THE UNIVERSITY OF SYDNEY

Brain and Mind Centre

Transcript

'Beyond prevention: which active interventions,
at scale will flatten the mental health and suicide curve post-COVID-19?'

Wednesday 13th of May, 2020

Ian Hickie:

Good evening! I'm Professor Ian Hickie from the Brain and Mind Centre at the University of Sydney, where I'm the Co-director of Health and Policy. This is a really special webinar for us this evening. Over the last few days and over the last week, you may be aware, you may have seen in the national press and in our national media some considerable emphasis on projections, predictions that we've made about the potential adverse effects of COVID-19 on our wider society and the specific downstream effects on mental health, and potentially, most importantly, on suicide rates in this country.

Many, many people have asked us – what is the basis for that staff? There has also been a fair amount of constructive criticism, wanting to know just exactly where did this come from? Did you make it up last week? Is it some academic research trial? Has it been subject to review? Does it really deal with lived experience? Is it relevant to place, has it actually been worked in ways that will actually be useful to those who have to make decisions in real time?

Now, I must say the great thing is we have seen an immediate response from our health minister Greg Hunt, and from our federal government. And these issues will be discussed by the National Cabinet of Australia on Friday. That's great. And I must commend the government on actually taking these things seriously. Australia is the first country to really put mental health on the agenda in the COVID-19 crisis. And to now have, as of today, a deputy Chief Medical Officer - I must congratulate Dr. Ruth Vine on her appointment. She's an excellent appointment, a skilled clinician and administrator to that post, to take sensible medical and expert advice to government, to actually make decisions to potentially flatten the curve.

So this webinar is - what is this curve? What is it all about? But most importantly, not simply to be alarmist at the size of the curve, but actually to look at the options that are available to us - economically, socially, educationally - to flatten that curve. That's the goal. Just like we saw in Australia - we saw governments take immediate actions to protect us from the disastrous health outcomes which have so characterised North America, Europe and other parts of the world.

Given the size of the economic and social dislocation, this is huge. The potentials for us in mental ill health are large. In my 30 years in this mental health area, and population health related to mental health and its outcomes, this is by far the biggest challenge. When unemployment rates go from 5% to 10% in two months, and with those recently acquiring direct income support for unemployment, from 600,000 to 1.5 million in the same period of time, and with great uncertainty in the world, and in our own backyards as to what happens next. This is by far the biggest challenge. We recognize that mental health for all of us, our own mental health and wellbeing, and that mental wealth of Australia is fundamentally locked in the economic and social welfare of our communities, and plays out in terms of ourselves individually.

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In taking this particular webinar forward tonight, I would like to recognize the traditional owners of the land on which we meet, and particularly the Gadigal people of the Eora nation on which the Camperdown campus of the Brain and Mind Centre is based. It is one of those occasions in which we could all learn from the first Australians in this country. Can we actually come together as a community and understand the social and emotional wellbeing of all of us to achieve the best possible outcomes.

Right at the start I'd like to show you a video put together by Julie Sturgis, the CEO of the North Coast PHN and her colleagues there from all the organizations that are coming together to form the North Coast collective. I've had it said to me this week, it must have been a bunch of nerdy people in back rooms who just make up mathematical models and statistical pool when there's no real people and there's no real place. They've just done this stuff on the back of an envelope somewhere to scare us all. It isn't really about real people, real places, the real regions in Australia. Just to deal with that right off the bat, and say it's about models that people can use in the future, courtesy of Julie and her colleagues. We'd like to start by showing you the video of the process that has led to these models. Start that video now.

VIDEO FOOTAGE TRANSCRIPT

Julie Sturgess:
North Coast collective was established because we were looking at the way we currently commission services, and we realised that if we joined together collectively to invest our money, we could deliver much better outcomes for the North Coast community. The complex and dynamic systems modelling brings essentially mathematics into something to project and predict things that we just don't have the bandwidth in our own minds to deliver. So it gives us a much clearer and more accurate picture of what we can expect out of the services we're commissioning in the future, by taking a really evidence based pragmatic modelling approach to it.

Ian Hickie:
We haven't had access to these tools previously. We take those tools, and if you put them in combination with local community leadership, you really have the potential to map and to plan what really needs to happen, where the gaps are, where the connections need to be, what needs to make a real difference. And then make smart investments, track the outcomes and see whether you get what you want.

Jo-An Atkinson:
We really see the value of these tools as being a long term decision support asset that can be embedded in ongoing monitoring and evaluation systems so that as new data comes in and new evidence becomes available, these tools can be updated and they become more robust over time and can really help form part of the ongoing decision support infrastructure for the region.

Darryl Walker:

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The systems dynamics model and then the optimisation that follows that is a point in time, but really they are a part of a pathway that's looking at changing from input focused and looking at input equity, to health outcome equity in a way that can be measured over time. It's really part of a transition and a much longer term transition towards better health outcomes. And in fact, it's starting off with mental health, but the intention is to move to other areas of health as well.

Frank Iorfino:
Governing bodies only have a finite resource that they can invest in terms of health and wellbeing for the community. It's about trying to use these models to understand well, how can I best spend that money to get the best outcomes for people.

Adam Skinner:
So our intention when we build these models is to produce something that can be used by decision makers. So we're aiming to give them a tool that they can use to make decisions in an evidence informed way.

Jo-An Atkinson:
The types of interventions that can be included in a model like this vary from upstream interventions or upstream investments in reducing the social disparities, but also around what investments can be made to strengthen the service system and importantly, how investments across those two areas can work together to deliver greatest longer term impact.

Stewart Dowrick:
Maybe for the first time, we can model the impact of interventions long term using algorithms and statistics. So you know, is it better to invest in acute care, primary care, social determinants. And looking at the impact long term will help us make better investment decisions. The opportunities it is giving for our clinicians and managers to look at the opportunity to change and invest in areas where we're going to get greater return. And that return isn't money. It's about the quality of life with these people suffering from mental illness and AOD services. It's outstanding.

Ian Hickie:
I think it's really important that the North Coast PHN is sitting behind the North Coast collective and then working with local health district partners, non government partners, everybody else to make a real difference. That's what PHN should do. It's mechanisms like the collective that really go to what is the big impact and how do we get there.

Julie Sturgess:
We've incorporated all the latest data and all of the latest evidence around interventions and the things that we know. But, you know, critically important is we've used a participatory design process. So we've had the community involved in building our model. We're not just having a theoretical approach, but we're testing that approach against what

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really happens on the ground. So we feel like we really close to reflecting, you know, what's really out there for people.

