Supplementary material

1. Model structure

1.1. Overview

The core model comprises a set of interconnected sub-models, or sectors, that includes: 1) a population sector, capturing changes in the size of the total population resulting from births, net migration, and mortality; 2) a psychological distress sector that models flows of people to and from states of low psychological distress (low to moderate socio-economic disadvantage, low psychological distress), vulnerable but not distressed (high socio-economic disadvantage, low psychological distress), and moderate to very high psychological distress; 3) a mental health services sector, modelling the movement of distressed patients through one of several possible service pathways involving (potentially) general practitioners, community-based mental health services (including clinical psychologists, other psychologists, and other allied health providers), psychiatric inpatient care, and online services; and 4) a suicidal behaviour sector that captures numbers of self-harm hospitalisations and suicides.

1.2. Population sector

Figure S1 shows the structure of the population sector, which captures changes in the size of the western New South Wales (NSW) population resulting from births, migration, and mortality. The total population of the Western NSW Primary Health Network (PHN) catchment is modelled as a single stock (i.e., state variable) that increases through births and decreases as a result of net migration (which is always negative over the period simulated) and mortality. Births and deaths occur at rates equal to bP and dP, respectively, where b is the per capita birth rate (per year), d is the per capita death rate, and P is the population. The per capita birth rate increases at a constant fractional rate per year, and the per capita death rate declines at a constant fractional rate. Net migration is assumed to be constant over the simulation period. Population estimates derived from the model are plotted together with estimates from HealthStats NSW (http://www.healthstats.nsw.gov.au/) in figure S2.

1.3. Psychological distress sector

The psychological distress sector captures transitions between states of low psychological distress (Kessler 10 [K10] scores of 10−15) and low to moderate socio-economic disadvantage (the general population), low

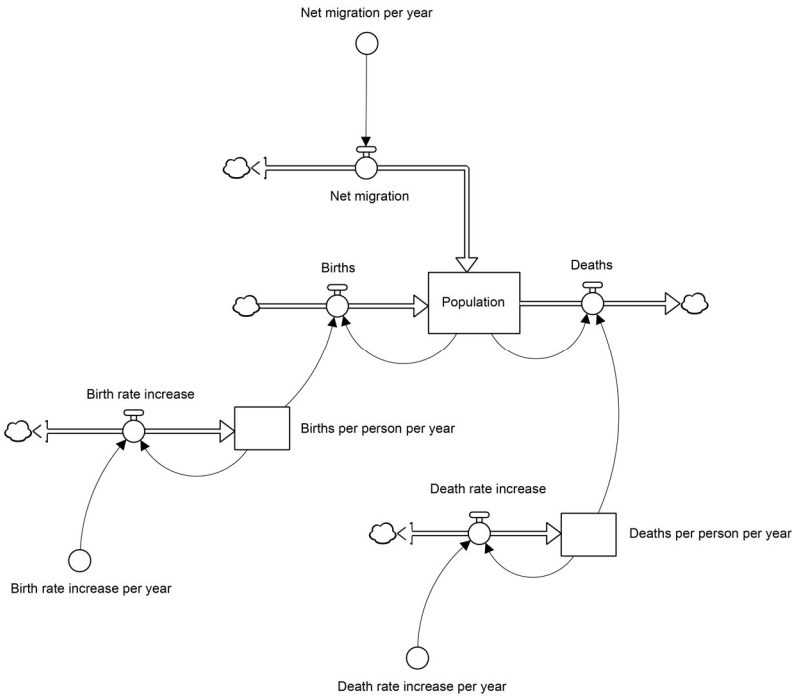

Figure S1. Structure of the population sector.

psychological distress and high socio-economic disadvantage (the vulnerable population), and moderate to very high psychological distress (the distressed population, with K10 scores above 15; figure S3). At any point in time, the distressed population comprises people who are receiving mental health care, and people who are not receiving care; the model structure presented in figure S3 shows only the stock of distressed people not receiving care (the remaining stocks of distressed people, i.e., those under treatment, are described in detail in section 1.4 below). The general population increases at a rate equal to $bP + m - dP$, where b and d are, respectively, the per capita birth and death rates per year, m is total (negative) net migration per year, and P is the total population. People flow from the general population, G, to the vulnerable population at a per capita rate v per year, so that vG people become vulnerable to developing a mental disorder annually. Per capita distress onset rates for the general and vulnerable populations are c and θc, respectively, where the rate ratio θ is greater than 1 (i.e., people in the vulnerable population are assumed to develop moderate to very high psychological distress at a higher rate than people in the general population); thus, $cG + \theta cV$ people become distressed per year, where V is the vulnerable population. A fraction r of people with moderate to very high psychological distress is assumed to recover spontaneously per year (i.e., without treatment), flowing into the general population. Estimates of moderate to very high psychological distress prevalence derived from the

model and the NSW Population Health Survey (see http://www.healthstats.nsw.gov.au/) are presented in figure S2.

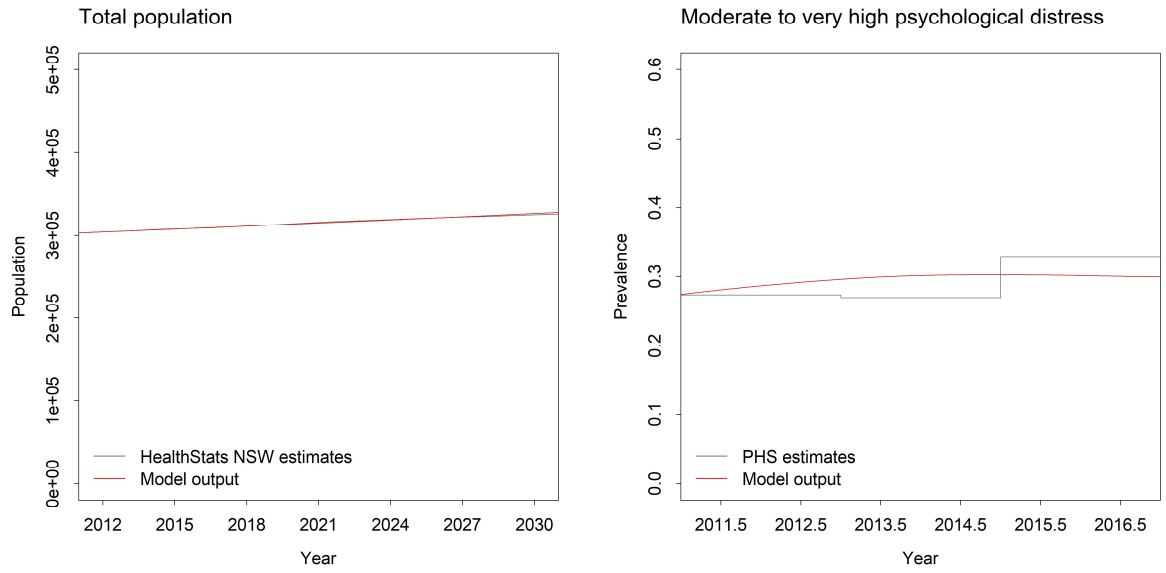

Figure S2. Left panel: Population estimates derived from the system dynamics model and from HealthStats NSW (http://www.healthstats.nsw.gov.au/). Right panel: Moderate to very high psychological distress prevalence estimates derived from the system dynamics model and corresponding NSW Population Health Survey (PHS) estimates.

