Socio-economic disadvantage and resource distribution for mental health care; a model proposal and example application for Victoria, Australia

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Abstract

Objective

A spreadsheet-based model for supporting equitable mental health resource distribution in Australia was developed, based on Australian Health Survey psychological distress findings associated with area socioeconomic disadvantage (SED). An illustrative application is presented.

Method

Stratum-specific psychological-distress rates for area SED quintiles are applied to local government areas, catchment areas and local health networks (LHNs). A case study applies the model to Victoria, including examining recommendations in the Royal Commission into Victoria's Mental Health Services 2019 interim report for increases to bed stock in two LHNs.

Results

Need-adjusted demand estimates considered as a ratio of raw population proportions for catchments range in Victoria between 0.59 and 1.60. Applying the formula to the Royal Commission recommendations suggests the proposed distribution of beds is a reasonable correction for these two LHNs and indicates next expansion priorities for more equitable distribution to other LHNs.

Conclusions

The spreadsheet, adaptable for other States and Territories, could complement National Mental Health Services Planning Framework outputs and assist in evaluation, for instance determining potential supply shortages in the tele-mental-health response to Covid-19. We outline research directions including consideration of the moral bases of value judgements, and identification of other variables including their use in parameterisation and calibration.

Key Words:

Mental Health Services, Distributive Justice, Health Disparities, Socioeconomic Status.

Word Count: 1994

Introduction

Social and environmental determinants of mental health, including influences of inequity, are important mental health policy and planning considerations [1]. Many area characteristics influencing population mental health problems feature as weighted variables in the Australian Bureau of Statistics (ABS) Index of Relative Socio-economic Disadvantage (IRSD) and the ABS recommends the IRSD [2] when the user ‘wants to ensure an allocation of funds goes to disadvantaged areas’. The IRSD as calculated in the mid-1990s was an important element of a resource distribution formula (RDF) supporting major mental health service reconfigurations in Victoria, including as adapted for different planning levels [3, 4]. Since then, overall funding has changed, with allocations to new service components and to growth areas, but generally without similar transparency of process or assurance of equity either in Victoria or, to our knowledge, in other jurisdictions.

ABS survey confidentialised unit record files (CURFs) commonly include the IRSD. Australian Health Surveys (AHS) also include the Kessler 10 (K-10) scale which measures psychological distress. Very-high K-10 (VHK-10) scores are consistently associated with greatly increased likelihoods of significant mental disorders [5]. Published work already presents information on area-based associations of IRSD characteristics of area and rates of psychological disorders or psychological distress [6] as well as on the most heavily weighted IRSD component variable, income [7]. The mental health specific national surveys (1997, 2007), had smaller samples and lower response rates than the AHS. So we propose that the AHS VHK-10 rates for Australian areas characterised by IRSD represent the best available information to parameterise a demand-estimation instrument. VHK-10 scores are three times more frequent in the most disadvantaged IRSD quintiles than in the least disadvantaged [6].

The Australian National Mental Health Services Planning Framework (NHMSPF) ‘allows users to estimate need and expected demand for mental health care and the level and mix of mental health services required for a given population’ [8]. However, the NMHSPF Planning Support Tool is limited in that in generating regional outputs it ‘only adjusts for the size and age distribution of the selected population’. Currently, the NMHSPF does not incorporate variations to overall level of need for services arising from ‘factors such as rurality, regional socio-demographic variability, and regional clustering of higher needs groups, such as people with severe and complex mental illness in boarding houses’ [8]. An RDF here proposed can complement NMHSPF outputs. It does not quantify service mix elements as the NSMHW does, but rather in effect applies a local needs-adjustment-multiplier - which can be applied to the NSMHW service mix. Local integrated planning or policy change may lead to adjustment to service mix or innovation of new models. Grounding in an economic paradigm, we use ‘demand’ rather than ‘need’ to describe model outputs.

In a November 2019 interim report, The Royal Commission into Victoria’s Mental Health Services (RCVMHS) recommended an increase of 135 public sector beds in two local health networks (LHNs), the Melbourne Health Alliance and Barwon Health [9]. While beds are but one part of comprehensive area service provision, to illustrate RDF application, we take as a case study consideration of whether following the RCVMHS’s recommended bed allocation will increase or decrease alignment of beds in Victoria with estimated service demand taking into account socio-economic disadvantage (SED) [9]. For the sake of transparency, we draw

where possible on publicly-available information and peer-reviewed literature for estimation of key parameters.

