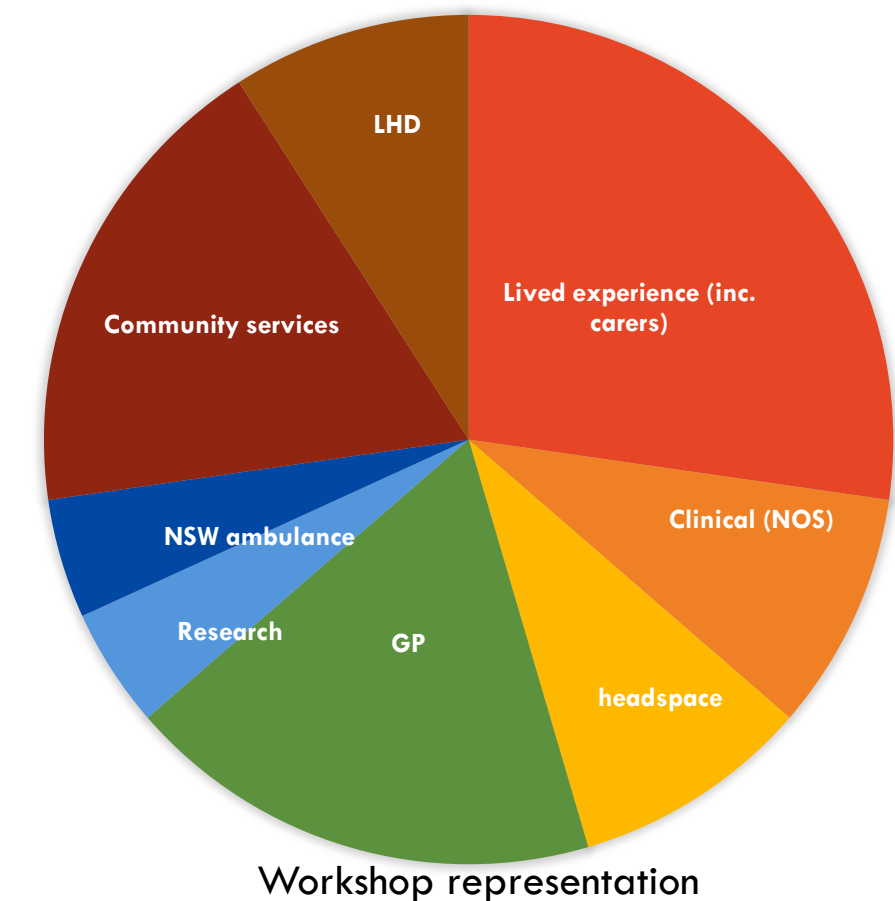
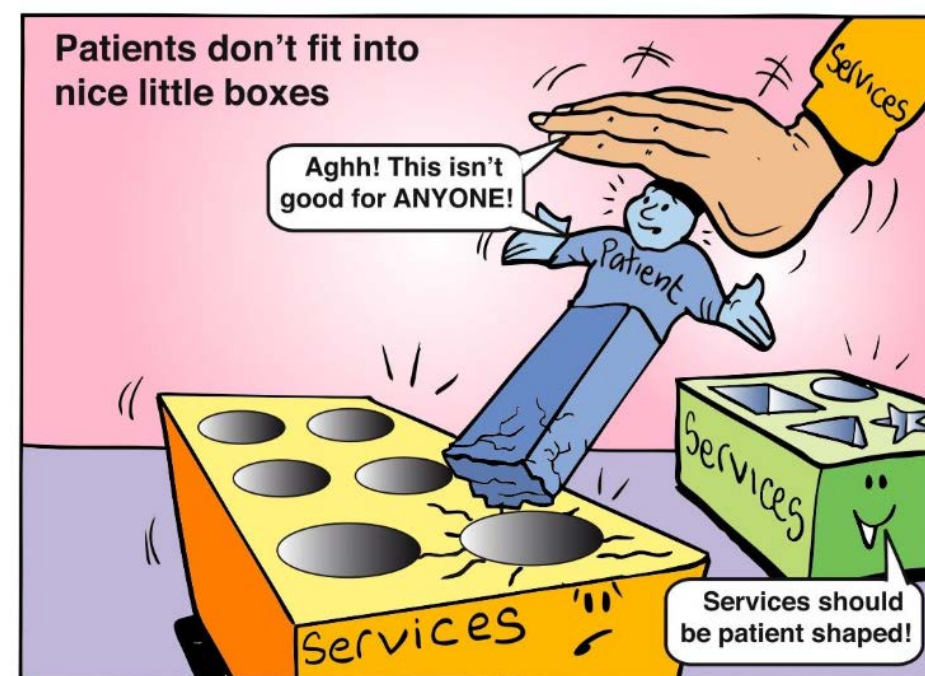
**@frankiorfino**  
**@BrainMind\_Usyd**

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*#FlattenTheMentalHealthCurve*

# Codesigning local solutions to systemic problems

## Common problems across settings

- Mental health treatment isolated from other physical/ social needs
- Late intervention
- Lack of communication between services
- Inefficient resource allocation
- Low service capacity/under resourced
- Long wait times for services
- High cost
- Unable to deal with complex issues
- Poor access to psychology and psychiatry





# The role of digital technologies in mental health care

*The use of digital technologies in mental health systems has demonstrated utility to improve access to care and screening, communication between clinicians and consumers, information flows and data sharing, and improving treatment engagement, particularly in remote or rural settings* (Falconer et al., 2018)

Technology has the potential to support individuals across the mental healthcare continuum



#### Self-care and wellness

Apps  
Wearables  
Trackers  
Podcasts, Ted Talks  
Websites



#### Decline, diagnosis and advice

Websites  
Symptom checkers  
Mood scores  
Chatbots  
Phone helplines  
Online support  
Text services



#### Treatment plan in place

CBT  
Mindfulness  
Other online therapies  
Virtual counselling



#### Management, monitoring and self-care

Apps  
Wearables  
Trackers  
Specialist IoT devices

- **Accessible:** available wherever and whenever it's needed
- **Affordable:** relatively low incremental costs
- **Confidential:** offering a safe, confidential or even anonymous environment for those not ready to talk openly
- **Digital-friendly:** particularly attractive to younger generations who have grown up with digital technologies
- **Empowering:** helping people take responsibility for their own mental health
- **Enabling:** helping professionals make a diagnosis and determining a treatment path, even for more unusual conditions
- **Equalizing:** having the potential to reach all individuals regardless of race, country, income or gender
- **Non-judgemental:** can be developed without bias, judgment or stigma
- **Scalable:** effective across distances and even geographic boundaries.