1.4. Mental health services sector

The structure of the mental health services sector is shown in figures S4−S6. People experiencing moderate to very high psychological distress seek help from general practitioners (GPs) and online services at constant per capita rates per year (see figure S3). Mental health-related GP consultations are modelled as a stock with outflows of patients diagnosed with mental disorders requiring specialised psychiatric care and patients referred to online services; those patients not diagnosed with a disorder or referred to online services return to the distressed population (figure S4). The per capita mental disorder diagnosis rate is assumed to be constant under the baseline (i.e., business as usual) scenario, although this rate increases as a direct result of GP training programs (see section 2.1). Patients are referred to online services only when these services are scaled up under the online services intervention scenario (section 2.2); the per capita referral rate is therefore set to zero for the baseline simulations. All patients diagnosed with a mental disorder are referred to specialised psychiatric services for assessment prior to receiving treatment. Assessment capacity (i.e., the number of patients that can

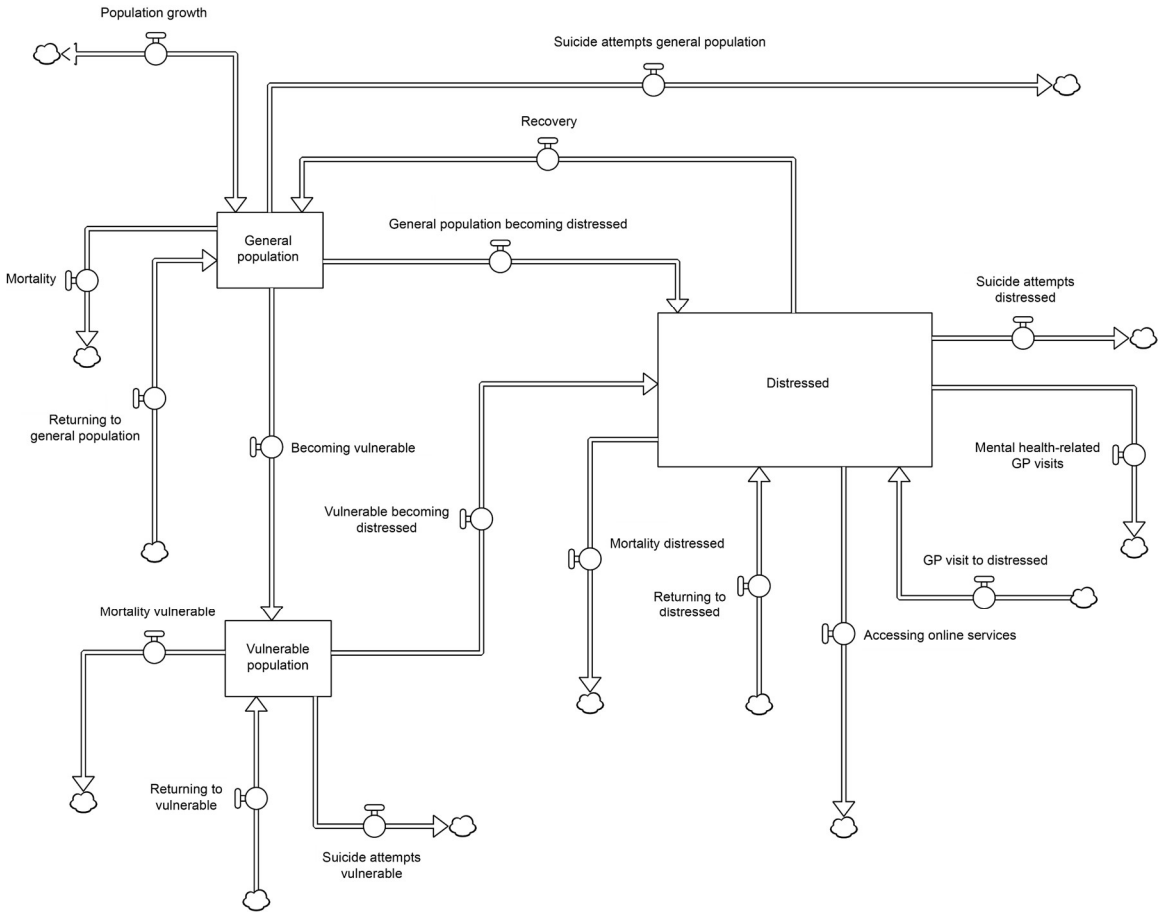

Figure S3. Stock and flow structure of the psychological distress sector.

be assessed per year) is assumed to be proportional to total non-secondary services capacity (see below) and so is constrained by the number of non-secondary service providers and the mean number of patients these providers see per year. Patients waiting to be assessed (those in the stock labelled 'Diagnosed mental disorder' in figure S4) disengage from mental health services at a constant per capita rate per year, so that the total disengagement rate increases when the referral rate exceeds assessment capacity (since the number of patients waiting increases).

Depending on their care needs, patients with a diagnosed mental disorder are referred to either non-secondary or secondary mental health services after they are assessed (figure S4). The fraction of patients referred to secondary services (i.e., psychiatric hospital care) is assumed to remain constant over the simulation period and was estimated via constrained optimisation (see the Methods section of the paper). Prior to starting treatment, referred patients wait for a period of time that depends on the treatment commencement rate and the total

