








## Original Research

## Inequities in mental health services among Aboriginal and Torres Strait Islander people in Australia

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## ABSTRACT

**Objectives:** Aboriginal and Torres Strait Islander peoples experience disproportionately higher rates of mental health disorders and often face barriers to accessing and utilising culturally appropriate mental health services. This study investigated the disparities and determinants of mental health service utilisation among Indigenous Australians.

**Study design:** This is a cross-sectional study.

**Methods:** This study used the 2018–19 National Aboriginal and Torres Strait Islander Health Survey. Our analysis included Indigenous adults aged 18 years and older with mental health conditions. Wagstaff's normalised concentration indices were employed to examine inequalities in mental health services uptake, and Bayesian logistic regression analysis was used to identify the factors driving these inequalities.

**Results:** This study analysed a weighted sample of 1870 adults, of which 59.5 % were female. Our findings showed that mental health utilisation was more concentrated among the least socioeconomically disadvantaged Indigenous adults (WCI = 0.11; 95 % CI: 0.06, 0.17). These socioeconomic disparities were higher in Western Australia (WCI = 0.35; 95 % CI: 0.20, 0.49) and Southern Australia (WCI = 0.22; 95 % CI: 0.04, 0.39). Similarly, a higher mental health uptake was observed among individuals with a higher level of education (WCI = 0.18; 95 % CI: 0.13, 0.23), while older adults had a lower uptake (WCI = -0.11; 95 % CI: 0.16, -0.05). Factors positively associated with mental health services uptake included the availability of doctors at one's local Aboriginal Community Controlled Health Services (aOR = 1.27; 95 % CrI: 1.01, 1.60), being married (aOR = 1.49; 95 % CrI: 1.26, 1.75) and self-rated poor health status (aOR = 1.27; 95 % CrI: 1.01, 1.60). However, Indigenous adults experiencing financial stress (aOR = 0.82; 95 % CrI: 0.70, 0.97) and residing in remote (aOR = 0.79; 95 % CrI: 0.63, 0.99) or very remote areas (aOR = 0.63; 95 % CrI: 0.53, 0.74) were less likely to utilise mental health services.

**Conclusions:** This study found inequalities in mental health services uptake among Indigenous Australians with notable variation across states. Key policy interventions to mitigate this include promoting economic empowerment, expanding digital mental health services in remote and rural areas and providing age-appropriate mental health services for older adults.

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## 1. Introduction

Mental disorders are among the top ten leading causes of the global disease burden, with substantial health, social and economic impacts at the individual, family and national level.<sup>1–3</sup> Worldwide, one in eight individuals are diagnosed with at least one mental disorder, and this figure is anticipated to grow exponentially by 2030.<sup>4,5</sup> However, more than 80 % of individuals experiencing mental disorders lack access to mental health services contributing to the global economic burden of US \$ 2.5 trillion per year, which is projected to rise to US\$ 6 trillion by 2030.<sup>6,7</sup>

Mental disorders are a major health burden among Australians, with over two in every five Australians (42.9 %) experiencing at least one mental disorder at some point in their lives.<sup>8</sup> The most prevalent mental disorders are anxiety (17 %) and depression (8 %), followed by substance use disorders (3 %).<sup>9</sup> Within the Australian population, Aboriginal and Torres Strait Islander peoples (hereafter respectfully referred to as ‘Indigenous Australians’) experience a disproportionately higher burden of mental disorders, accounting for 23 % of the total years of healthy life lost in 2018, compared to 12 % of all Australians in 2022.<sup>10</sup> Additionally, the prevalence of suicide and psychological distress among Indigenous Australians is twice that of the general population, while hospitalisations related to self-harm are three times higher.<sup>10</sup>

To address the growing mental health burden nationally, Australia’s investment in mental health services increased from AU \$10.9 billion in 2017–18 to AU \$12.2 billion in 2021–22, reflecting an average annual growth rate of 4 %.<sup>11</sup> The Australian government has expanded community mental health programs, residential mental health care, and specialised mental health services through their mainstream healthcare system, as well as specific initiatives such as the ‘Better Access to Mental Health Care Initiative’, which includes telepsychiatry services for rural and remote areas.<sup>12</sup> Despite these initiatives, significant barriers persist including systemic racism, the lack of culturally appropriate mental health care, limited access to specialist services in remote areas, and socio-economic challenges (e.g., high transportation costs) that hinder access to mental health services for more than 200 culturally and linguistically diverse Indigenous populations (3.8 % of the total population).<sup>10,13–16</sup>