Aims

1. To propose and describe an IRSD-based model to assist resource distribution formulae for adult mental health resources.
2. As a case study, to assess implications of interim recommendations of the RCVMHS.

Methods

A proposed model (aim 1)

Latest ABS census data (2016) provided the population of each local government area (LGA) within Victoria, and associated IRSD quintiles. Applying quintile-specific AHS VHK-10 published findings [6], we estimated the number of individuals with VHK-10 scores in each LGA then, based on the Victorian Department of Health and Human Services' advice regarding catchment configurations, aggregated this population onto Victoria's 21 adult mental health service delivery catchments. Catchment population outputs (see supplementary materials table S1) then were aggregated on to Victoria's 16 LHNs. To determine proportional estimation of IRSD-adjusted need, we divided the estimated number of people with VHK-10 scores in the relevant area by the total estimated number of people with VHK-10 scores in Victoria. More detail and the spreadsheet working which could be adapted for other State, Territory or regional applications are available in supplemental materials.

Case study of bed provision (aim 2)

IRSD-adjusted estimated State-proportional service demands were compared with the existing bed supply in the RCVMHS report. As beds are often provided in ward units of 25, and Barwon Health has a much smaller population than the Melbourne Health Alliance, we assumed the 135 additional public sector beds would be distributed 25 to Barwon Health and 110 to the Melbourne Health Alliance.

Results

Table 1 presents sequentially for LHNs: population, IRSD adjusted estimated need, current bed numbers [9], and beds following RCVMHS recommendations. Areas are ordered by the size of needs-adjustment compared to population proportions, which varies from 0.6 (Eastern Mental Health) to 1.4 (Mildura base hospital). The right-hand panel of the table indicates that the RCVMHS proposed additional LHN beds brings the bed-state somewhat better into alignment with the IRSD needs-estimated service demand for these areas; the formula suggests next targets for bed expansion based on percentage discrepancy of >2%. These would be: metropolitan, Monash Health; and non-metropolitan, Latrobe Regional Health.

Discussion

Key points

The target group for specialist mental health services is an estimated 3% of the population, concordant with overall population prevalence of VHK-10 scores at 3.6% [6]. While many factors influence psychological distress, the composite SED construct includes many powerful influences on these rates [11] and so has a strong claim to be included in bed distribution [9] and other resource considerations.

Advancing the research agenda

While the IRSD as a composite index includes many important influences on mental health care need and demand, we may consider other inputs that might enhance predictive value. When the 1990s Victorian RDF [4, 10] was developed, construction of these formulae was a mature field so there may be worthwhile guidance from this to possible considerations. Table 2 compares the two approaches while supplementary Table S2 compares overall weightings between the 1996 formula and that proposed here. Conspicuously, two inner-urban areas weighted highly in 1996 rank lower in this formula, reflecting changes in Australian cities since 1996 [12]. For instance, on location of boarding houses that will have contributed to population demographics weighting in 1996, and on homelessness (Table 2) further integration of urban planning information, other survey findings and of NMHSPF demographic adjustments could refine understanding of this difference.

There are significant problems with inequity in the Medicare-funded distribution of mental health care. For example, co-payments associated with receiving mental health services can be a financial barrier to accessing care [13, 14]. COVID-19 response has sought to increase access through video-conferencing but since the MBS items allow co-payment they may not improve equity. The LGA-specific estimators of relative need and demand from this model could guide assessment of equity for these innovations.

Further research and debate should consider the moral bases of value judgements involved, of other candidate variables, and of how data sources might be used in model parameterisation and calibration.

Limitations

We drew where possible on peer reviewed sources – with the advantage that the work used has been through critical review but the disadvantage that some data sources are not the most recent available. In relation to aim 2 any possible inaccuracies in the RCMHS interim report will not be corrected here; overall resource distribution may be different from bed locations. The case example, while topical, is of limited scope and other investigations could consider distribution of other human and structural resources. The RDF model is essentially deterministic, and cannot determine how service reconfiguration may impact the equity and efficacy of mental health services. Recent advances in simulation modelling approaches could enable incorporation of effects of feedback loops and other features of complex systems to further explore these questions.

Conclusion

This work can help inform distributional justice in planning, including in application of the NMHSPF. As an example, considering new bed allocations recommended by the RCMHS, the work provides some support that these are a justifiable local proportional increase. Following this reasonable first step, the model identifies next priorities among Victorian LHNs for equitable expansion.