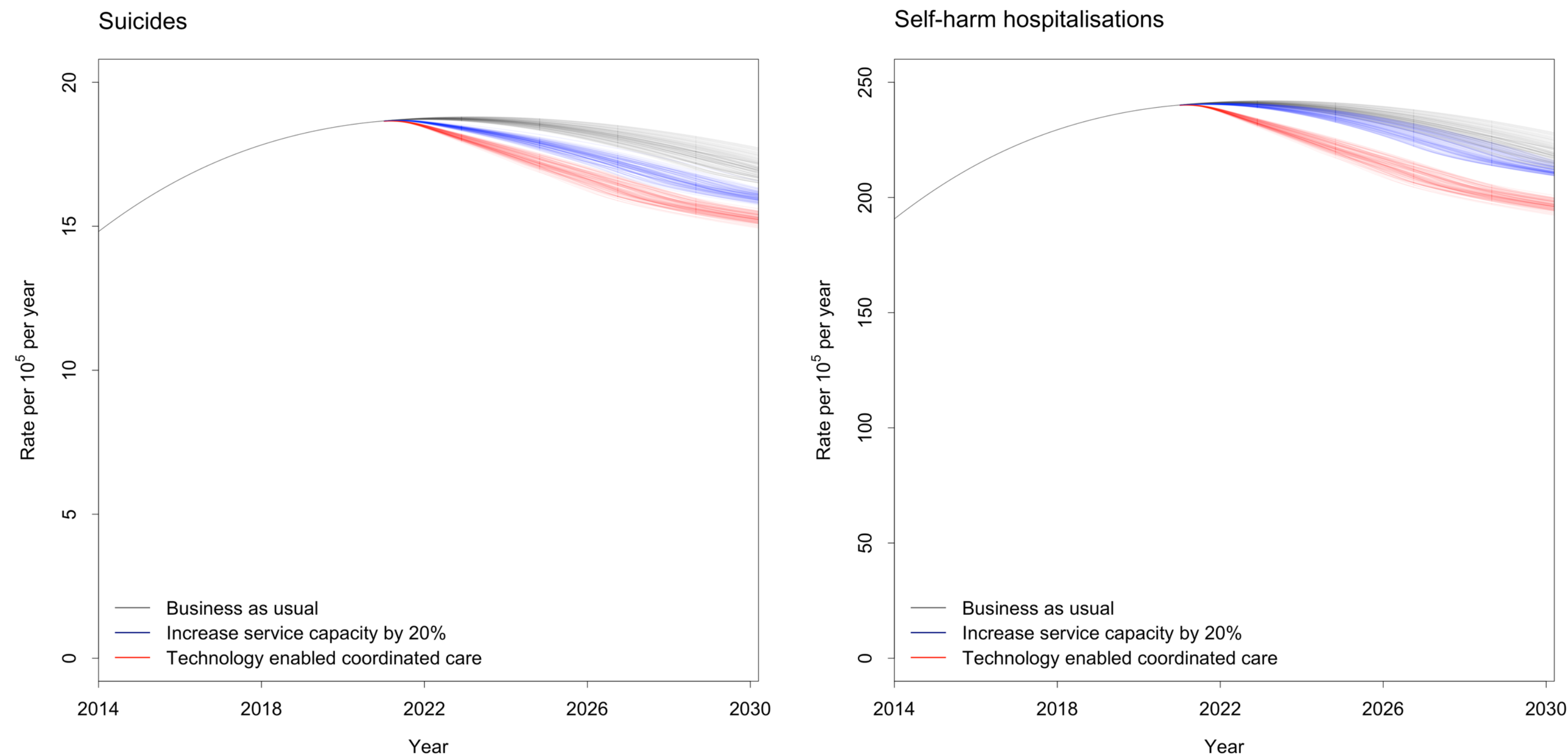
Source: World Economic Forum report - Empowering 8 Billion Minds: Enabling Better Mental Health for All via the Ethical Adoption of Technologies





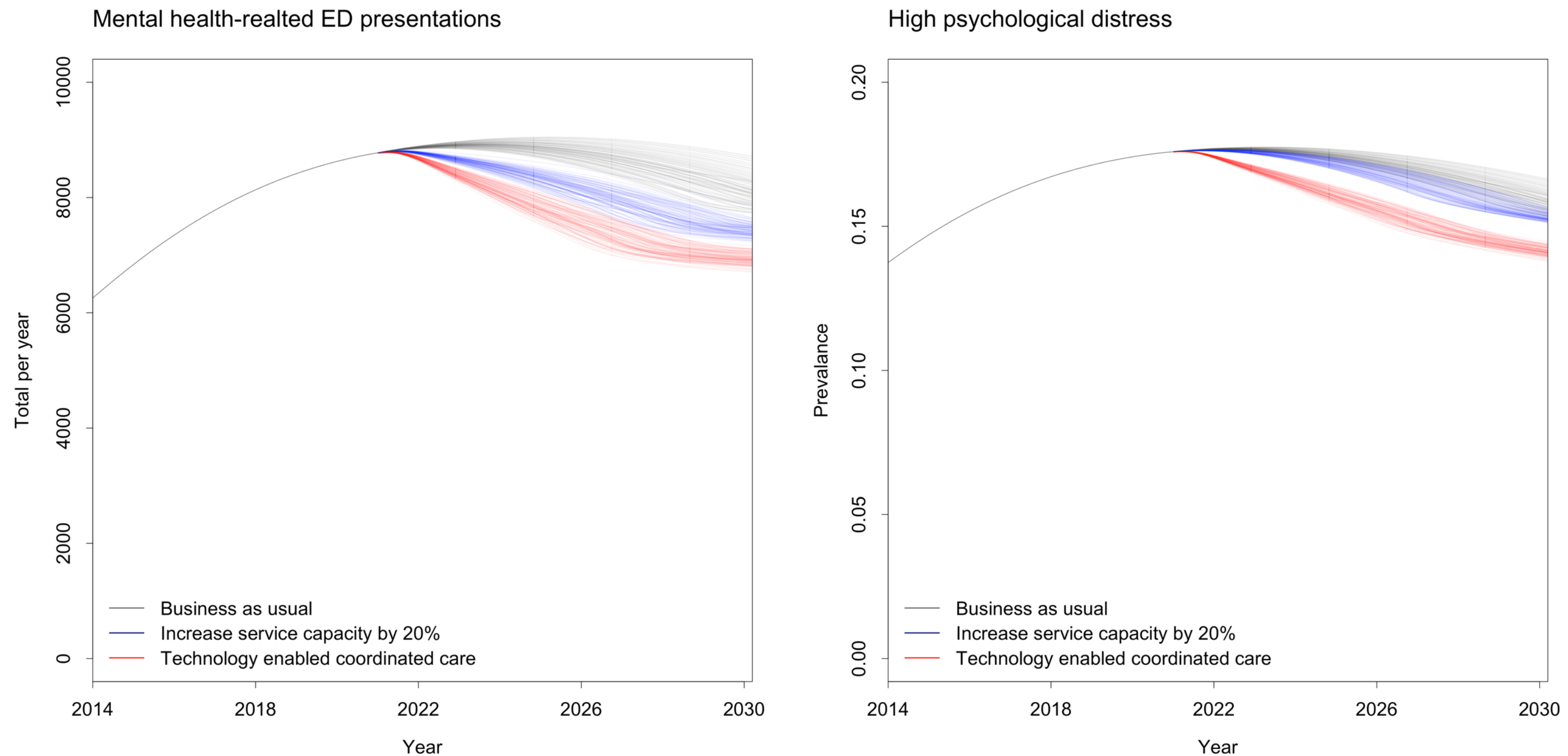
# Increasing the use of technology-enabled coordinated care in mental health settings has an impact on outcomes

Under the ‘business as usual’ scenario (pre-COVID assumptions), approximately 12 274 self-harm hospitalisations and 953 suicide deaths were forecast for the period 2021 – 2030.