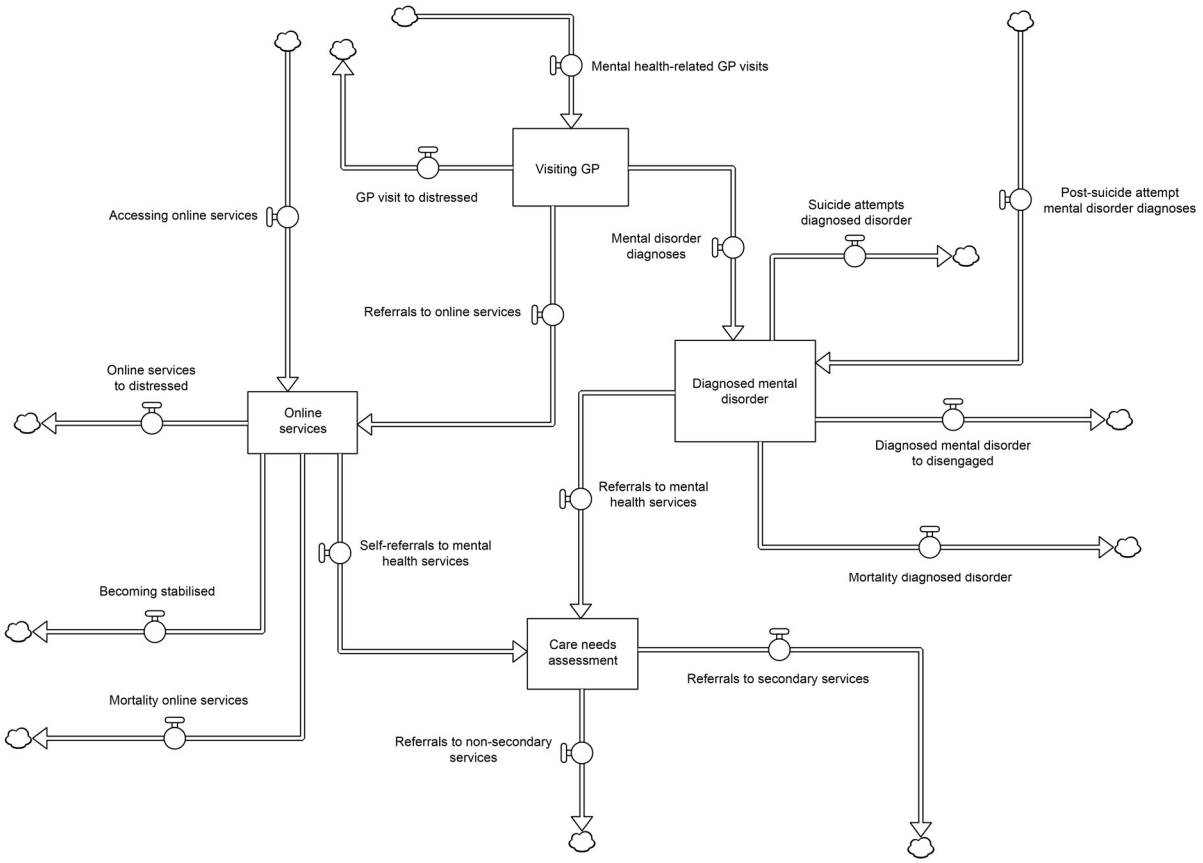

Figure S4. Help seeking and assessment component of the mental health services sector.

number of patients waiting for care (see figure S5). Maximum treatment commencement rates are equal to $(C - T)/d$, where C is services capacity (i.e., the maximum number of patients that can be under treatment at any given time), T is the number of patients currently receiving care, and d is the mean delay between one patient completing treatment and a new patient starting treatment (i.e., the time taken to fill a newly available treatment place).

Non-secondary services capacity is the product of the number of non-secondary service providers (including psychologists and other allied mental health providers) and the mean number of patients these providers are able to treat at any point in time. Per capita numbers of non-secondary service providers and psychiatric hospital beds (i.e., secondary services capacity) are assumed to remain constant over the forecast period (2018 onwards). Referral rates that exceed the maximum treatment commencement rates lead to an increase in the number of patients waiting for care and a concomitant increase in mean waiting times. Patients waiting for non-secondary

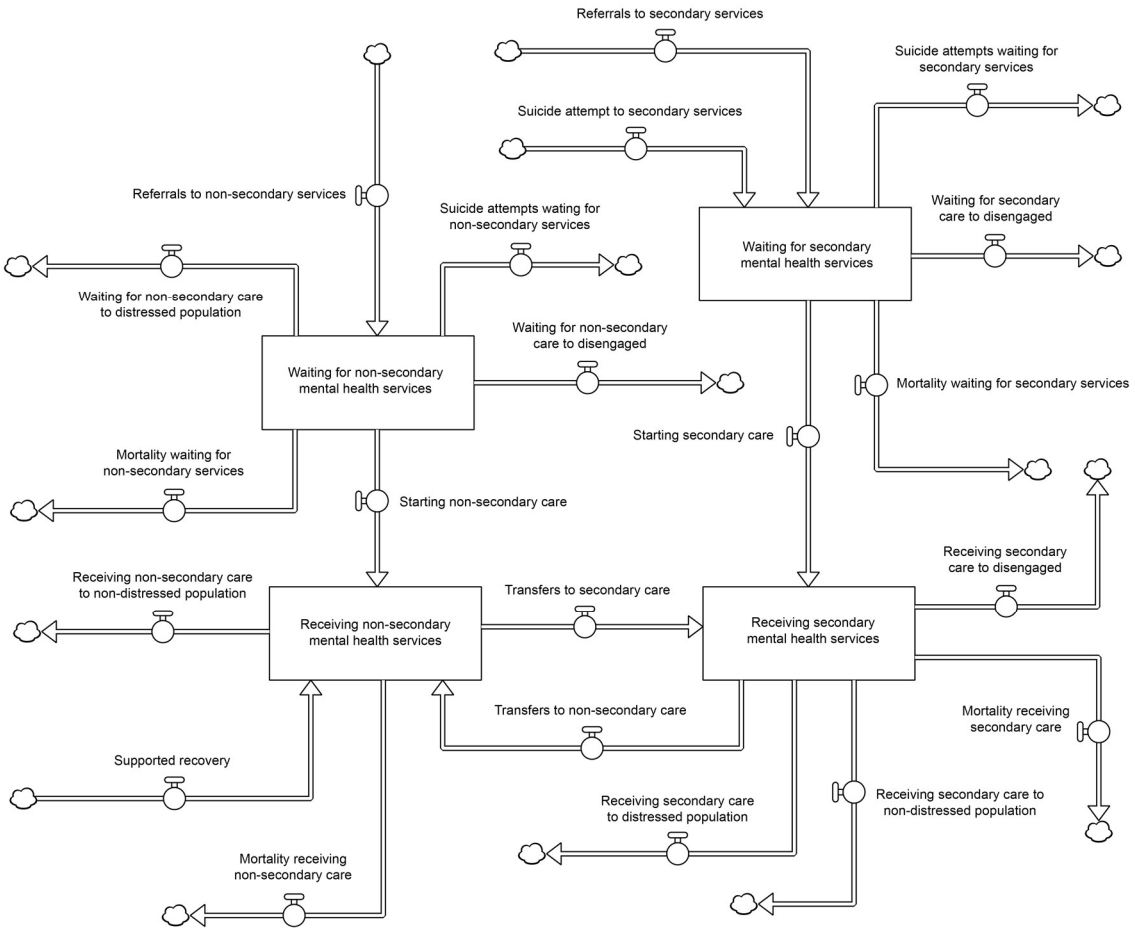

Figure S5. Non-secondary and secondary care component of the mental health services sector.

services are assumed to disengage from treatment or return to the distressed population at constant per capita rates, while patients waiting for secondary services disengage at a per capita rate that depends on the current waiting time. After commencing treatment, patients are transferred from non-secondary to secondary services (stepping up) and from secondary to non-secondary services (stepping down) at constant per capita rates per year. Rates of treatment completion are equal to T/s, where T is the number of patients receiving treatment and s is mean treatment duration. All patients treated by non-secondary services are assumed to recover (at least temporarily), returning to the general and vulnerable populations. Patients discharged from secondary care either recover, flowing back into the general and vulnerable populations, or return to the distressed population; the proportion of patients recovering after discharge (0.391; see Thase et al., 1997) is assumed to be constant over the simulation period. Model-based estimates of mental health services usage rates are plotted alongside

estimates derived from Medicare Benefits Schedule claims data and data on psychiatric bed occupancy published by NSW Health (2017) in figure S7.