Declaring of Conflicting Interests

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Tables

Table 1. Comparison of resource distribution formula outputs with current, RCVMHS proposed, and very-high K10 population distributions for Local Health Networks; data ranked by relative formula weighing

	Resource distribution formula methodology					Worked application example: Distribution of adult mental health beds	
LHNs In Royal Commission's report	A. LHN Population (2016)	B. LHN Proportion of State Population	C. Estimate of Very High K10 Number in LHN	D. <u>Resource Distribution Formula Output</u> : Estimated Very High K10 LHN as Proportion of State	E. Ratio of: IRSD-weighted Very High K10 % to LHN population % (D/B)	F. Current Distribution	G. RCVMHS Proposed Bed Distribution
Mildura Base Hospital	59163	1.0%	2426	1.4%	1.4	1.5%	1.5%
Goulburn Valley Health	152208	2.5%	5641	3.2%	1.3	2.2%	2.1%
Latrobe Regional Hospital	275634	4.5%	10209	5.7%	1.3	4.4%	3.6%
Albury Wodonga Health	134691	2.2%	4888	2.7%	1.3	2.2%	2.0%
Ballarat Health Services	227280	3.7%	8214	4.6%	1.2	3.3%	3.1%
Southwest Healthcare	102391	1.7%	3670	2.1%	1.2	2.3%	2.3%
Bendigo Healthcare Group	270326	4.4%	9465	5.3%	1.2	5.2%	4.7%
Melbourne Health	1356096	22.0%	47099	26.3%	1.2	18.6%	25.1%
Mercy Health	407395	6.6%	13151	7.3%	1.1	8.9%	7.0%
Monash Health	954420	15.5%	28002	15.6%	1.0	15.6%	13.5%
Barwon	308410	5.0%	9038	5.0%	1.0	3.8%	5.7%
Peninsula Health	294795	4.8%	8398	4.7%	1.0	5.1%	5.0%
St. Vincent's Hospital	270170	4.4%	5893	3.3%	0.8	5.4%	4.7%
Alfred Health	314485	5.1%	5346	3.0%	0.6	6.4%	5.6%
Austin Health	191621	3.1%	3258	1.8%	0.6	3.2%	3.0%
Eastern Mental Health	853036	13.8%	14502	8.1%	0.6	11.9%	11.0%
Total	6171381	100.00%	179182	100.00%		100%	100%

Column A: Most recent census data (2016), obtained from the Australian Bureau of Statistics.

Column B: Data were calculated by dividing each Local Hospital Network's (LHN) population by the total state population

Column C: We estimated the number of people with very high K10 per LHN by applying IRSD quintile-specific very high K10 rates (Enticott et al., 2016) to the local government areas (LGAs) in the LHN, including proportional distribution of LGAs where these span multiple LHNs.

Column D: Data were calculated by dividing the number of those with very high K10 scores in each LHN with the total number of those with very high K10 in the state.

Column E: Data are a ratio, and were obtained by dividing Column D by Column B. Data are ranked in order of largest to smallest ratio (relative population weighing).

Column F: Current distribution of adult mental health beds in Victoria, as calculated from the Royal Commission of Mental Health and Wellbeing's interim report

Column G: Adult mental health bed distribution proposed in the Royal Commission of Mental Health and Wellbeing's interim report

Table 2 A consideration of the 1996 Victorian RDF and the current model

Variable in the Victorian 1996 RDF	Consideration in regards to the current proposed model	Possible implications for research
Socioeconomic disadvantage (SD)	The updated IRSD is at the core of the current model	Updating information from later AHS findings and from future mental health surveys – if sample sizes permit the calculations could be made with deciles rather than quintiles.
Population demographics	Not featured in the current model, and this is a major contributor to differences between the 1996 formula and so potentially with current funding levels. But consideration of this is in the NMHSPF.	A useful next step could be to overlay these proposed adjustments for variability on the area-specific outputs of the NMHSPF planning support tool. Australian cities have seen major demographic changes since 1996 including potentially effects on urban-drift and how this should influence weighting needs research.
Indigenous peoples	Not in the current model. Indigenous people are an important priority group for health care (including mental health) – this may need separate treatment.	A topic for investigation is the extent to which increased morbidity in Indigenous people is accountable for through intermediate variables that feature in the IRSD including income, unemployment, overcrowding and educational attainment. Some adjustment above this will probably be indicated.
People from Non - English Speaking Backgrounds	The IRSD includes a variable capturing the percentage of people who do not speak English well.	Consideration of additional surveys may be useful – for instance regarding refugees.
Private sector activity correction	Not in current model. Private-sector varies with SD (although this is better measured with another index (13)).	The cited study relied on data released under a Freedom of information request – a more open policy on Medicare data would assist public transparency and accountability.
Homelessness	This is not captured in the IRSD and is an increasing issue in Australia. A further correction for this seems, <i>a-priori</i> , justifiable.	Further research into this population and its needs would assist parameter setting. With urban demographic changes this influence may have changed since 1996
Rurality	This is a significant influence on costs of service delivery and could usefully be incorporated into further models.	This bears on an interface with activity-based funding considerations and possible adjustments for travel time and other challenges of service delivery to more dispersed populations.