Note: Sensitivity analyses were performed to assess the impact of uncertainty in estimates of the direct effects of each intervention scenario on the simulation results.

# Increasing the use of technology-enabled coordinated care in mental health settings has an impact on outcomes



Note: Sensitivity analyses were performed to assess the impact of uncertainty in estimates of the direct effects of each intervention scenario on the simulation results.

# Characteristics of technology-enabled coordinated care

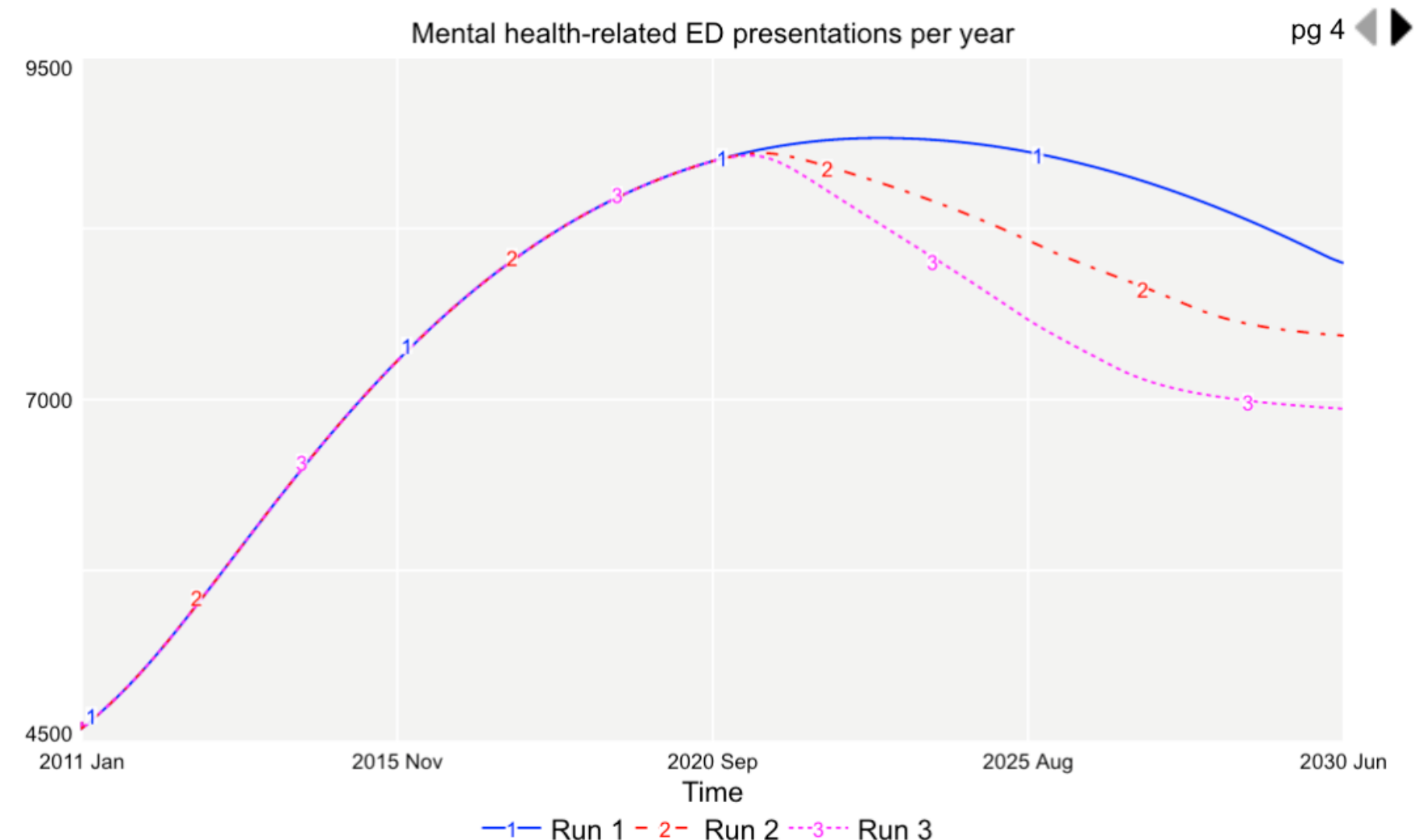
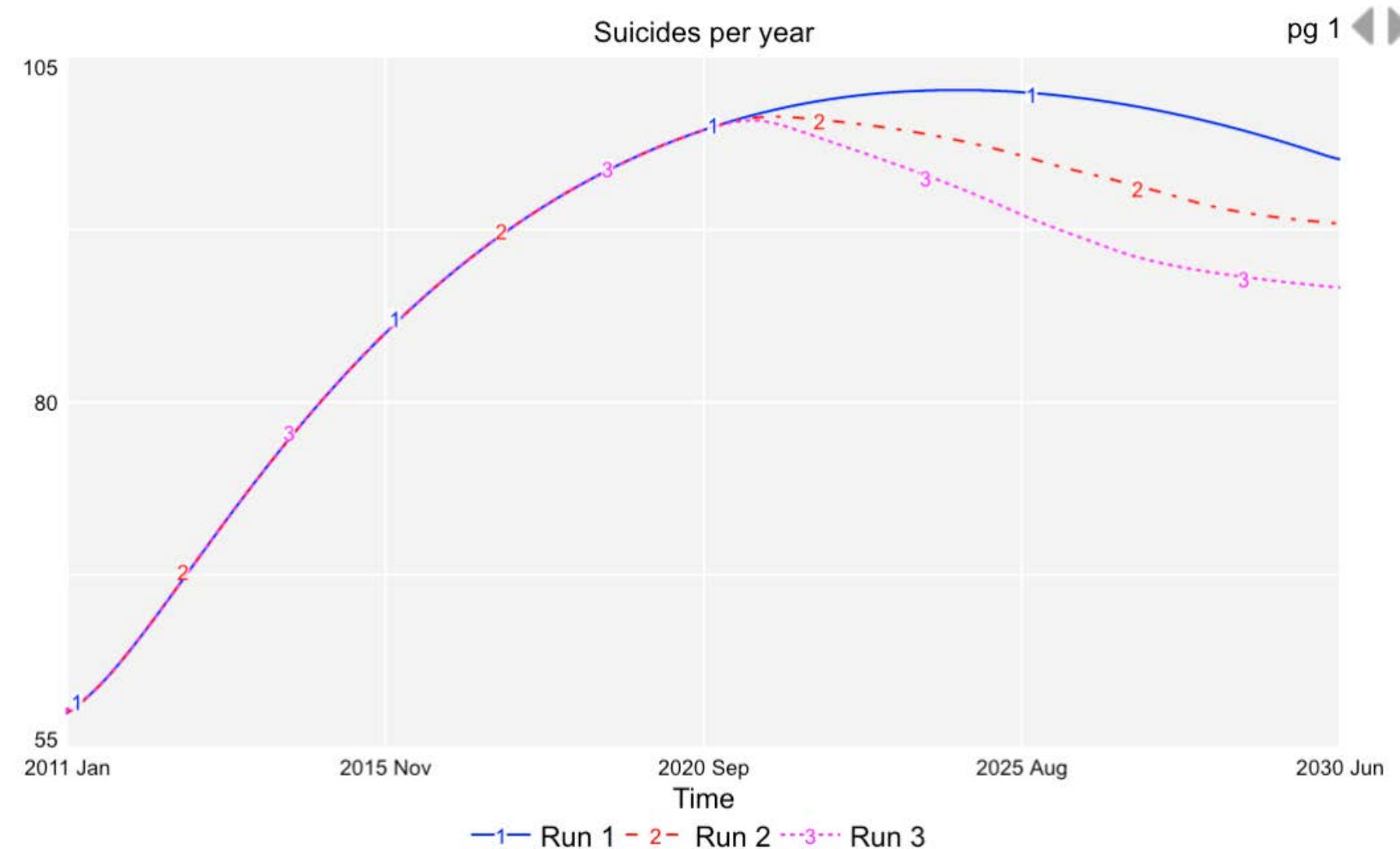
1. Improves per-service recovery or relapse rate (Woltmann et al., 2012; Falconer et al., 2018; Kikkert et al., 2018)
  - Systematic assessment and triage
  - Routine outcome monitoring and decision support (respond to changing needs, expert level and team-based input in managing cases)
  - Interoperable clinical information system use (information flows between professionals)
  - Service delivery redesign (workforce reorganization, support self management)
2. Increases referral pathways between providers (Badamgarav et al., 2003; Fortney et al., 2016; Katon et al., 2010)
  - Addressing complex needs
    - Specialised psychiatric care (i.e., psychiatrists and allied mental health services)
    - Alcohol and drug treatment services
    - Employment services
    - Housing support
3. Reduces rates of disengagement from services (Badamgarav et al., 2003; Falconer et al., 2018)
  - Reduced wait times
  - Reduce dissatisfaction with care due to inadequate care from a stretched system
  - Demand for services doesn't exceed service capacity
4. Increases service capacity