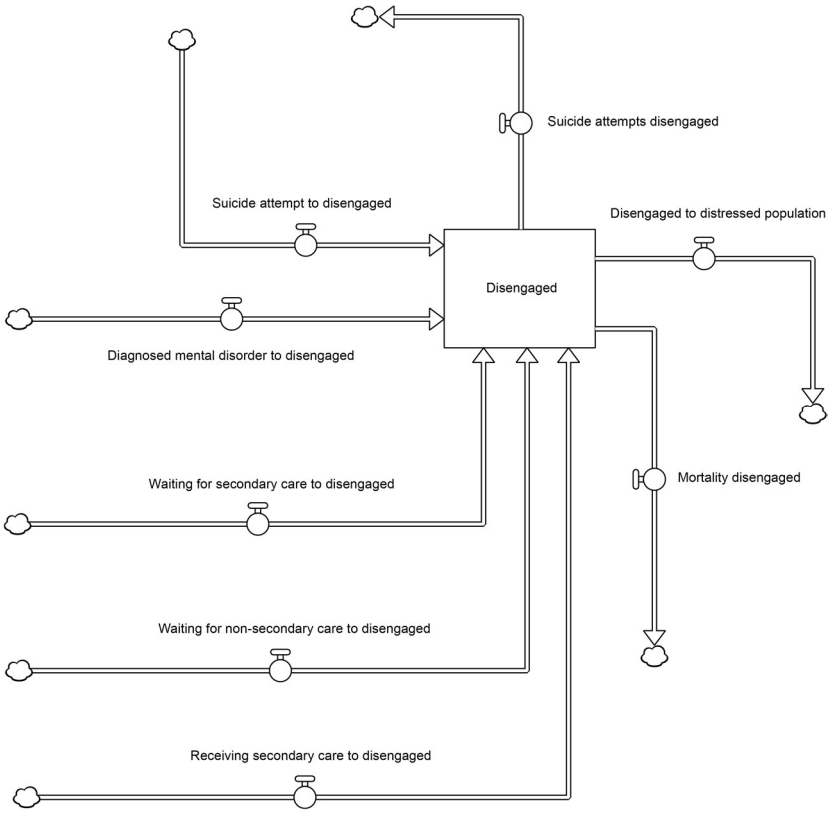

Figure S6. Disengagement component of the mental health services sector.

Patients waiting to be assessed by specialised psychiatric services or for non-secondary or secondary treatment disengage from the mental health services system at constant per capita rates or (for patients waiting for secondary services) at a rate that depends on the current waiting time (see above and figures S4−S6). The total disengagement rate therefore increases whenever the demand for mental health services exceeds services capacity, since the numbers of patients waiting for services, and hence mean waiting times, continue to increase while patients are being referred to services at a higher rate than they can be treated. Patients receiving secondary care also disengage from treatment at a constant per capita rate due to dissatisfaction with the care they receive (figure 5). Disengagement from the mental health care system is assumed to increase the risk of suicidal behaviour (due to a loss of hope that effective treatment is available, or trauma associated with inadequate care), so that an increase in the disengagement rate leads to an increase in self-harm hospitalisation

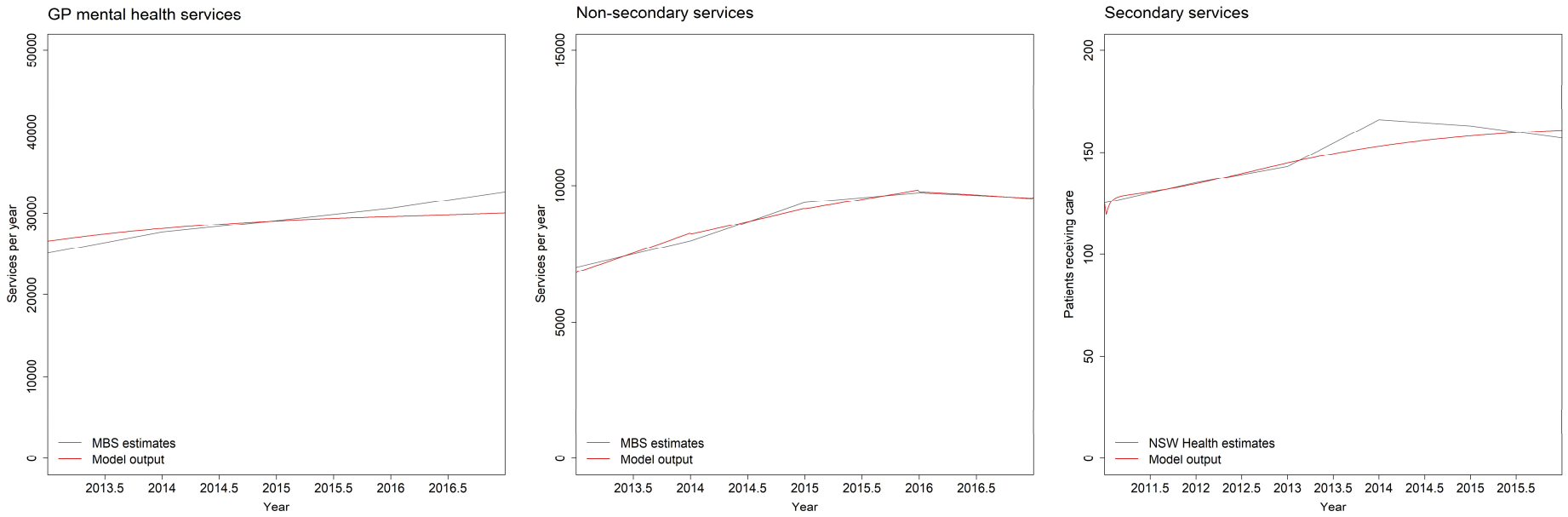

Figure S7. Estimates of mental health services usage rates derived from the system dynamics model and from Medicare Benefits Schedule (MBS) and NSW Health Annual Report data.

and suicide death rates (see section 1.5). People who have disengaged from services return to the distressed population at a constant per capita rate per year (figure 6).