Ian Hickie:

So, I must say I'm incredibly grateful to Julie Sturgess and her team for investing over time. That kind of participatory design does not happen overnight. We're very fortunate now in the COVID-19 crisis, that we had all this prior work done. It's real, it's worked out, it's local. You can then use what happens now in a really huge challenge comes along to actually deal with these issues, and we've been able to obviously use new data. Now, when it goes to what it actually goes into the models, it's pretty clear to anyone who knows me that I'm obviously not the brains behind the outfit and can't put those things together. So I'm going to hand over now to Professor Jo-An Atkinson, who leads the statistical modelling team here at the Brain and Mind Centre to explain actually, mathematically, just how complicated it is and how it gets done. Jo-An.

Jo-An Atkinson:

Thanks Ian! So over the past few months, the role and value of Systems Modelling in informing the national response to the threat of COVID-19 has been thrust into the limelight and into the consciousness of researchers and decision makers and the general public to an extent that's never been achieved before. Researchers from multiple disciplines have been working together to rapidly deploy systems models based on existing but imperfect data and expert knowledge. And there's been unprecedented levels of cross jurisdictional cooperation in facilitating the exchange of data and critical information needed to improve these models and improve our capability for rapid and effective responses to the crisis.

So, what we're presenting tonight is really a similar approach but for mental health. Next slide please. So, while the different trajectories of the COVID-19 epidemic curve have been etched into the minds of a whole generation, a new curve is keeping many of us awake at night. A mental health related curve whose height and duration, as Ian mentioned, will depend on the length and impact of the recession of unemployment rates, particularly in young people, and social dislocation. And it will also depend on how effectively we can respond. Next slide please.

So, we've been working with for a number of years with regional planners, and their stakeholders applying systems modelling and simulation to provide robust decision support tools to inform mental health services planning and suicide prevention. And so to provide some preliminary insights into what it would take to flatten the curve, we rapidly deployed the detailed model we developed last year with Julie and the North Coast Primary Health Network, and the North Coast Collective. And you'll hear more about that work later in the session as well. Next slide, please.

So the model architect is actually one of our most talented mathematical modellers at the Brain and Mind Centre, Dr. Adam Skinner, who combined the local knowledge of the regional systems and challenges with published research evidence and best available

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regional, state and national data sets to develop the model. And while there isn't time to go into a huge amount of detail of the model this evening, this figure really represents a high level overview of the structure and pathways of the system dynamics model, which captures the dynamics of the North Coast population, of psychological distress, the dynamics of mental health services in the region, the social determinants of mental health and their impact on suicide behaviour. Next slide please.

So, the model has been validated by ensuring that you can reproduce historic data across a range of indicators including prevalence of psychological distress, mental health related ED presentations, hospitalisations, community based service utilisation, and suicidal behaviour. Next slide please.

And through the interface, we can test different scenarios to figure out at a strategic level how best to flatten the curve. Under the pre-COVID baseline scenario, which you see which is the blue line there, suicide deaths were forecast even before COVID to rise, before plateauing in 2021-2022, with an estimated 490 deaths projected for the region over the next five years. Next slide, please.

So when we were ran a scenario where we increased unemployment rate for the region to 11% and youth unemployment to 24%. And we also simulated a 10% reduction in social connectedness to try and reflect what we may see in the real world over the coming 12 months. And under this scenario, total suicide deaths were forecast to increase by 23% over the next five years. And that's an additional 113 suicide deaths in the region. Next slide, please.

We then explored some mitigation strategies. So firstly, we simulated a 20% increase in the current growth rate of services capacity. And what I mean by that is mental health GPs, psychiatrists and allied services and community mental health healthcare services. And this was forecast to reduce suicides by less than half a percent over the next five years, telling us that a little bit is not going to be enough. Next slide, please.

We then simulated a 50% increase in the current growth rate of services capacity. And this was forecast to reduce suicides by 1.1% over the next five years. Still no substantial flattening of the curve within the next five years, but impacts do amplify over the longer term horizon. Next slide, please.

It's not until we doubled the current growth rate of services capacity did we really start to flatten the curve and bring it down to the pre-COVID baseline levels in the region, but this takes too long – it takes until 2031. So while services capacity growth is going to be important, we need to explore what else we can do in combination. Next slide please.

So we simulated the implementation of better care coordination through the harnessing of technology, in addition to increasing services capacity, and this combination is forecast to reduce suicide deaths by almost 5% - more than doubling of the impact of increases to

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services capacity alone, and Frank will speak more about this in his presentation. Next slide please.

So, then we simulated the addition of post suicide attempt assertive aftercare, which is active outreach and enhanced contact to support someone after a suicide attempt, on top of increases in service capacity and technology enabled care coordination. And this combination was forecast to deliver at 8.8% reduction in suicidal behaviour, averting around 670 suicide attempts and 53 deaths in the region, and really starts to flatten the curve. Next slide please.

In addition to impacts on suicide, doubling services capacity also reduces pressure on the health system by averting almost 2000 mental health related ED presentations. Next slide please.

And with technology enabled care coordination, the curve flattens even further, averting about 4200 ED presentations over the next five years in the North Coast region. Next slide please.

And post suicide attempt assertive aftercare, while having a good impact on suicide outcomes, doesn't contribute much to reducing mental health related ED presentations at the population level. Next slide please.

So proactive strategic investments in mental health programs and services will play a vital role in supplementing current efforts to provide social and economic supports, and also to increase community connectedness. And while not shown here, our simulations of the impact of improving community connectedness across all of our models, so far, points to its importance and will make a significant contribution beyond health services to help flatten the curve. Next slide please.

So in wrapping up, it's important to qualify that our Systems Modelling across a number of areas suggests that there are regional differences that can really influence the degree to which even evidence based interventions are likely to deliver real impacts in any given region. So, Systems Modelling with participatory processes to ensure that all voices and perspectives can contribute to their development, should be an essential part of the regional decision support infrastructure to inform the allocation of mental health spending in a way that is strategic, efficient and delivers the quality of care needed to make a real difference.

This is a critical juncture for mental health and suicide prevention. Will we just go back to the same ways we've always done things?, continuing to try and plug holes in a mental health system that falls short for many, or where we harness the same disciplined complex systems modelling approach that has underpinned the successful response to the Coronavirus threat in Australia to take us on a new mental health trajectory in this country. Thank you.