# The way you use technology matters

## Replicating existing models of care online won't cut it. **Why?**

New models of care are needed that **leverage the benefits of using technology** such as, better triage processes (e.g. online assessments, workforce reorganization), multidisciplinary team-based care, routine outcome monitoring, and better information flows



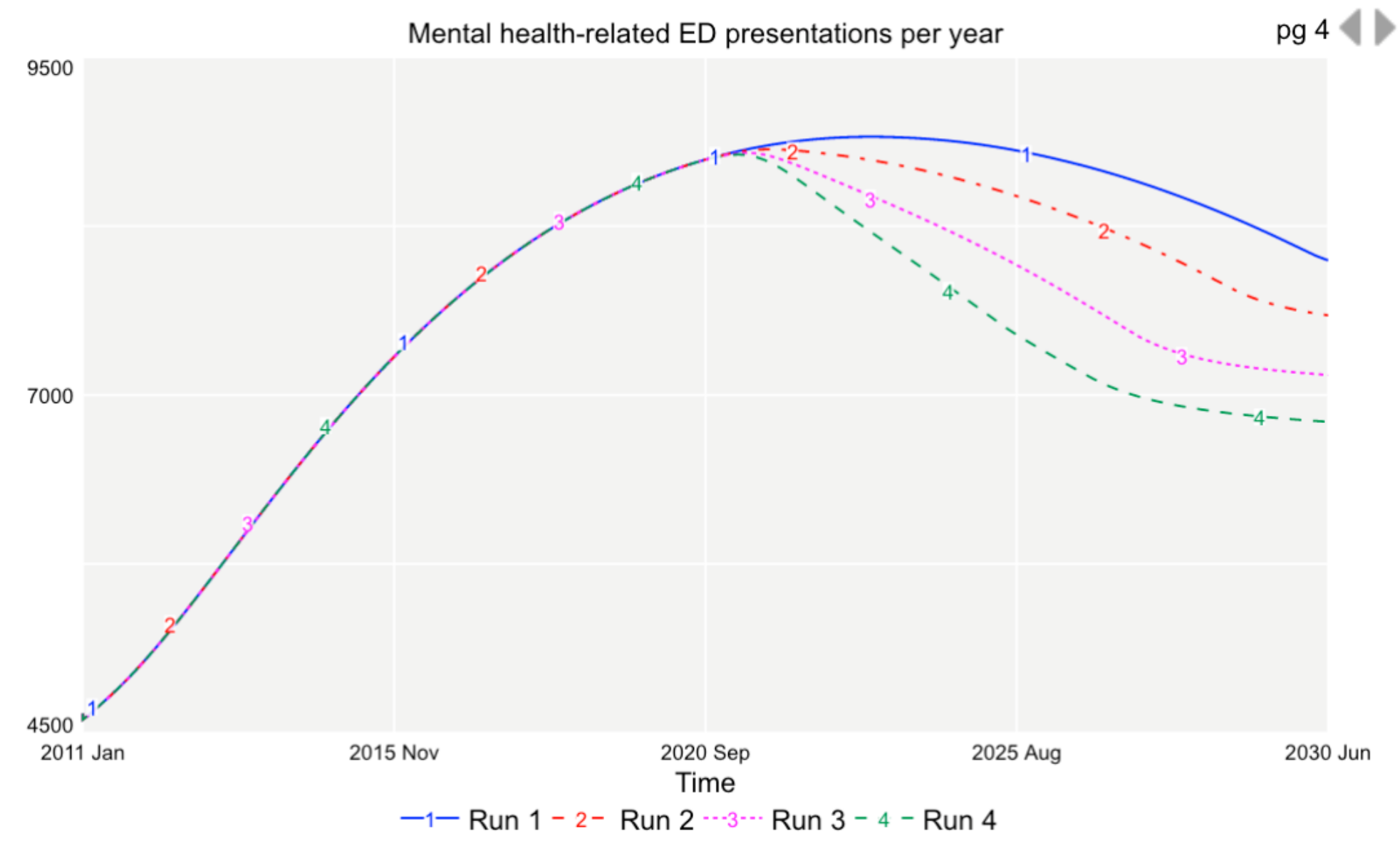
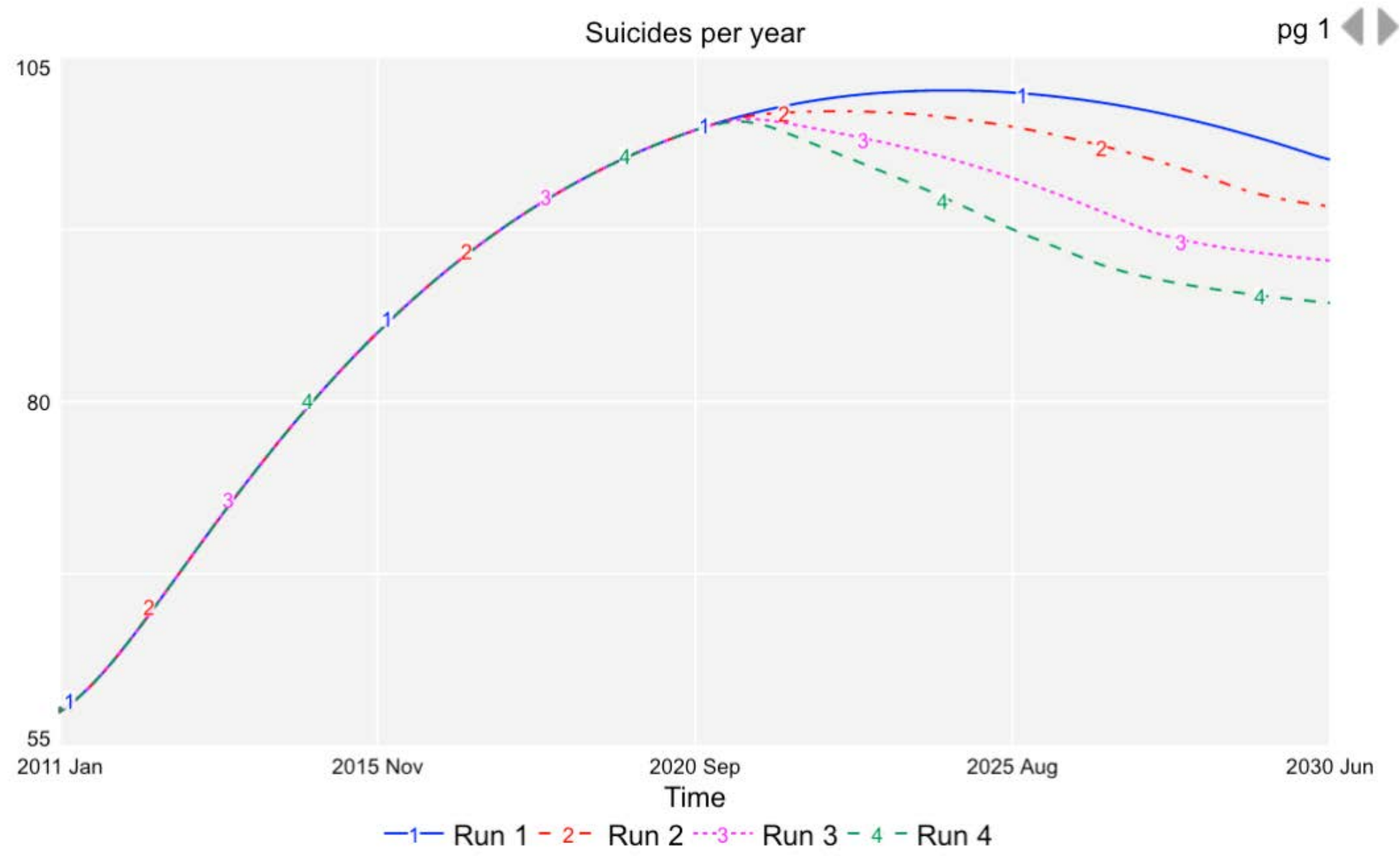
### Scenario details