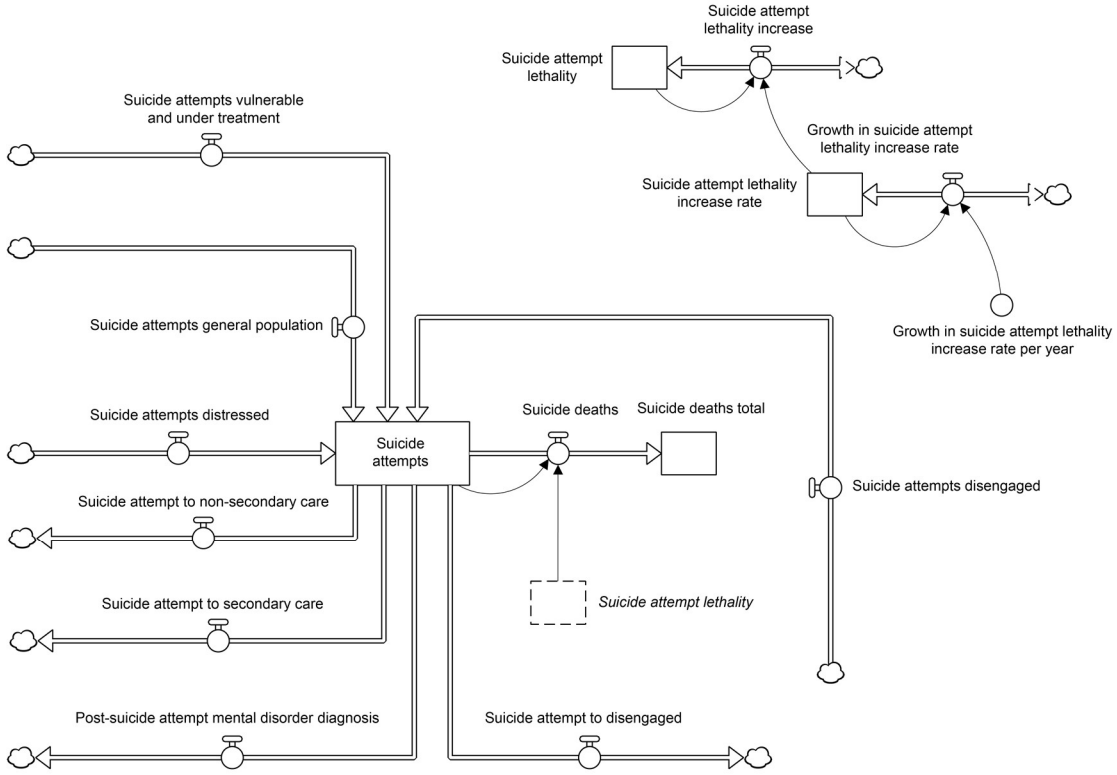

Figure S8. Structure of the suicidal behaviour sector.

1.5. Suicidal behaviour sector

Figure S8 presents the structure of the suicidal behaviour sector, which captures self-harm hospitalisations and suicide deaths (note that we equate suicide attempts with self-harm hospitalisations due to data availability constraints; see the Discussion section of the paper). The suicide attempt rate is equal to $sG + (1 + \eta)sV/2 + \eta s(D - R) + \theta\eta sR$, where G, V, and D are, respectively, the general, vulnerable, and distressed populations (see section 1.3), R is the number of people disengaged from mental health services, s is the per capita suicide attempt rate for the general population, and η and θ are suicide attempt rate ratios, assumed to be greater than 1 (i.e., the per capita attempt rate for the distressed population is assumed to be greater than that for the general population and less than the rate for people who have disengaged from services). Note that the per capita suicide attempt rate for the vulnerable population is the mean of the per capita rates for the general population and distressed population. The number of suicide deaths per year is calculated as λa, where a is the suicide

attempt rate and λ is attempt lethality (i.e., the proportion of suicide attempts that are fatal). Attempt lethality increases over the simulation period, with the rate of increase declining at a constant fractional rate per year. People who survive a suicide attempt are referred to specialised psychiatric services for assessment, commence non-secondary or secondary treatment immediately, or disengage from the mental health care system (figure S8). Figure S9 presents self-harm hospitalisation and suicide death rate estimates derived from the model and from HealthStats NSW (http://www.healthstats.nsw.gov.au/).

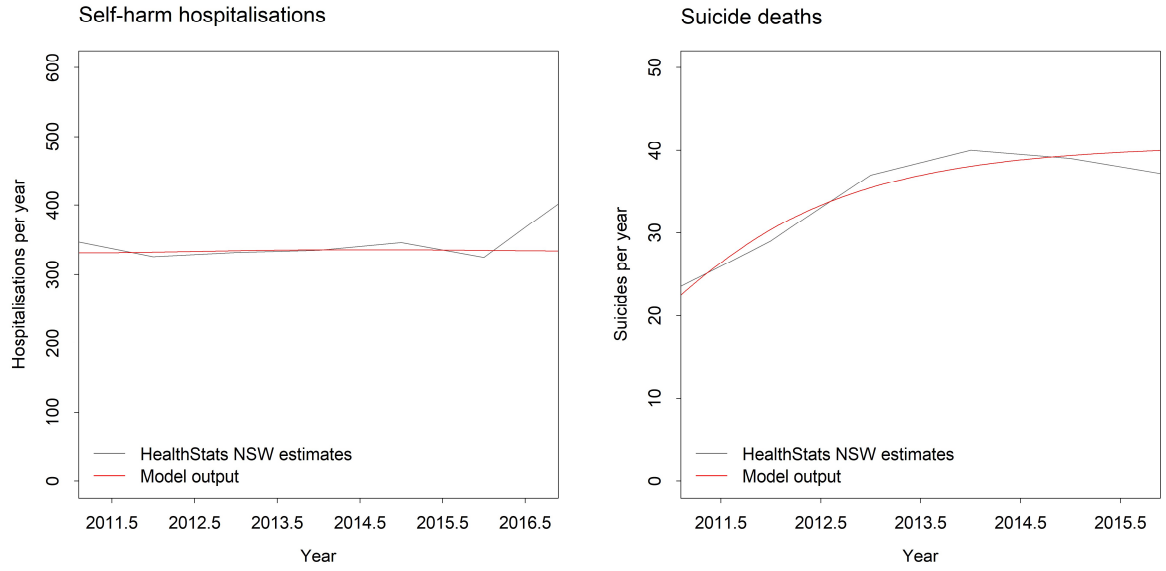

Figure S9. Self-harm hospitalisation and suicide death rate estimates derived from the system dynamics model and from HealthStats NSW (http://www.healthstats.nsw.gov.au/).

2. Intervention definitions and parameter assumptions

2.1. Specific suicide prevention interventions

a. Post-attempt assertive after care

An active outreach and enhanced contact program designed to reduce re-admission among consumers presenting to services after a suicide attempt. Parameters determining the direct effects of this intervention include:

Time to scale up (years) — the time in years to fully implement an assertive aftercare program (the default is 2 years).

Assertive aftercare effect — the proportion of potential repeat suicide attempts expected among consumers receiving assertive aftercare. The default value (0.398) implies that 39.8% of repeat suicides that would have occurred without assertive aftercare actually occur when aftercare is provided; i.e., assertive aftercare is assumed to prevent 60.2% of potential repeat suicide attempts. The default estimate is derived from Hvid et al. (2011).