Ian Hickie:

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Jo, that's incredibly helpful. And that is a whirlwind tour of a year of incredibly complex work. I understand Adam has not slept for a week and a year, actually putting together the figures for the nation over the last week. And for the year before that in putting together this incredibly complex model. Now, a number of people have noted during the Q&A, and you can type on the Q&A, and I'm responding to as many of those as I can in real time - for those who can see me typing furiously. We will provide the slides for the whole webinar for people looking to detail. You can see the complexity in the number of those slides at each of them in the boxes around the economy, around the healthcare system, around the social systems themselves, are elaborate subsystems of the model with elaborate parameter estimates, and great deal of detail, explanation and transparency. There is transparency - what is in there, why it's there, the size of the effect can be interrogated, you can actually be improved or changed.

And the number of questions that have to go back a little myself here. Some related to peer work, some related to other interventions as to how they've been modelled, how they might operate, how they've been mapped in these particular communities. In different communities, you'll have different inputs. There are different demography. Some people have asked about Aboriginal persons, for example, - better addressed, perhaps in our Western New South Wales model to some degree but extremely relevant here in the North Coast as well. So you can go into sub populations, we've had a particular preoccupation with youth populations, the disadvantaged populations. So when the models are elaborate, well worked out and taken to these regional areas, you can look in your region - are the right people or the most disadvantaged people, those most at risk actually being connected? As we've said the government just repeatedly this week, I want to know where the job keeper and job seeker actually get to the most disadvantaged people or not? Casual workers, young people, those who are outside the system, - are they effective as planned. Some things apparently planned in Canberra don't always reach Lismore, or Byron Bay or Grafton in the way they are exactly planned.

But to take us further down that road, we need to hand over to Julie Sturgess, who has really led this campaign on the North Coast to get our act together in the regions of Australia. The Federation, some people think it's a problem, a 19th century construction to get us all together. Julie, can it work? Can you explain why you did this? And now when you face the challenge of COVID-19, how valuable is this tool to you?

Julie Sturgess:
Thanks Ian. Look, I think I mean, you've covered it, and Jo has covered it. I mean, it's incredible. Every day I think on the North Coast, we find new ways to apply the learnings that we have from the model. But I suppose, you know, I'm happy. I guess what I really want to cover is why we did it in the first place, which is something that you just mentioned, can we just go to that next slide.

I think it started and as you said, we've been on this journey for about 12 months around the modelling, but before that quite a bit of work on the North Coast around how we were dealing with mental health and alcohol and other drug issues in our catchment. And

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certainly the first part of that journey was identifying the burden that we actually had on the North Coast, and particularly from a PHN perspective - understanding, you know, with all the funding that we had, how did we actually meet the requirements or meet the need, in the catchment that we had. When we actually looked at all of the services we commissioned - and there are lots - and all of the people that actually access them, we realized that, really, we probably if we were being optimistic, maybe saw between five and 10% of the people that actually had any need, and I think that drove a lot of the work we were doing, because what we realised we needed to do is better understand the system, if we were going to ever have a hope of increasing our delivery and meeting the needs of that population. And I think it wasn't just the PHN. But particularly as you alluded to, and you'll see from that other diagram is that there were lots of other services out there that were also doing the same thing that we were or certainly contributing services to address mental health and alcohol and other drug issues. So, in looking at that, we embarked first on a process around just understanding the programs that we commissioned. And, you know, what I will say is that we have a lot of great service providers and a lot of great programs out there. If we just go to the next slide.

Um, but and, and everything that we commissioned is evidence based. But I think the critical thing we did is actually look at, there is an evidence base behind a lot of those models, but actually in our area, in our region how was that evidence base playing out and what were the outcomes that we were seeing across those populations? And, you know, what we saw is that by commissioning services differently and really understanding those outcomes both short and long term, we could probably commission in a much smarter way to get better outcomes for the region. Now that was just looking at PHN money. But what we realised is all of those silos in that complex system, we needed to work much harder to understand what that was. And so, you know, obviously, the modelling became really important to us in that journey. Because, you know, it clearly articulates the importance of all the other service providers and all the other interventions that go into a system to make it come together and deliver outcomes. So it's just been a critical piece of work, in I guess Illuminating, you know, those journeys for people and how we get there. And it's been critical, not just for the clinicians involved in that, but for the community too.

And as you saw in that video, we've had all of the community people with lived experience, their carers, and this isn't just been a health exercise. We've had police, in education, refugee health. All of those, you know, obviously the local health districts have been key partners in this, in helping us to develop something that's comprehensive and looks at things from many different angles. Sorry. Next slide, please.

So really, I guess where we're going on the North Coast now is, you know, understanding the burden, but then, particularly linking the inputs or the services we commissioned to the outcomes that we're getting. And we're using the modelling to do that, determining the key interventions that we're going to invest in and, you know, Jo identified some of those key ones, and certainly, you know, technology enabled coordinated care and social connectedness and those things are very high on our priority list. And we also take it a step further and look at how we apply that on the ground because obviously, we need to take

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individual populations, and again, where we're commissioning for equitable outcomes, not just equitable inputs. So we're really looking at how we apply that, and then forecasting what the change that we expect to see at a population level will be, I think, really important. And I haven't put the dynamic modelling beside that last point. But you know, the important thing that we're doing is projecting the outcomes that we think we will achieve. And with commissioning all of the services now we have a trajectory that we expect to see. And so in an ongoing monitoring and management perspective, the model lets us track performance of all those interventions. And if they're not delivering the outcomes that we expect to see, then, you know, either, first of all, we look at how we're implementing them, or secondly, they may be the wrong interventions to achieve what we thought, so I think that is critically important. Next slide, please.

So, I think, you know, one of the most important things that we've seen… the colours and this has changed a bit, so I'm looking at it going on, I've got to read it, but is that what we know is there is a finite budget that we need to work within. And what we often do is look at the outcomes of the funds that we do spend and go are we delivering the outcomes? But the other thing the model lets us do is look at the outcomes from the things we choose not to invest in. And so understanding the risk in our population around services we choose not to spend money on either. So at a portfolio level, we feel like, as health service commissioners and providers, that we have a good understanding of all the risk that is happening in our area. Now to do it. Next slide, please.

Really what we've done on the North Coast is initially establish what we call a North Coast collective, and the initial partners in the collective have been the Primary Health Network and the local health districts. And it's just because we had a big focus on health interventions in that, but in a vision where you know, we put carers and consumers at the centre of what we do. And particularly through the modelling, understanding the importance of the social determinants, then a big focus of the collective moving forward is how we engage other service partners. And you know, those other silos that contribute to outcomes in the collective approach. So that, you know, is a critical part about, you know, not looking at only health investment, but looking at the investment that contributes to those outcomes across the board at a regional level. Next slide, please.