**Run 1:** Baseline case (no change to the use of technology by services)

**Run 2:** Using technology for access only (i.e. moving existing face to face consultations online, no change to model of care)

**Run 3:** Using technology to improve care coordination (i.e. enhancing care through multidisciplinary team-based care)

# The rate of uptake influences the effect on outcomes



**Scenario details**

- Run 1:** Baseline case (no change to the use of technology by services)
- Run 2:** 25% increase in the proportion of mental health services provided that involve technology-enabled coordinated care
- Run 3:** 50% increase in the proportion of mental health services provided that involve technology-enabled coordinated care
- Run 4:** 80% increase in the proportion of mental health services provided that involve technology-enabled coordinated care

# Implementation of digital technologies

## Technology-Enabled Person-Centered Mental Health Services Reform: Strategy for Implementation Science

Haley M LaMonica<sup>1</sup>, BS, MA, PhD, ABPP-CN; Tracey A Davenport<sup>1</sup>, BA (Hons), eMBA; Katharine Braunstein<sup>2</sup>, BPsy (Hons); Antonia Ottavio<sup>2</sup>, DipHthSc, BN; Sarah Piper<sup>1</sup>, GradDip, Psych (Hons); Craig Martin<sup>2</sup>, BN, BASc, Grad Dip MH, MN (Clinical Leadership); Ian B Hickie<sup>1</sup>, AM, MD, FRANZCP, FASSA; Shane Cross<sup>1</sup>, BPsy (Hons), MPsych, PhD

<sup>1</sup>Brain and Mind Centre, The University of Sydney, Camperdown, Australia

<sup>2</sup>InnoWell Pty Ltd, Camperdown, Australia

### Supplement

#### Chapter 6

Study 4: Implementation study of a prototypic e-clinic being integrated into youth mental health services: staff experiences and reported service quality improvements

Shane P Cross<sup>1</sup>, Sarah E Piper<sup>1</sup>, Tracey A Davenport<sup>1</sup>, Alyssa C Milton<sup>1</sup>, Frank Iorfino<sup>1</sup>, Cristina S Ricci<sup>1</sup>, Laura Ospina-Pinillos<sup>1,2</sup>, Lisa Whittle<sup>1</sup>, Ian B Hickie<sup>1</sup>

**Table 1.** Potential service-specific barriers and mitigation strategies to implementation of our technology-enabled solutions.

Barriers	Mitigation strategies
Negative staff attitudes [20,21]; staff resistance to change [17,20-22]; changes to work practices, such as increased workload [20-22]	Engagement and buy-in fostered through participatory design and user (acceptance) testing; co-design of service model to identify gaps between new and existing workflows and foster collaborative problem-solving approaches to customization and configuration of the technology-enabled solution for the benefit of service quality improvement; development of a communication strategy to assist the service with messaging within internal stakeholders and service users
Staff turnover and lack of staff resources [17,18]	Implementation Officer embedded in service to maintain continuity of support; contingency plan for training new staff
Innovation not able to adapt over time to meet staff needs [17,20,22]	Ongoing evaluation of the technology-enabled solution; continuous and iterative refinement of the technology-enabled solution and service model throughout Phases 3 and 4 (implementation and sustainment)
Design and usability of the technology-enabled solution [20,21,24]; adaptability/flexibility of the technology-enabled solution [17,18,22]; compatibility/fit of technology-enabled solution with service mission [17,18]; user resistance to the technology-enabled solution [22]; noninteroperability (or limited) with other information and communications technology systems [17,20]; fidelity of implementation [17,22]; availability of and user familiarity with required equipment to use the technology [21,24]	Service provider readiness assessment to determine compatibility of the technology-enabled solution with the service; co-design for a service-specific technology-enabled solution; technology configuration and customization arising from the co-design process, including co-design and co-development of service-specific content, as well as integration with service information and communications technology systems; iterative user experience and user acceptance testing; iterative evaluative processes related to technology and implementation process, highlighting adaptability of the technology; provision of ongoing education and training and technical assistance

Source: LaMonica et al., 2019



*Flattening the Mental Health and Suicide Curve* panellist

# Associate Professor Kenny Lawson

Economist, Brain and Mind Centre (collaborator)

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# COVID-19: Economic and mental health impacts