Supplementary Tables

Table S1. Development of very-high K10 resource distribution formula for adult mental health catchments in Victoria; data ranked by relative formula weighing

Mental Health Catchment (adults)	A. Catchment Population (2016)	B. Catchment proportion of state population	C. Estimate of Very High K10 Number in Catchment	D. Resource Distribution Formula: Estimated Very High K10 Catchment as Proportion of State	E. Ratio of: IRSD-weighted Very High K10 % to LHN population % (D/B)
Mid West	382505	6.2%	17740	9.9%	1.6
Northern Mallee	59163	1.0%	2426	1.4%	1.4
Goulburn and Southern	152208	2.5%	5641	3.1%	1.3
Gippsland	275634	4.5%	10209	5.7%	1.3
North East Hume	134691	2.2%	4888	2.7%	1.3
Grampians	227280	3.7%	8214	4.6%	1.2
North West	342440	5.5%	12317	6.9%	1.2
Glenelg	102391	1.7%	3670	2.0%	1.2
Dandenong	629747	10.2%	22482	12.5%	1.2
Loddon	270326	4.4%	9465	5.3%	1.2
Northern	362184	5.9%	12470	7.0%	1.2
South West	407395	6.6%	13151	7.3%	1.1
Barwon	308410	5.0%	9038	5.0%	1.0
Peninsula	294795	4.8%	8398	4.7%	1.0
Inner Urban East	270170	4.4%	5893	3.3%	0.8
Inner South-East	314485	5.1%	5346	3.0%	0.6
North East	191621	3.1%	3258	1.8%	0.6
Central East	374411	6.1%	6365	3.6%	0.6
Inner West	268967	4.4%	4572	2.6%	0.6
Middle South	324674	5.3%	5519	3.1%	0.6
Outer East	478625	7.8%	8137	4.5%	0.6
Total	6171381	100%	179182	100%	

Column A: Most recent census data (2016), obtained from the Australian Bureau of Statistics.

Column B: Data were calculated by dividing each catchment's population by the total state population

Column C: We estimated the number of people with very high K10 per catchment by applying IRSD quintile-specific very high K10 rates (Enticott et al., 2016) to the local government areas (LGAs) in the catchment, including proportional distribution of LGAs where these span multiple catchments.

Column D: Data were calculated by dividing the number of those with very high K10 scores in each catchment with the state-wide total of those with very high K10.

Column E: Data are a ratio, and were obtained by dividing Column D by Column B. Data are ranked in order of largest to smallest ratio (relative population weighing).

Table S2 Comparison of 1996 and 2020 proposed weightings

IRSD weighted 2020		Combination weighted 1996	
Mental Health Catchment (adults)	Relative weight	Mental Health Catchment (adults)	Relative weight
Outer East	0.59	North East	0.64
Inner West	0.59	Outer East	0.70
Inner South-East	0.59	Central East	0.71
North East	0.59	Dandenong	0.85
Central East	0.59	Mid West	0.93
Middle South	0.59	Peninsula	0.97
Inner Urban East	0.74	Southwestern	0.98
Peninsula	1.01	Goulburn	0.99
Barwon	1.01	Barwon	0.99
South West	1.11	Middle South	1.00
Northern	1.18	Loddon	1.03
Loddon	1.21	Gippsland	1.04
North West	1.22	Grampians	1.04
Glenelg	1.23	North Eastern	1.05
North East Hume	1.24	Southern	1.06
Dandenong	1.24	South West	1.20
Grampians	1.25	North West	1.20
Gippsland	1.28	Northern	1.20
Goulburn and Southern	1.29	Northern Mallee	1.21
Northern Mallee	1.41	Waratah	1.41
Mid West	1.61	Inner Urban East	1.43
		Inner South East	1.69
Note there have been some realignments and renaming of catchments since 1996			