And so we have a really ambitious target around how we move to a regional model for commissioning. And certainly we're not there yet. But, you know, what we hope we're starting to do is move from, you know, segmented funders and commissioners and then providers who are all working towards, you know, very siloed and perhaps different outcomes, to at least having a shared approach to our commissioning strategy. And shared approach by the community and service providers understand what outcomes we are trying to achieve and agree on those. And you know, when we focus on those outcomes, there will be some things that we prioritize as different outcomes in our region to what other regions might do. And, you know, the hope is that sometime in the future, we move to a much stronger regional governance model around commissioning so that we have a seamless approach to addressing mental health and AOD issues across the continuum. And I suppose I should call out, obviously, mental health is the first approach that we're using with this, but

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it is a methodology that we plan to use across other health service delivery as well. So that's a whirlwind tour of its application for us here.

Ian Hickie:
And so I just going to unmute myself as I'm coughing here in the background. Never great to get a bit of a COVID-19 [inaudible]! You know, I think The Treasurer found this last night to be coughing and spitting. But I'm on my own. In the face of the COVID-19 thing, have you see those figures about the size of the curve? You know, do you feel having invested in this beforehand that you can now have conversations with people in real time that are not just, you know, filled with anxiety and, and being overwhelmed? Do you? Do you feel more empowered to make the decisions that you need to make with your partners on behalf of the community?

Julie Sturgess:
Absolutely. I mean, forewarned is forearmed. And I think, you know, what this has allowed us to do is particularly challenge, you know, some of the traditional ways that we've always done things and, and, you know, particularly you know, before COVID, but especially with COVID, to really tailor our interventions based on some of the modelling that we've identified. And look, you know, there are always challenges in that and, you know, people will challenge the accuracy, but I mean Jo went through the validation of the model earlier, and I guess the thing that I always highlight to people when they're challenging how we're supporting our decision making with this is, - what is it that we currently use if we're not using modelling to help us understand this complexity and the way that we commission? And you know, the answer is often – "not a lot"! Individual interventions have evidence, but we are not currently using anything that helps us understand the complexity of how we put all these things together in a system.

Ian Hickie:
Don't you know Julie, in Australia we hate managed care, - it's American, we hate it. We love chaos, 'my interventions better than your intervention',' there's no evidence the other' and we should just add them all up is what I really hate. If we add them all up, my intervention, your image, and we fund them all, you know, 130% actually on the ground, [inaudible] percent maybe you'll say, you know, like, we've got this myth that we funded everything. We just provided everything. They'd be all these marvellous outcomes - which clearly, to anyone who works in any dynamic system anywhere in any other area knows to be untrue.

So thank you for that marvellous presentation. I love the idea of being challenged, being challenged continuously, I'm trying to respond to as many as I can along the way, some are technically out of my league about sensitivities and parameters, and I'm sending them back to others, some other estimates we put in. But I do think it's a very interesting thing when people say you haven't done and we actually had, but the size of your effect isn't as big as you think it is, or interacts with another effect. There's competing effects. And in many other situations, there are gaps we're not making.

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I think, Julie, before COVID-19, the discussion we were having, we haven't invested enough in the long term effects, we tend to invest in short term effects and hope that everything be fixed by the next financial year. You're really committed to the longer term social determinants in your region, which are very challenging and that's great in the context of the COVID-19. There is what we do now, but also what we do long term.

At this point, I want to hand over to Frank Iorfino. He's one of our postdocs that has been working on the 21st century. Can we actually use Technology? Don't you love these little things? Can we actually do stuff that will allow us to coordinated care? Or dare I say, Julie from the PHN point of view, hold providers accountable for what they're doing and actually know what they are doing, and perhaps what the clinic next door is doing? For those who know the Brain and Mind (Centre), sort of slogan in healthcare. It's right care, first time. As I've just said the same thing in another forum - actually, I don't care why you get better. I care if you don't get better, or you get worse. And I want to know as quickly as possible, so you get to better care. And I must say, with the focus on suicide that we've had in the last two weeks, that really matters. Frank, do you want to take us through what can be done with 21st century technology?

Frank Iorfino:
So Ian, thanks for the introduction. So I'm going to provide a quick overview on the use of digital technologies in this model. And this work was carried out with local stakeholders who work across a number of settings, as well as people who have lived experience as Julie touched on earlier. And it was clear from these workshops that there are a range of problems associated with the way services are organised, which often impacts on the quality of care. So this includes mental health treatment, isolated from physical and social needs, late intervention, long wait times, and often poor communication between services. And these issues were identified as particularly problematic for people with more complex needs. So those who might need housing support or disengaged for employment, which typically requires an effective care coordination and team based care approach. Next slide, please Grace.

And we know that the integrated use of technologies may be one of the biggest enablers for effective care coordination. So the accessibility, the scalability and the standardisation of digital technologies means that we are well placed, they are well placed to have a major role in mental health care to be able to provide systematic assessment, personalised treatment plans, outcome monitoring, and Decision Support across a variety of settings, and away from the clinic when people are in there at home. So they're used to mental health systems has already demonstrated utility to improve access to care and communication between clinicians and consumers. But as Ian and Julie touched on, you know, what is the impact of these types of events of interventions within a broader system?, and that's what we aim to model here in this model. Next slide, please.

So under the business as usual scenario, this is based on pre-COVID assumptions, but the trends here are the same under the post-COVID assumptions as Jo touched on. There are approximately 12,000 self-harm hospitalisations, and 900 suicide deaths forecast for the

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period between 2021 and 2030. And we carried out sensitivity analysis to assess the impact of uncertainty in the model parameter estimates of this intervention on the simulation results, and these results indicated that for the total population, the implementation of technology coordinated care was forecast to reduce self-harm hospitalisation and suicide deaths by about 7%. And for comparison, increasing the service capacity growth of existing services by 20% had approximately a 2% reduction for the same period. Next slide, please. And we see that even these, the same patterns for mental health related ED presentations and the prevalence of high psychological distress, and so this emphasises how using technologies to strengthen the way the whole mental health system functions together is really important. And when combined with the other interventions, such as increased service capacity growth, and post attempt after care as Jo-An showed earlier, you can have a major impact on outcomes. Next slide.

The effects of this intervention are guided by an evidence base literature which indicate that using technologies to deliver coordinated care improves the per service probability of recovery. And it improves care pathways to secondary prevention and specialized services, which includes referrals to housing support or employment support programs for those who need it. And it also reduces disengagement by re-engaging those who have been lost to services due to increased wait times or due to an experience of inadequate credit which is so common. And so, altogether this functions to ensure that people receive the appropriate type of mental health care and reduces their wait for these services, which is so often a major cause of inefficiencies and ineffectiveness in complex mental health systems. Next slide please.