**Evolving situation:** COVID-19, economy, mental health, policy responses

**Dynamic simulation model:** Captures these key interdependencies

**Scenario 1:** Unemployment reaches 11.1%; youth unemployment 24%

**Scenario 2:** Unemployment reaches 15.9%; youth unemployment 34.8%

**‘U-Shaped’ recovery:** Conditional on Governmental response

*\* Scenarios aligned with consensus forecasts; updatable as situation changes*

# Productivity losses over 5 years

Scenario 1: Productivity loss - Cost \$M per year

Period	Mental health & unemployment	Mental Health only
Mar 2020 - Jan 2021	411.67	-21.48*
Jan 2021 - Jan 2022	592.27	8.45
Jan 2022 - Jan 2023	438.28	60.31
Jan 2023 - Jan 2024	341.99	86.42
Jan 2024 - Jan 2025	281.93	95.07
<b>Total (Mar 2020 - Jan 2025)</b>	<b>2066.14</b>	<b>228.76</b>

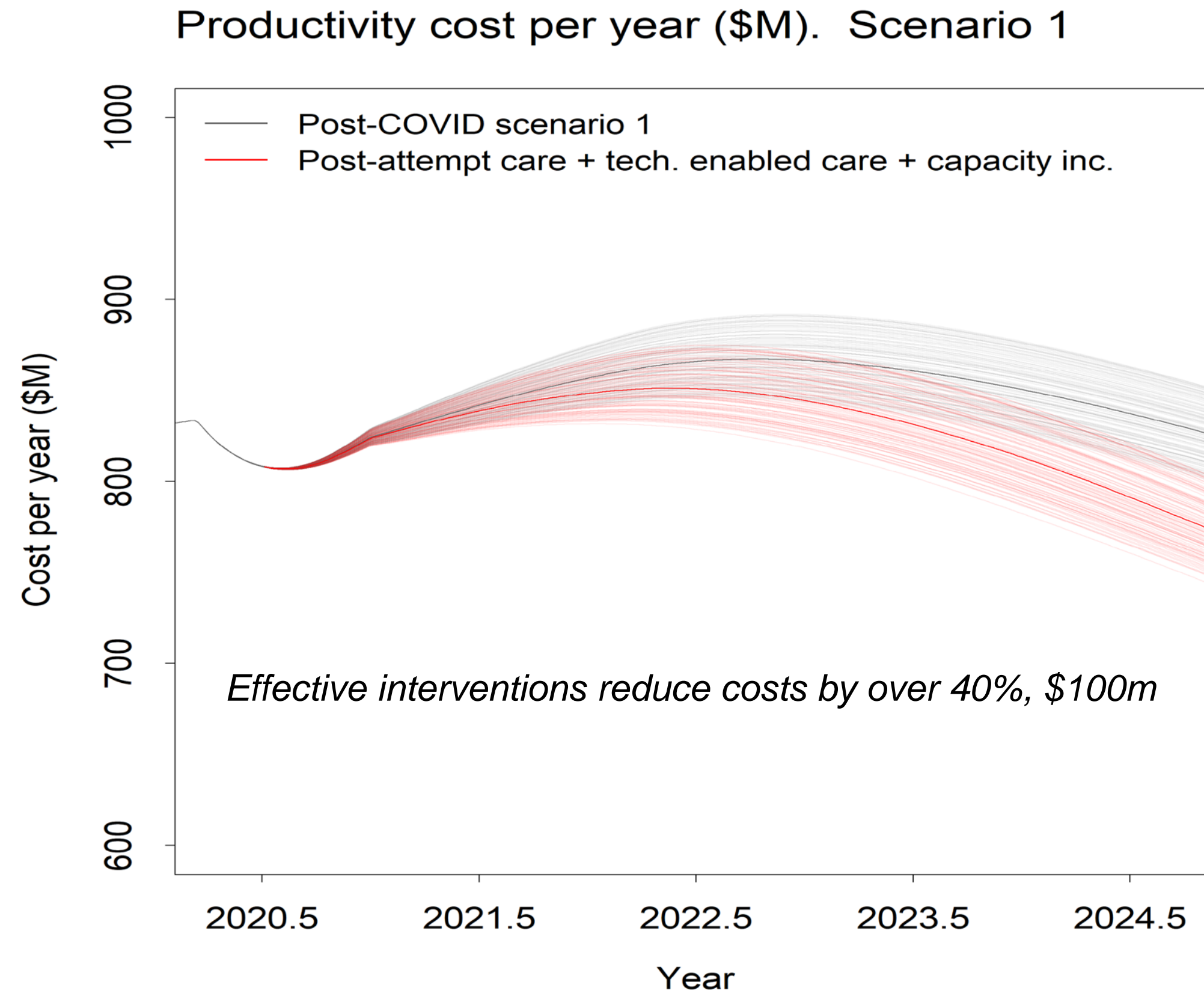
Scenario 2: Productivity loss - Cost \$M per year

Period	Mental health & unemployment	Mental Health only
Mar 2020 - Jan 2021	14.82	-41.77*
Jan 2021 - Jan 2022	1186.54	27.30
Jan 2022 - Jan 2023	914.32	136.07
Jan 2023 - Jan 2024	731.07	184.57
Jan 2024 - Jan 2025	608.28	196.85
<b>Total (Mar 2020 - Jan 2025)</b>	<b>4255.03</b>	<b>503.03</b>

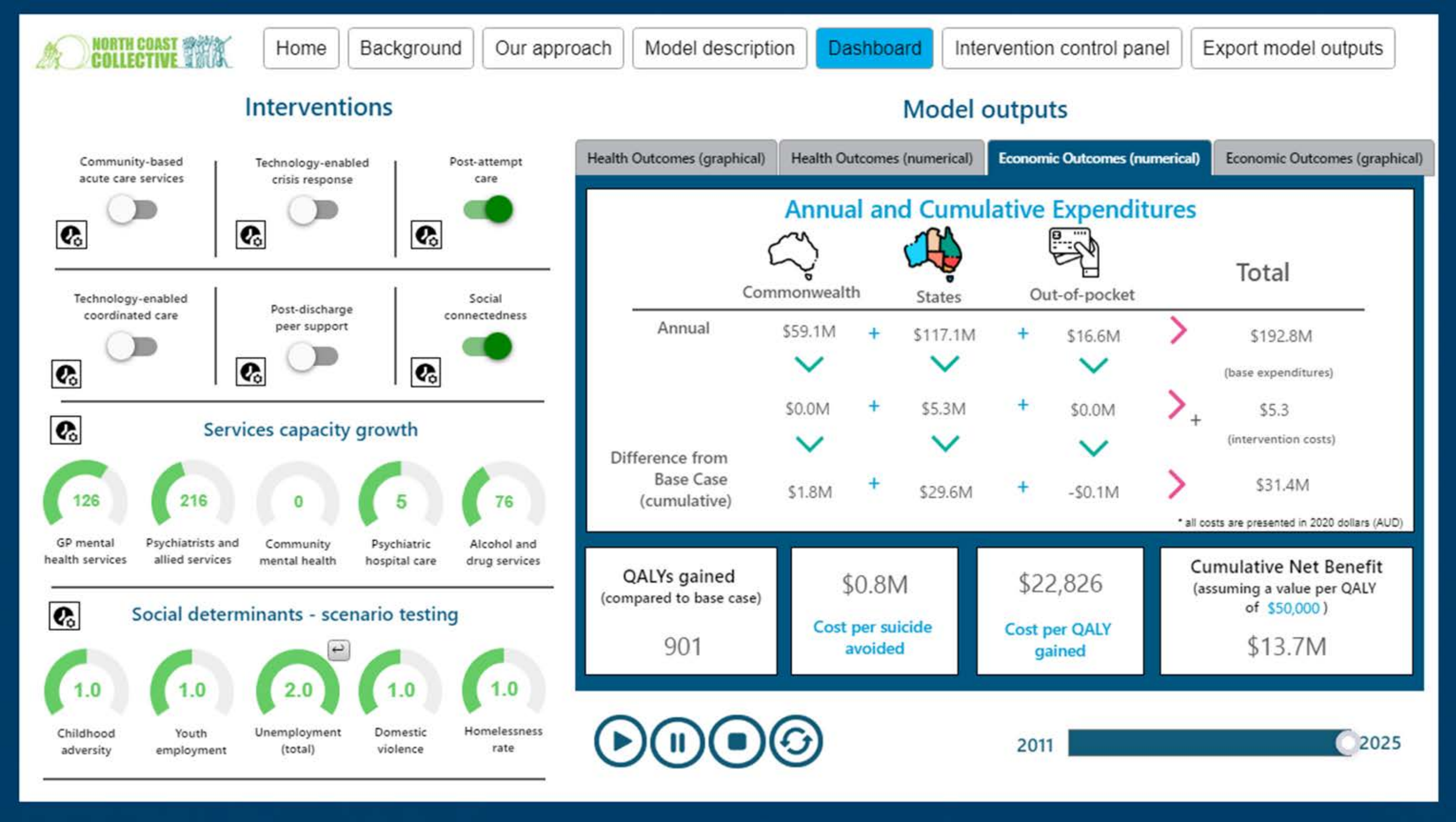
- Cumulative productivity loss is between 3% and 7% of regional potential
- *Mental health accounts for over 11% of these productivity losses*