Effect duration (weeks) — the average time in weeks after a suicide attempt that assertive aftercare has an effect on the probability of a repeat attempt. The default value of 52.1 weeks implies that, on average, assertive aftercare reduces the repeat self-harm rate for 1 year after an attempt. After this time, assertive aftercare is assumed to have no impact on the suicide attempt rate.

Repeat self-harm rate per year — the probability that a person will self-harm in the year after a suicide attempt without assertive aftercare. The default value (0.179) implies that 17.9% of people hospitalised for self-harm will re-attempt within 1 year (i.e., assuming they don't receive aftercare); this estimate is derived from Carroll et al. (2014).

b. Community support programs

Population-wide implementation of programs designed to reduce isolation and increase resilience through promotion of community connectedness. No assumptions are made about the details of the particular programs implemented, and these may differ across communities. Parameters determining the direct effects of this intervention include:

Sense of Community Index target — the maximum Sense of Community Index (SCI) that could be achieved with the planned community programs (where the SCI ranges from 0 to 12, with 12 corresponding to the highest possible sense of community; see Chipuer and Pretty, 1999). The default value (10.35) corresponds to an increase in the SCI (relative to the baseline value, 9.15) of 1.2 units, which is equivalent to the difference

between SCI estimates for suicidal ideators and non-ideators in a sample of rural NSW residents (Handley et al., 2012).

Time to reach target (years) — the time in years required to reach the SCI target given the initial rate of increase in the SCI (i.e., the rate of increase when the intervention starts). Note that the rate of increase in sense of community declines as the target is approached, so the actual time required to reach the target will generally be greater than the time specified. The default value is 10 years.

Effect on distress — the multiplicative effect of a 1-unit increase in the SCI on distress onset rates. The default value (0.640) is derived from Handley et al. (2012) and implies that a 1-unit increase in the SCI reduces the rate at which people become psychologically distressed by 36.0%.

c. GP training program

A general practitioner training program aimed at reducing suicidal behaviour through appropriate referral to mental health services. Parameters determining the direct effects of this intervention include:

Time to implement training (years) — the time in years to fully implement a GP training program (the default is 3 years).

GP training effect — the multiplicative effect of GP training on the mental disorder diagnosis rate. The default value (1.4375) implies that GPs who have received training are 1.44 times more likely to diagnose a mental disorder than a GP who has not received training, increasing referrals to specialised mental health services. The default estimate is derived from Pfaff et al. (2001).

d. Suicide helpline services

Increased investment in suicide helpline and call-back services. Parameters determining the direct effects of this intervention include:

Additional callers target — the maximum proportion of people contemplating suicide who could be expected to call a helpline as a result of the intervention. The default value (0.2) implies that increased investment in helpline services could result in 20% of people at risk of self-harm accessing a service when they would not have otherwise. Note that people who would have called a helpline given current levels of investment are assumed to still access services at the same rate (i.e., the total proportion of people calling a helpline is equal to 0.2 plus the proportion who would have called without the intervention).

Time to reach target (years) — the time in years required to reach the additional callers target given the initial rate of recruitment (i.e., the rate of recruitment when the intervention starts). Note that the recruitment rate declines as the target is approached, so the actual time required to reach the target will generally be greater than the time specified. The default value is 2 years.

Suicide helpline effect — the proportion of potential suicide attempts expected among people who call a suicide helpline as a result of the intervention. The default value (0.822) implies that 82.2% of suicide attempts that would have occurred among potential callers actually occur when they are prompted to access helpline services; i.e., increased access to helpline services is assumed to prevent 17.8% of potential suicide attempts among callers who would not otherwise have accessed these services. The default estimate is derived from Gould et al. (2007).

2.2. Mental health interventions

e. Community management of severe disorders

Programs aimed at increasing the effectiveness of community-based management of patients with severe mental disorders. Parameters determining the direct effects of this intervention include:

Effect on distress — the multiplicative effect of community-based management programs on the rate of distress onset among people with severe mental disorders. The default value (0.861) is derived from Simmonds et al. (2001) and implies that increased investment in community-based management programs would reduce the rate at which consumers with severe mental illness become psychologically distressed by 13.9%.

Effect on duration of hospital care — the multiplicative effect of community-based management programs on the average duration of hospital care for severe mental disorders. The default value (0.402) implies that a community management intervention would reduce the average length of stay for consumers with severe mental illness by 59.8% (Simmonds et al., 2001).

f. Mental health education programs

Population-wide mental health education programs aimed at reducing stigma, improving recognition of suicide risk, and encouraging help-seeking. Parameters determining the direct effects of this intervention include:

Time to implement programs (years) — the time in years to fully implement mental health education programs across the population. The default value is 5 years.

Effect on help seeking — the multiplicative effect of mental health education programs on the average number of times a psychologically-distressed person will seek help from a GP each year. The default value (1.585) is derived from Jorm et al. (2003) and assumes that mental health education programs would increase the rate of help seeking for mental health problems by 58.5%.

g. Services re-engagement program

A program designed to re-engage psychologically distressed patients who have disengaged from treatment and are at increased risk of suicidal behaviour. Parameters determining the direct effects of this intervention include:

Effect on re-engagement rate — the multiplicative effect of a services re-engagement program on the rate that consumers who have disengaged from the mental health services system return to the population of distressed people prepared to seek medical help. The default value (2) assumes that a services re-engagement program would double the rate at which disengaged consumers contemplate engaging with mental health services again.

h. Online services

Increased investment in online services providing support to people with relatively low care needs. Parameters determining the direct effects of this intervention include:

Maximum capacity per week — the maximum number of people independently accessing online services per week (i.e., not via a GP). The default value (200) assumes that online services are able to accommodate a maximum of 200 self-referrals every week.

Time to reach maximum capacity (years) — the time in years required to reach the maximum online services capacity. The default value is 5 years.

Maximum referral fraction — the maximum proportion of mental health-related GP visits resulting in a referral to online services. The default value (0.05) assumes that up to 5% of mental health-related GP attendances will lead to a referral.

Online services stabilisation rate — the per capita rate per week at which people receiving online services experience temporary relief from symptoms. The default value (0.400) is derived from Christensen et al. (2004) and implies that 40.0% of people receiving online services will be stabilised per week.

Rate of self-referral to allied services — the per capita rate per week of self-referral to non-secondary services among people receiving online services. The default value (0.143) is taken from Christensen et al. (2006) and

assumes that 14.3% of people receiving online treatment will seek help from an allied psychological service provider per week.