Now will this work also suggests that the way these technologies are employed really matters and has an impact on the outcomes, so simply replacing existing services or consultations with video conferencing will have some impact but won't quite cut it. So you can see here in this graph that new models of care are needed to leverage the benefits of using technology, as I've mentioned, and when you don't use them in this way, then the outcomes aren't as great. And so, way to leverage the benefits of technology are these better triage processes that are facilitated by online assessments in a skilled workforce, routine outcome monitoring, which may involve linking with other effective apps and e-tools or wearables, and importantly, interoperable systems that improve information flows and reduce duplication for better communications between providers and with their patients. Next slide please.

And as you increase the proportion of mental health services which use this type of technology, then the impact on these outcomes also increases. This illustrates the importance of ensuring proper uptake across the whole system to reach the full potential on patient outcomes and health service efficiencies. Next slide, Grace.

And so this really does emphasise that they're overcoming the implementation barriers associated with the these new technologies is critical. Our recent work has identified key technology, clinician, service factors that currently limit the effectiveness of new technologies. These factors include variation in the level of integration into existing service

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pathways and clinical protocols, or staff attitudes and training, or the overall degree of local leadership and organisational support for these technologies. And importantly, the lack of interoperability between systems. Addressing these technology and implementation barriers at a local level are critical to ensure that these technologies are developed and integrated with services in a way that truly transforms clinical practice for the whole system. Thank you.

Ian Hickie:
Okay, thank you so much Frank. Digital technologies, so much part of our lives, but actually so much in healthcare is still not coordinated or uses the essential technology to link people, link outcomes, and make transparent and make accountable care systems. I really hope that one of the things that comes out of this whole crisis is actually a fundamental shift to the use of technologies to empower users of services, but also those responsible, like Julie for funding and commissioning services, as a service provider. Actually, you might have to know what you do, who you do it with, does it really do what you think it does. Even if you've been trained to do it. Maybe it doesn't do it as well as you thought.

Now, I'd love to be an economist. In fact, for those of us who know my relationship with Allan Fels and the reason I joined the national Mental Health Commission in 2012, it was to do a short course in economics. And I consulted on only last week, and some people said where the economic assumptions comes down in these models? We consult the Congress widely, the Reserve Bank, others, but we're not economists. So we thought it was really important since the main disrupter here clearly, clearly, - as far as mental health and wellbeing and suicide prevention is - is unemployment and underemployment, and the complex relationships which people just send between job keeper, are people really employed or unemployed, and those have moved to a job seeker, etc, etc. There's a lot of these words I'm not sure where they come from, but we used to call underemployment.

Kenny is our resident economist. People think, Kenny, we are not interested in economics, myself and Fels only went on to the National Commission in 2012 because we wanted to discuss the mental wealth of the country, that this is a central productivity issue as an essential issue to the future economic social wealth of our country, mental health is that. So Kenny, what do you make of these models?

Kenny Lawson:
Thank you. And good evening, everyone. What a pleasure it is to be here. And what a pleasure it was to be asked to collaborate on what is an outstanding model and just a big up my fantastic colleague and friend, Adam Skinner again, and nothing would have been possible without him, and Julie's just such an enlightened policymaker. And so what am I going to talk about here? Well, first of all, and it's to recognise what Ian has just said, and mental health is not just valued in itself, but it's also a means to an end in terms of wider economic growth, but actually, it actually feeds back into mental health itself. It's so important to have system dynamic models in order to represent an evolving process.

So as we know, this is an evolving situation - COVID-19, economy, mental health and policy responses itself. Dynamic Simulation model captures these independencies. Now I'm going

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to show you two scenarios, both of which are aligned with consensus forecasts, and updatable as the situation changes.

So scenario one is where unemployment reaches 11.1%, youth unemployment 24%. Now, this is slightly higher than the national average. And the reason is, is because, North Coast, starts from a more disadvantaged place. Scenario two is where we have a more worst case scenario. So unemployment is considerably higher, both on a population scale overall and for youth unemployment. Now, the assumption within the model in terms of the recovery from the economy is U shaped. So the idea being that you know, we have a downturn and conditional on governmental responses, and we slowly recover. However, as as we are going through that process, there can be considerable mental health impacts and also economic impacts as well.

So the next four slides is going to talk you through a few scenarios. Now we have a table and lots of figures. So as you cast your eyes down the details, I'm going to concentrate on story. And then hopefully we'll be at the bottom where I talk about the cumulative impacts.

So those two scenarios to recap for scenario one where productivity losses and result from scenario one, which is unemployment ticking to 11%, scenario two, where unemployment ticks to around 16%. So I'm going to take you through scenario one to begin with. And then you'll notice here we have broken the results down by year over five periods. And we've got two columns for each scenario. The first scenario is the combined productivity loss. Now this is from unemployment, and also from those in employment suffering from mental distress. I'll cover that in seconds. And the second column is a subset of the first. This is essentially productivity impacts from mental health directly from those employees.

So the first thing to notice, or the first thing for me to say rather is what's the comparison? The comparison is with no COVID. So this is scenario one, COVID occurs, unemployment ticking up quite considerably, here is the change in productivity losses due to mental distress relative to a local bit scenario. So these are changes. So the people with an eye for detail, make notice a negative number for and March to January 2020- 2021. And the reason for this is because whilst there is productivity losses for those employed, and I'll talk about that in the next slides, we have essentially, you know, people are becoming unemployed. So we're shifting the impact to the unemployed themselves.

Now, in terms of the story, there are lag effects, as the economy adjusts, and essentially takes a hit, and they're initially, you know, companies tend to, unfortunately, retrench people who are young, because they're often easier to get rid of casual employment, and but then you know, the effects on employment actually kick in over the next year.

The other lag effect to bear in mind is that mental distress, whilst the economy recovers, the impact on mental distress continues. So this is why we represent this scenario with that five year period. This is the consensus with regard to the economy recover. And, you know, we also see the impacts on mental health actually increasing over time.

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Now, what's included in productivity impacts? Well, it's things like, first of all unemployment, also for those who are employed, absenteeism. So you're taking these off presenteeism, so you're trying to work but you're not quite working at your best because you're under a heightened degree of distress, but also includes people who then go on to commit self-harm, unfortunately. So that's time in hospital, and it's those who tragically go on to commit suicides, and it's also including the impacts of carers. Often carers are the ones forgotten here, but you know, the impact on trying to manage and care for people suffering mental distress goes beyond statutory services. And we really need to think about how to support carers as well.