# Investing in interventions = Reduction in productivity costs



# Health sector impacts: post-attempt care



## Take home messages

We need dynamic simulation modelling = 'policy sat nav'

Evolving situation: as situations change the model is updated

Rapid decision support: policy options, costs & consequences

Policy coordination: decisions in one sector affect the others

***Invest in mental health: alleviate distress, save lives, create wealth***



*Flattening the Mental Health and Suicide Curve* panellist

# Matthew Hamilton

Senior Policy Analyst and Lead (Health economics work-stream), Orygen

**@orygen\_au**s

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*#FlattenTheMentalHealthCurve*

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# MESSAGE

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- **To develop the sort of models that can inform the re-engineering of mental health service systems and effective policymaking on the social determinants of mental disorder we need to provide practical supports to :**
  - Build on existing mental health simulation expertise
  - Encourage collaboration and linkages between modelling projects
  - Improve transparency
  - Implement continuous improvement of individual models
  - Balance short term needs with longer term vision and funding horizons

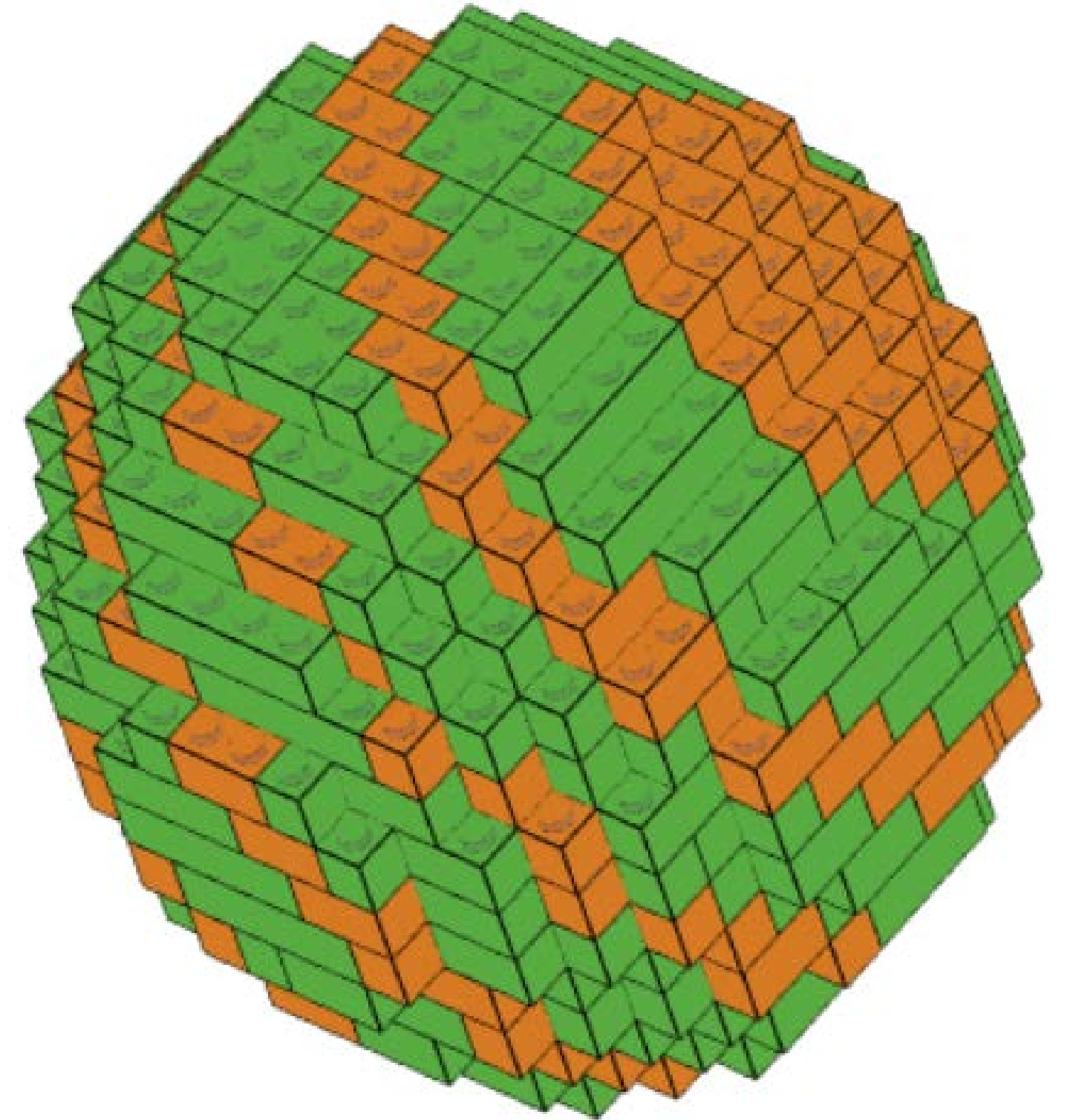
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## MESSAGE (REPHRASED)

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If you have a really complex problem you should:

- break it into smaller, more manageable tasks;
- allocate those tasks to as much appropriately skilled help as you can get;
- have a plan that ensures each task/project team contributes to the overall goal; and
- be realistic about timeframes and resource requirements.





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## READY FOR WHATS NEXT

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A framework for open science development of simulation models in mental health.