2.3. Services planning interventions

i. Hospital staff training

Public hospital staff training and capacity expansion designed to reduce workload pressure and facilitate more effective, 'trauma-informed' care. Parameters determining the direct effects of this intervention include:

Level of training increase per year — the absolute increase in the level of mental health training of hospital staff per year. The level of training is measured on an arbitrary scale ranging from 0 to 1, with higher values corresponding to a greater capacity to deal with psychologically distressed consumers; an increase in the level of training from 0.5 (corresponding to current capacity) to 1 produces a 20% increase in capacity, whereas a decrease from 0.5 to 0 results in a 40% drop in capacity. The default value of 0.02 assumes that a hospital staff training program would increase the level of training by 0.02 units every year.

Level of staffing increase per year — the fractional increase in public hospital staff per year. The default value (0.024) is based on data published by NSW Health in their Annual Reports and implies that the total clinical workforce increases by 2.4% per year.

Effect of overloaded hospital staff on attempts — a graphical function relating the level of workload pressure on hospital staff (the 'frazzle' factor) to suicide risk among highly distressed consumers presenting to hospital. The frazzle factor is equal to the number of mental health-related emergency department presentations per week divided by hospital capacity (i.e., the number of patients that can be treated in a way that does not affect suicide risk) and depends on staff numbers and level of training. Frazzle factors greater than 1 correspond to high workload pressure and lead to an increase in consumer suicide risk; frazzle factors less than 1 correspond to low workload pressure, and enable the delivery of effective, 'trauma informed' care that reduces consumer suicide risk.

j. Services capacity increase

An increase in mental health services capacity. Parameters determining the direct effects of this intervention include:

Assessment fraction increase per year — the fractional increase in the proportion of non-secondary mental health services capacity allocated to comprehensive psychological assessments of new consumers per year. The

default value (0) assumes that the assessment fraction does not change from its initial value. Note that the default parameter settings imply an increase in assessment capacity as the number of allied service providers increases (since assessment capacity is proportional to non-secondary services capacity).

Additional psychiatric beds per 100 k per year — the absolute increase in the number of psychiatric hospital beds per 10^5 population per year. The default value (0) assumes that the number of beds per capita remains constant over the forecast period (2018 onwards).

Additional allied providers per 100 k per year — the absolute increase in the number of non-secondary service providers (including clinical psychologists, other psychologists, and other allied health providers) per 10^5 population per year. The default value (0) assumes that the number of providers per capita remains constant over the forecast period (2018 onwards).

3. Numerical inputs and data sources

Table S1. Numerical inputs and data sources. Inputs highlighted in red were varied in the sensitivity analyses (see Methods section of the paper). Note that while we present results for the total population of the Western NSW PHN catchment in the paper, the core model was stratified by Aboriginality, so parameter values are given for both the Aboriginal and non-Aboriginal populations where applicable.

Input label(s)	Value(s)	Notes
Population sector		
Birth rate increase per year	0.000042605768508 (total population), 0.0316909579145 (Aboriginal population)	Estimated via constrained optimisation
Death rate increase per year	-0.000298753	Estimated via constrained optimisation
Death rate ratio increase per year	0 (total population), 0.014013667494 (Aboriginal population)	Estimated via constrained optimisation (Aboriginal population value only). Note that the value for the total population is 0 by definition (the death rate ratio is always 1 for the total population).
Net migration per year	-32.2330493896 (total population), 504.769083706 (Aboriginal population)	Estimated via constrained optimisation
Psychological distress sector		
Death rate ratio distressed	1.27	Derived from Russ et al. (2012, Br. Med. J. 345, e4933)
Death rate ratio vulnerable	1.08	Derived from Russ et al. (2012, Br. Med. J. 345, e4933)
Distress onset rate	0.106074479897 (Aboriginal), 0.0468104212089 (non-Aboriginal)	Estimated via constrained optimisation
Distress onset rate ratio vulnerable	1.132135516 (Aboriginal), 1.132135516 (non-Aboriginal)	Estimated via constrained optimisation
Natural recovery rate	0 (Aboriginal), 0 (non-Aboriginal)	Estimated via constrained optimisation
Vulnerable onset rate	0.0378453470472 (Aboriginal), 0.00301421737071 (non-Aboriginal)	Estimated via constrained optimisation
Mental health services sector		
Assessment capacity fraction initial	0.543144	Proportion of non-secondary mental health services capacity allocated to comprehensive psychological assessments. An estimated 234.4 patients per week were assessed over the period 2013-2016 (based on Medicare Benefits Schedule and NSW Health Annual Report data); this estimate is divided by initial non-secondary services capacity (i.e., at the start of 2011) to obtain the proportion of capacity allocated to assessments.
Additional non-secondary service providers per 100 k per year	0	Default value assumes no increase in the number of non-secondary mental health service providers per 100 k population from 2018 onwards

Additional psychiatric beds per 100 k per year	0	Default value assumes no increase in the number of psychiatric beds per 100 k population from 2018 onwards
Available psychiatric beds data	GRAPH(TIME)	Numbers of available psychiatric beds per year for the period 2011-2017 were derived from NSW Health Annual Report data
Complex needs assessment fraction	0.240537808	Estimated via constrained optimisation
Diagnosed mental disorder to disengaged rate	0.0334925369278 (Aboriginal), 0.00956154397984 (non-Aboriginal)	Estimated via constrained optimisation
Maximum online services capacity per week	200	Default value assumes online services are able to accommodate a maximum of 200 self-referrals per week
Maximum online services referral fraction	0.05	Default value assumes a maximum of 5% of mental health-related GP visits will result in referral to online services
Mean online treatment duration	6	Default value assumes online treatment takes a mean of 6 weeks to complete
Mean time stabilised	4	Default value assumes online treatment, when effective, will provide relief from symptoms for a mean of 4 weeks
Mental disorder diagnosis fraction increase per year	0	Default value assumes that the mental disorder diagnosis rate per GP consultation remains constant
Mental disorder diagnosis fraction initial	0.520971765	Estimated via constrained optimisation
Mental health services mean length of stay	2.22629582857143 (weeks)	Derived from data published online by the Australian Institute of Health and Welfare (Mental Health Services in Australia 2018 web report)
Non-secondary services capacity per provider increase per year	0.336705984	Estimated via constrained optimisation
Non-secondary services provider data	GRAPH(TIME)	Numbers of allied mental health providers for the period 2013-2017 were derived from Medicare Benefits Schedule data published online by the Department of Health
Non-secondary services treatment duration	4.043563645 (weeks)	Mean number of allied mental health services per patient per year for the period 2013-2017, based on Medicare Benefits Schedule data published online by the Department of Health. Patients are assumed to attend one consultation per week (over *c*. 4 weeks) once per year.
Pre-intervention GP visits per year	0.426430177126 (Aboriginal), 0.579918400682 (non-Aboriginal)	Estimated via constrained optimisation
Receiving secondary care to disengaged rate	0.243527438122 (Aboriginal), 0.14992180035 (non-Aboriginal)	Estimated via constrained optimisation
Recovery fraction	0.391231	Derived from Thase et al. (1997, Arch. Gen. Psychiatry 54, 1009-1015)
Return to possible treatment rate	0 (Aboriginal), 0.0281949732951 (non-Aboriginal)	Estimated via constrained optimisation
Self-referral rate due to online services	0.1425	Derived from Christensen et al. (2006, BMC Psychiatry 6, 13)
Starting non-secondary services capacity per provider	4.594533581	Estimated via constrained optimisation
Transfer to non-secondary care rate	0.143414841	Estimated via constrained optimisation
Transfer to secondary care rate	0	Estimated via constrained optimisation
Waiting for non-secondary care to disengaged rate	0.372163231021 (Aboriginal), 0 (non-Aboriginal)	Estimated via constrained optimisation
Waiting for non-secondary services attrition rate	GRAPH(Non-secondary services waiting time)	Graphical function derived from Western Sydney PHN model
Waiting for secondary services attrition rate	GRAPH(Secondary services waiting time)	Graphical function derived from Western Sydney PHN model
Suicidal behaviour sector		