So let's think about some of these numbers. So in terms of the cumulative impacts over that five year periods, under scenario one, remember the conservative scenario, it's over 2 billion for this region. So it's quite a considerable sum. The mental health impacts specifically for those in employment are about 11% of that. But that's crucial. So when we're thinking about government responses, and people are worried about productivity, we need to recognise the interaction between those who are still employed suffering from mental distress. They're also not quite working at their best, and that's about 11%.

Now, if we switch to scenario two, which is more of the worst case scenario, you know, on average, and we see that there's a doubling of the impact. So in short and you know, we're going through tough times, this is going to continue. There's a lag effect for mental health, which we must be aware of in terms of the impact on productivity, and cumulatively for this region this is huge. Just think about what's happening nationally, and in different regions as well. Next slide, please.

Okay, thanks. So the slide itself is look representing the absolute losses of productivity. So the slide before is about the change in productivity relative to the no COVID scenario. Now this slide is about we're in the COVID one scenario. So because we're naturally conservative with their forecasts that we're providing, we're choosing scenario one. We're in this scenario now. So what we'll see is we're comparing COVIDs. And with the same policy responses, so no changes, it's business as usual. We're trying to manage people with heightened level of distress and here's the impact on productivity. So that's, that's the green.

And then what we're going to do is we're going to compare the impact with turning on these interventions. So, and as Frank eloquently outlined, we've got technology enabled care. And we've got also post attempt care. So these are people who've tried to commit suicide. Thankfully, that didn't come through. But these people need wraparound services intense, we're going to switch that on as well. But we're also increasing capacity. So the key thing for economics here and policy responses is that we need balance between our interventions.

Going back to Ian's point, it's not good thinking about single interventions, and applying evidence which existed years ago and thinking they apply now, the idea is we need to balance and I'm sure he's done a pretty good job in terms of responding to COVID. Other countries haven't. And one of the key issues for that is finding the lack of balance. So Julie

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talked about portfolios. Okay, here's a portfolio of interventions to try and reduce the productivity impact.

A question online was about uncertainty. And this is why we have these five charts. We've run the model multiple times, we've changed parameter inputs. It's really stress tested this. And here are the results, we've got a very clear and consistent story. If it's just business as usual, if we don't invest in new interventions to the green fans at the top, productivity losses are enormous. If we invest in this portfolio of interventions, which is just one set, Julie talked about social determinants as well, which is key. But just as one set of three interventions, we see a reduction in productivity, which is close to 100 million for this region. And that's about 40% of the productivity costs themselves. So this is modifiable. We don't have to simply accept that mental health impacts will come. We can invest in interventions that work and we can get wider productivity impacts for society as a whole. Next slide, please.

But it's not just about productivity. And let's think about the health sector also. So this dynamic model is bringing together the health sector of the economy, policy responses, we're simulating these in a dynamic frame.

And this is the dashboard that the Julie and her policy colleagues see before them. Essentially, it's their policy sat nav. Now, it's trying to tell them, you know, what would happen if we switch on certain interventions relative to others, what would happen if we've got portfolios, and what we've got here on the left hand side is the interventions of and also below that service capacity group. So thinking about balance, or not just investing in single interventions, but multiple, but we're also aware that we need to supply capacity as well. Otherwise, we could have unintended consequences.

Now, what I just want to focus on here is the impact of switching on a set of aftercare. So to remain this as people who have committed self harm, and we really want to support them for that not to happen. And so the first line in terms of the annual commitment of expenditure, excuse me, break into who pays, so the Commonwealth estates and out of pocket. Now this is the background health expenditure within the regions for mental health. The line below is the cost of introducing a set of applications, costed this out for the region. And that's approximately 5.3 million over a five year period. And then what we want to do is think about what's the downstream costs as well in terms of other services. So I've got balance in the system, we want to increase the demands to support people, but there's also downstream consequences as well, and psychiatrists, psychologists, Allied Health and others, and the combined health sector investment would be approximately 31 million over five years.

Now, what make the impacts be? here's what I'm going to take you to the bottom row. Now, this quality thing, what does this mean? Well, if we invest in a set of aftercare, we're extending life and also improving the quality of it by reducing the distress. And so you know, we've got 900 quality adjusted life years or five year periods. This is important in terms of thinking about the cost per suicide avoided. In terms of people's lives, this is minimum. And when we think about the cost per quality gain, so we'll have the economist sometimes talk

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about cost effectiveness, something in terms of a rule of thumb, something is below $50,000 per quality adjusted life year gained, sorry about all the jargon. But what this means is that this is very cost effective to be investing.

And now if we actually value health as well, and this is all about people's lived experience, so economics is just about layering on and trying to provide the foundational argument but it's about people's health and well being. The societal value created for this region, by switching on post attempt care is approximately 14 million over five years.
And just as a final point on the slides, the model runs here for five years, but it can run for any time period. It can run over lifetimes. You can run it over annual, it can be smaller increments. It's all in line to Julie's needs, in terms of what is the decision, when is it going to be taken? How much do I have, and it's as flexible as that. Next slide, please.

So the take home message is here is that we really do need dynamic simulation modelling. It's akin to a Sat Nav in my view, we can't use static modelling approaches, we can't use single studies. These are analog methods in a digital age. We have dynamic simulation models fit for purpose, developed through a participatory process, led by Julie and we've got a team around her trying to help her drive the policy change forwards. It's an evolving situation, and the model can be updated accordingly.

We need to ensure that we've got rapid decision support so policy options, costs and consequences. We are not telling anyone what to do, we are not giving menus, and the costs and consequences from that. Let's make sure that what we're exists investing in at the moment is effective and efficient. But as we pour more resources into the system, there's an opportunity for policy coordination.

Decisions taking one sector affect the others. Decisions taken by the feds in terms of the economy, fiscal, monetary, and also lockdown policies will have impacts on mental health, and mental health response in terms of health sector, social determinants, in turn feed back into the economy. Models can enable… - Sorry to interrupt you Kenny, we are running out of time - oh sorry, sort of final theme here is invest in mental health, alleviate the stress, save lives, which is what we're fundamentally interested in. And by doing that, we create wealth itself.

Ian Hickie:
Thank you, Kenny! Do you want to do to run our public relations campaign for us Kenny? Just like that and just do it, you know, just tell someone in the bubble that's the answer. From an economist, it's all about the economy now. That analog in the digital age… I hate to tell you, Kenny, paper and pencil in the digital age are what hospitals doing really, analog would be the events on a particular kind of, you know, so many of our health systems are 1852 telephone, 1876 Alexander Graham Bell got the patent, just entered the Medicare system. We got a little way to go. But I mean, it is a problem for us. And I must say what you said about the models, the models are right up to date, just what is happening elsewhere used in other industries.