- Initially being applied to develop a simulation model of resilience in Victoria that can be iteratively refined, generalised and extended
- Also applied to three simulation models led by Orygen in epidemiology, e-mental health help-seeking and primary mental healthcare
- All code and data for which we have appropriate permissions will be released under open source licensing arrangements
- Will also release open source toolkit to implement this framework

Project investigators: Orygen, Victoria University, Flinders University, Deakin University

Funding provided by an Innovation Grant from VicHealth. In kind funding provided by Orygen and Victoria University



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# WHY DEVELOP A FRAMEWORK?

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- **Policymakers need to trust models and they need to be value for money.**
  - Complex models require extra work to validate and communicate.
  - There are some potential trade-offs (fast-cheap-good)
- **Modelling entire systems is a very different challenge to the modelling the business case for public reimbursement of individual interventions.**
  - Extends beyond a single decision problem in a specific context.

WHAT? V. WHAT, HOW, WHERE, WHEN, WHO & WHY?

- **A different approach and toolkit is required to that used to build most of the current simulation models in mental health**
  - Not feasible to be undertaken by one research group, but needs iterative development by multiple teams over long timeframes.
  - The practical implementation in code and data management presents the biggest challenges and opportunities

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## IN PRACTICE

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- Start with relatively simple models, implemented so that component algorithms and data are reusable by others
- Develop tools to streamline process of generalising models to other contexts
- Once these initial simple models are validated, refine and extend them
- Link individual models together (including those produced by other groups) to progressively assemble more complex representations of mental health systems spanning social determinants to specialist services.



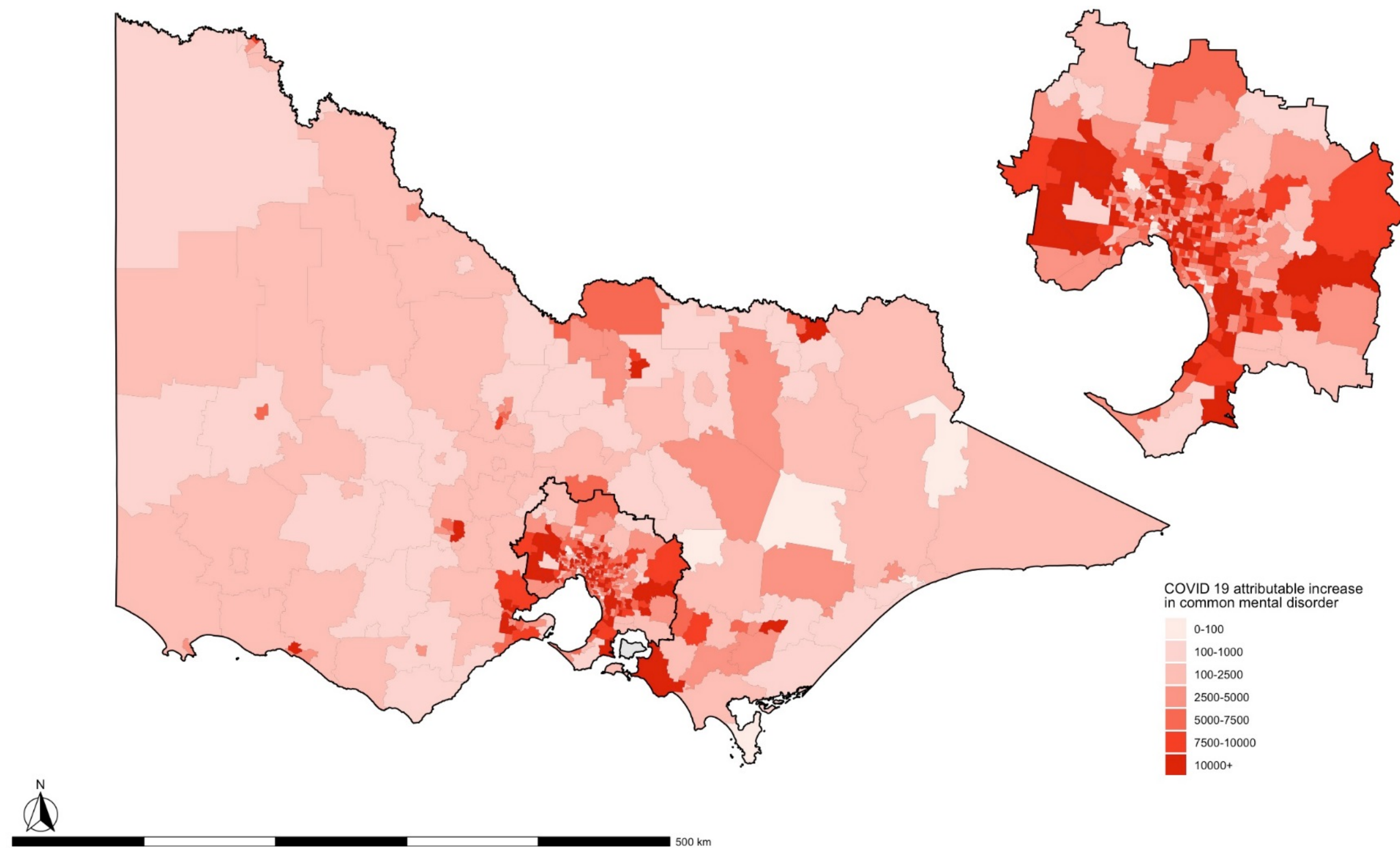
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## WORKED EXAMPLE

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- We developed an extremely simple demographic model to predict age and sex population counts.
- We wrote code to generalise that model to any context within Australia
  - e.g. running it for Victoria state involves concurrent system dynamics simulations for ~7,000 spatial units, each with their own unique input data set.
- We used that model as the basis for an epidemiology model that added prevalence rate data from national surveys along with scenario analysis parameters to adjust those rates for current context.
- We wrote additional code to convert outputs of Sydney model to inputs to our model for COVID-19 scenario analysis.
- We are linking the base demographic and epidemiology models to our other models to help develop sample weights for individual simulations and implement scenario analysis
- We plan to further extend this model with other spatial attributes and predictors

# SAMPLE OUTPUT



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# CONCLUSION

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- Australia has good current expertise in simulation modelling in mental health
- However, if we want to go beyond evaluation of individual programs and policies to modelling complex systems environments, we need to do some things differently.
- Priorities:
  - Open source code and data
  - Standardised workflows and metadata
  - Common frameworks and tools
  - Funding support to build infrastructure and facilitate continuous improvement



**REVOLUTION  
IN MIND** *ory  
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MATTHEW.HAMILTON@ORYGEN.ORG.AU

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# Useful resources

- Brain and Mind Centre: **[sydney.edu.au/brain-mind](https://sydney.edu.au/brain-mind)**
- Orygen: **[orygen.org.au](https://orygen.org.au)**
- North Coast Primary Health Network: **[ncphn.org.au](https://ncphn.org.au)**
- Black Dog Institute: **[blackdoginstitute.org.au](https://blackdoginstitute.org.au)**
- headspace: **[headspace.org.au](https://headspace.org.au)**
- Beyond Blue: **[beyondblue.org.au](https://beyondblue.org.au)**
- Head to Health: **[headtohealth.gov.au](https://headtohealth.gov.au)**
- Lifeline: **[lifeline.org.au](https://lifeline.org.au)** or 13 11 14

# Thanks for tuning in!

For more information about the YOUTHe  
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