Growth in suicide attempt lethality increase rate per year	-0.309069780395 (Aboriginal), -0.883852865749 (non-Aboriginal)	Estimated via constrained optimisation
Post-suicide attempt assessment rate	0.259035437	Estimated via constrained optimisation
Post-suicide attempt diagnosis rate pre-intervention	0.267722407	Estimated via constrained optimisation
Suicide attempt lethality increase rate initial	0.329399456908 (Aboriginal), 0.549551794857 (non-Aboriginal)	Estimated via constrained optimisation
Suicide attempt lethality initial	0.0321567460493 (Aboriginal), 0.0768923397736 (non-Aboriginal)	Estimated via constrained optimisation
Suicide attempt rate ratio disengaged	5.480580993	Estimated via constrained optimisation
Suicide attempt rate ratio distressed	14.7333342686 (Aboriginal), 10.00004 (total)	Derived from Chamberlain et al. (2009, Crisis 30, 39-42)
Suicide attempts per person per year general population	0.000252086972896 (Aboriginal), 0.000100976646495 (non-Aboriginal)	Estimated via constrained optimisation
Interventions		
Assertive aftercare effect duration	52.14285714	Default value assumes assertive aftercare reduces the probability of repeat self-harm for a mean of 52.1 weeks after a suicide attempt
Assertive aftercare effect estimate	0.3975155	Derived from Hvid et al. (2011, Nord. J. Psychiatry 65, 292-298)
Assessment capacity fraction increase per year	0	Default value assumes no increase in the assessment capacity fraction over the simulation period
Community management programs effect estimate	0.8613131	Derived from Simmonds et al. (2001, Br. J. Psychiatry 178, 497-502)
Community management programs effect on duration of hospital care	0.4018425	Derived from Simmonds et al. (2001, Br. J. Psychiatry 178, 497-502)
Effect of education programs on help seeking	1.585327	Derived from Jorm et al. (2003, Psychol. Med. 33, 1071-1079)
Effect of overloaded hospital staff on attempts	GRAPH(Frazzle factor)	Graphical function derived from Western Sydney PHN model
Effect of Sense of Community Index increase on distress	0.64	Derived from Handley et al. (2012, Soc. Psychiatry Psychiatr. Epidemiol. 47, 1281-1290)
Effect of Sense of Community Index increase on education program effectiveness	1.034002	Assumes an increase in the Sense of Community Index from its baseline value (9.15) to the highest possible value (12) would increase the effect of a mental health education program on the rate of help seeking by 10%
Effect of Sense of Community Index increase on lethality	0.9637119	Default value assumes an increase in the Sense of Community Index from its baseline value (9.15) to 12 (the maximum possible value) would reduce suicide attempt lethality by 10%
GP training effect estimate	1.4375	Derived from Pfaff et al. (2001, Med. J. Aust. 174, 222-226)
Increase in level of training per year	0.02	Absolute increase in the level of mental health training of public hospital staff per year. Level of training is measured on an arbitrary scale ranging from 0 to 1, with higher values corresponding to greater capacity to deal with distressed patients; an increase in the level of training from 0.5 (corresponding to current capacity) to 1 produces a 20% increase in capacity, whereas a decrease from 0.5 to 0 results in a 40% drop in capacity.
Mental health-related ED presentations per person per year	0.036651044	Derived from data for Western NSW Local Health District provided by Western NSW Health Intelligence Unit
Online services effect estimate	0.4	Derived from Christensen et al. (2004, Br. Med. J. 328, 265)
Prevalence of severe mental disorders	0.041	Derived from Slade et al. (2009, The Mental Health of Australians 2. Report on the 2007 National Survey of Mental Health and Wellbeing. Department of Health and Ageing, Canberra)
Proportion of psychiatric patients with a severe mental disorder	0.3809196	Derived from Slade et al. (2009, The Mental Health of Australians 2. Report on the 2007 National Survey of Mental Health and Wellbeing. Department of Health and Ageing, Canberra)

Repeat self-harm rate per year	0.179	Derived from Carroll et al. (2014, PLoS ONE 9, e89944)
Sense of Community Index target	10.34955752	Default value corresponds to an increase in the Sense of Community Index (relative to the baseline value, 9.15) of 1.2 units, equal to the difference between Sense of Community Index estimates for suicidal ideators and non-ideators in a sample of rural NSW residents (Handley et al., 2012, Soc. Psychiatry Psychiatr. Epidemiol. 47, 1281-1290)
Services re-engagement program effect estimate	2	Default value assumes a services re-engagement program would double the rate at which disengaged patients contemplate engaging with mental health services again
Staffing level increase per year	0.023765926	Derived from public health system clinical staff data for 2012-2017 published by NSW Health in their Annual Reports
Suicide helpline caller increase fraction target	0.2	Default value assumes that increased investment in helpline services could result in 20% of people at risk of self-harm accessing a service when they would not have otherwise
Suicide helpline effect estimate	0.8220641	Derived from Gould et al. (2007, Suicide Life Threat. Behav. 37, 338-352)
Time to reach suicide helpline caller increase fraction target	2	Time in years to reach the additional callers target given the initial rate of recruitment. Note that the recruitment rate declines as the target is approached, so the actual time to reach the target will generally be greater than the specified value.
Years to implement Aboriginal mental health education programs	3	Default value assumes it will take 3 years to fully implement an Aboriginal population-specific mental health education program
Years to implement education programs	5	Default value assumes it will take 5 years to fully implement whole-population mental health education program
Years to implement GP training	3	Default value assumes it will take 3 years to fully implement a GP training program
Years to reach maximum online services capacity	5	Default value assumes it will take 5 years to reach the maximum online services capacity
Years to reach Sense of Community Index target	7 (Aboriginal), 10 (total)	Time in years to reach the Sense of Community Index target given the initial rate of increase. Note that the rate of increase in sense of community declines as the target is approached, so the actual time to reach the target will generally be greater than the specified value.
Years to scale up assertive aftercare	2	Default value assumes it will take 2 years to fully implement an assertive aftercare program

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