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Now finally, before we run out of time, Matthew Hamilton from Orygen, all this talk about the economy, but do young people get distressed and develop disorders? Matthew's been working with Orygen, with Pat McGorry, and very much the extent to which actually people do develop mental ill health and doing that by place and circumstance. Matthew.

Matthew Hamilton:
[Matthew unmutes himself]

Ian Hickie:
There we go, Matthew, your marvellous, soft tones from the other part of the world.

Matthew Hamilton:
Fantastic. All right, thanks so much! So listen, over the last few presenters, I think it's given a pretty good case as to why you might want to do this sort of modelling to look at both social determinants and health system redesign. I'm going to talk about it some of the things that might help us develop the capacity in Australia to do this sort of work.

I start off in fact, we've actually got fairly good modelling capacity creates a range of things within Australia, a lot of it in different types of techniques. But these are the things that will actually feed into doing these more dynamic simulation endeavours. I think we should build on that. And part of it is also about collaborating between the different modelling projects.

Now there's a number of reasons to collaborate, but basically because this is a very complex undertaking and no one group can actually do this on our own, we actually could be relying on other people doing different parts of the puzzle. And the other thing is, the more complicated the model, the easier it is to make mistakes. By actually having multiple models addressing the same set of issues, it's more likely you'll find those mistakes before you put your models out to the public domain.

Part of it also relates to improving the transparency models, because policymakers got to trust what they're using as decision aids. and the more transparency, these more complicated models, the more likely they are to have some trust in the outputs.

And the last thing, which again is I think they've been highlighted by a number of previous speakers is around, and that model shouldn't be developed for one particular point in time and then left on the shelf because the environment changes. And what funders and those that are undertaking mothership is written to refine them and have the frameworks do that. And this relates to the last thing of that policymakers often are faced with very pressing immediate term challenge is to make a decision in the here and now. But there is also the big picture here about, over time developing a much more sophisticated understanding of the complex systems in which mental disorder arises and is treated. Next slide please.

And so to rephrase all that, and basically, it's a big complicated problem, and you ideally want to break such a problem into smaller more manageable tasks, get as much skilled help as you can to undertake it, have some sort of plan or framework to knit it all together into a

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coherent message and be realistic about what needs to do that. I think the best way I can think of is communicated is models are like Lego bricks in terms of we all doing different bits, some people are working in primary care, specialist care prevention. And ideally, we should be able to stick those together but not just models as a whole. Models are big, major undertakings, both the data and the algorithms that go into them take a lot of work for the individual components, and each of those components should be available as Lego bricks as well.

So people don't like some of your models, they can take the bits that's usable to them and useful. And next slide, please.

So in terms of our attempt to do this over the last three years, and we've been developing an Open Science Framework for the development of simulation models in mental health, the motivation for that is that we refunded that time, public health develop a model of resilience for Victoria. And as we approached planning, that was clear that this is actually a major and complicated undertaking. And to do it just for Victoria would seem to be a potential waste of a significant amount of effort. So though our model is going to focus [inaudible], we want to design it in a way that it would be relatively straightforward for others or ourselves to generalize it to other contexts.

And the other thing is that we wants to be able to extend into other areas of prevention and also other areas of mental health care service delivery, to get a much more whole of system and view. And so we decided to build a framework and a set of tools to implement that. We've applied those tools to other simulation model work that we have in Orygen at the moment, in epidemiology, mental health help seeking and primary mental health care.

All these we plan to be publishing this year and releasing all the code and data in open source formats. So people can see what we've done. See if they agree with it, play around with it, change it and use anything they find useful in their own work. And the other thing we'll be releasing is a toolkit that we've developed to implement our models in the hope that some people might find them useful to implement a similar sort of framework. And so next slide, please.

So why we put all this effort in developing a framework? Well, I mean, I've alluded to some of this in the introduction. Basically, policymakers need to trust the models. And the models themselves need to be a value for money, and the more complicated there is a lot more work to validate and communicate, and the more cross validation you have between models, the more transparency you have, the easier it is going to be to build trust.

The other thing is that these sort of modelling projects require a sort of different toolkit and a different approach some more of the traditional modelling approaches which are feasible to do within a one research group. It might take a couple of years, but it's still doable. This is actually a major undertaking, and requires a lot more collaboration between different types of groups. And some of the challenges to actually getting that collaboration are quite significant, particularly in how you implement the models, because it's harder for models to talk to each other. They're talking different languages. Next slide, please.

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And so in practice, what we've done is we start with relatively simple models, but we implement them in a manner that each component part of those into the algorithms and data are readily reusable by others. And we also have a set of tools to streamline the process of generalising… these simple models for a particular context to other contexts, and once we've validated these more simple representations, then we move to refining them and extending them. And then this linking with different types of models together, including those from other groups. And these go to the next slide, please.

And so basically, in terms of work example, over the last year or so, so firstly, develop, these are the simple demographic model predicting population counts, we then wrote some code to generalise that to any context in Australia. So for somewhere like Victoria, we'd run maybe 7000 parallel models, each with their own unique data set that is specific to the spatial unit being modelled, and producing outputs for that particular area. We then use that demographic model as the basis for an epidemiological model. And we using literature as prevalence rate, and then we took some of the outputs from the model that you've just heard about the recent speakers like Jo-An as inputs into our model, they model a lot of things that we didn't have the bandwidth to do. But we think, well, maybe we can generalise parts to get a message this represents for other areas beyond the North Coast. And within our own modelling projects, we're basically looking at using that kind of relative simple models to scale the agent populations are developing. And for our more complicated models, these ones work for individual, representing individual households and individual people, as to get a sense of the equity of outcomes across a population. Next slide, please.

I suppose, to tie it up… And in terms of obviously, we're able to get a relative good profile of the expected distribution of outcomes in an area of interest. And if you go to the last slide, please.

I think the take home messages that I would like to leave with is that obviously we've got good capacity within Australia. But if we're to move beyond doing individual models, and to do more complex system modelling of the type that Jo-An and her team has highlighted so excellently. And we need to put a number of things in place, and things I would recommend as priorities is open source code and data. Standardising workflows and the descriptions of the data that are used in the models. I set a common frameworks and software to make it easier for people to use those common workflows and to adopt a common framework. And finally, for funders to invest in building modelling capacity, and also having longer timeframes and modelling projects, so can build in the continuous improvement, 'cause models get better with better data, and more time. So that would be that my last take home recommendation.

Ian Hickie:
On that last question, Matthew, and we have gone over time and I apologise to everyone else, if they have to drop out they will but since people are still online and a lot of questions to answer, I'll just try and sum up and bring some of those together. So the only open source and transparency, just to say Jo-An and her colleagues and others have a letter in "Science"

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on COVID, and open and transparent data. We are committed to that. The models I actually owned and operated by those who commissioned them, - Julie and others, they're not owned by us. We provide the particular issues to them, so that they can work them in their areas. People want to know in the various regions we worked at Northern Rivers of New South Wales, Western Sydney, obviously, urban area Hunter New England, Far West. For big models, we've worked on particular issues. That's not the whole of Australia. No, it's not the whole of Australia. There are about 50 functional regions in Australia. For those remember Simon Crane's office - used to have the regional map of Australia - much better than maps to the states and territories. Ideally, prior to COVID-19, we would have had such maps for all the areas, particularly now the 31 PHN across Australia, and we would have a more detailed composite model which would be the national model. Unfortunately, COVID-19 didn't wait until we actually had done all that, or we probably wouldn't have done in any way. This has been a long and complicated process. Each model on the ground takes a long time for the coders on the back end.

I've had a lot of backwards and forwards with some people this evening about the Co-design: is their lived experiences, their gender engagement, local organisations, do we really care about sub populations? Are all the relevant services engaged? These are complex questions that want to be answered in each community.

What Julie is really done, and others are doing in the Hunter New England, in Western Sydney is building those parts, building those communities, working with people like Matthew and Jo-An and her teams, to be informed. Bring in the expertise of people like Kenny, with genuine economics backgrounds to what this means.

What is the productivity gains? Where are the longer term sets of issues? So we certainly do not have all the answers to all the questions in Australia. We don't. But guess what? We do have COVID-19, and guess what? The people with the virus, that were modelling the virus, had no Australian data. They thought it might be the flu. Guess what? It's not the flu. The virus doesn't behave that way. And what they've done is modify the data continuously and quickly in relation to real time data.

So my final point is about real time data. A lot of time and effort in my view has been wasted continuously talking, for example, about completed suicide, which is like completed at attribution of deaths due to COVID-19, which will happen for the next 55 years in theses about the COVID-19 crisis when it's all over. I've just seen recent analysis of the suicide data from the 2009 published in The Lancet this week - crisis and its effect across 63 countries.

We don't have the luxury of having all the answers or perfect systems, what we have are very good models. We have some great examples in Australia of Australian data in different regions, due to the work I must say of people in PHNs like Julie, like in Hunter New England, like in Western Sydney, and like in far western New South Wales, and the work of Matthew and his colleagues in Victoria supported by the Victorian Government to get down to that community level.

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Place matters. Populations matter. As there isn't one central national solution, Australia is a very complicated place, we need to get it right in the regions in which people live, for the people who live in those regions. What economic crises do however, is kill the vulnerable. It's those who are at the margins. It is unemployment, and he's social disconnection, is those who are already in trouble. And those areas where the whole industries have been wiped out in tourism, hospitality, retail, effect on the higher education sector, effects on the arts and creative sectors, which are not simply coming back, in a snap back.

There's been questions about how long we've modelled. I think what we've shown here are myself very conservative models, the best I can tell, with consultation with those who work for the Reserve Bank, those who work from the Treasury estimates, those who work in economics internationally, we have modelled the most conservative, which is one year of disruption at the current rates, with slow recovery as described by the Treasury just recently, that is the most optimistic forecast.

Of course in economics, as in health, we don't know the future, we will see what actually happens over time. But I suggest the responsibility for us all is in fact to try and make the best decisions that we can make, pre-emptively. I think we've all seen the value of that with the government decisions acting on medical advice with regards to the shutdown, to protect us from the horrendous impacts of the COVID virus, as experienced in health consequences elsewhere in the world, saving many lives, including, I must say, many older lives like my own.

There are many younger lives on the line in the COVID-19 situation and their preoccupation, some said with the youth sector. That's right. That's where a lot of lives will be lost. This role of marginality will have long term effects. And Kenny touched on productivity. I think another question we have answered along the way, or attempted to answer - one of the things we know from the 2009 global financial crisis is the government made it worse, particularly for young people in Europe, when they followed the crisis with austerity. When they actually followed the crisis would actually not supporting employment, education, ongoing health care for those most affected, those at the margins.

So these things do not play out equally across society. They're not like wars, we don't intrinsically come together, these crises are socially divisive. They're not necessarily socially cohesive. I, like many I have with us, hope that Australia actually does behave in a socially cohesive way. But more importantly, in each of the regions and communities in which we live, that we behave in a socially cohesive way, that we do take care, but then we also invest. And I do care that we invest in things that work.

It's very easy to champion the favourite thing you do, the service you provide, the perspective you have. But there's another level of this. If we are genuinely collective, which is respect the different perspectives and look at the evidence and the data in real time. And be informed by that.

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I hope this evening has provided you with insights into the way we're trying to address that problem, the people we are collaborating with, the insights we're trying to work with, and the way that we are trying to empower communities to make these particular issues. The really good news, I think, hopefully, this issue is now firmly on the table. Greg Hunt has made it clear that this type of information will inform the National cabinet's response now and into the future. These estimates, the models will change in relation to real time data. But real time data needs to act locally and be effective.

There's a set of useful resources here, the references that are extensive. Jo-An and her team can provide the already extensively peer reviewed publications on the models. There's for the more academics. For those who want to use them in real time.

Please be in contact with us about how this takes. It is not a short term process to establish one of these models. But due to the work that Matthew is doing, the work that Jo-An is doing, the work that others are doing, we are trying to find the most effective backgrounds or templates to bring to communities.

I thank everyone for their participation, but I must particularly thank Jo-An and her team, Matthew and his team for the statistical work for these particular areas. Our work is supported by NHMRC. That's right – NHMRC, peer reviewed Centre for Research Excellence, it only took us three years to convince the NHMRC to invest in modelling. Why modelling? Why don't you just run another trial? - because it's a complex system, actually, to actually understand what is going on, to develop real world interventions.

And so the partner organisations to the Brain and Mind Centre, YOUTHe which is the CRE, and Orygen Youth Health are the key supporters, but on the ground it's people like Julie and the PHNs, who are the heart and soul of this work, and I must thank them greatly. If you want to work with Julie, you should work with her. Thank you everyone else for your time and your attention, and we'll make the webinar and references available to you, and thank you to our other co-presenters. Goodnight.