Not only do disparities in the burden of mental disorders exist between Indigenous and non-Indigenous Australians, but there are also differences in healthcare utilisation patterns which partially explain the existing health gap.<sup>17–23</sup> However, existing inequalities in mental health service uptake within Indigenous populations at the subnational level, along with the underlying sociodemographic and health system factors that influence mental health services uptake, remain poorly understood. This knowledge is imperative for developing robust policies and strategies to create a more responsive and equitable mental health care system that addresses existing inequalities. This study examined subnational socioeconomic disparities, as well as the determinants of mental health service uptake, among Indigenous Australians aged 18 years and older.

## 2. Methods

### 2.1. Study design and data source

We used the 2018–19 National Aboriginal and Torres Strait Islander Health Survey (NATSIHS) to examine inequalities in mental health services uptake among Indigenous Australians.<sup>24</sup> NATSIHS is a population-based cross-sectional study conducted in collaboration with multiple stakeholders, including representatives from Australian Government agencies, state/territory government agencies, Non-Government organisations, academic and research institutions.<sup>24</sup> The survey was designed to collect a wide range of information about the health and well-being of Indigenous Australians, including an individual’s demographics, nutrition, social determinants of health,

chronic diseases (including mental health conditions), and experiences of self-harm.<sup>24</sup> The data were collected via face-to-face interviews with those living in private dwellings across Australia. The detailed methodologies for the NATSIHS are explained elsewhere.<sup>24</sup>

### 2.2. Study population

The NATSIHS was conducted between July 2018 and April 2019. Two samples were used: a community sample and a non-community sample. The community sample included a random selection of discrete Indigenous communities and associated outstations from the Dwelling Register for Aboriginal and Torres Strait Islander Communities. The non-community sample involved multistage area sampling of private dwellings outside Indigenous communities. Mesh blocks (the smallest geographic areas containing 30 to 60 Indigenous households) from the 2016 census were identified. Dwellings in each mesh block were randomly selected. In non-remote areas, two adults aged 18 years or older were randomly selected from the community and non-community samples. In contrast, in remote areas, one adult was randomly selected.<sup>24</sup>

In NATSIHS, all respondents were asked about their mental health and behavioural conditions.<sup>24</sup> Based on their self-responses, individuals with mental health conditions such as depression, bipolar disorder, and anxiety disorders (including generalised anxiety disorder, panic disorder, panic attacks, phobic anxiety disorders, obsessive-compulsive disorder, post-traumatic stress disorder and other anxiety-related disorders) were identified for this study.<sup>24</sup> The development and testing of the questions were informed through advice from an expert advisory panel.<sup>24</sup> For this study, we included a total of 1870 Indigenous individuals aged 18 years and older with one or more mental or behavioural conditions.

### 2.3. Variables

**Outcome variables:** The main outcome variable was inequality in mental health services uptake among Indigenous Australians with mental and behavioural conditions. For analysis, mental health services uptake was coded as ‘1’ if the individual had accessed or used any mental health services and ‘0’ if they had not.

**Explanatory variables:** The selection of explanatory variables to be included in this study was done based on the purpose of this research; previously published literature from Australia<sup>25,26</sup> and the availability of data regarding the relevant variables. Accordingly, the included variables were age group, sex, marital status, educational status, place of residence, employment status, socioeconomic disadvantage, financial stress, availability of health services in their local area, number of household members, usual healthcare providers, presence of a doctor at one’s local Aboriginal Community Controlled Health Services (ACCHS), self-rated health status, central obesity, and removed from the natural family. **Table 1** presents the definitions and classifications of explanatory variables.

### 2.4. Statistical analysis

Data was accessed through the ABS Data Lab (<https://new.datalab.abs.gov.au/>) and analysed using STATA software (version 18, Stata Corp, College Station, TX, USA). The initial analysis summarised categorical variables using frequencies, percentages, mean and standard deviation. The prevalence of mental health services uptake was calculated across each explanatory variable. All frequencies and percentages were weighted using the personal weight variable (‘fingerwt’), with the sample size estimated by dividing the personal weight variable by 100.

Following this, we conducted two separate analyses: (1) Concentration index (CI) analysis to measure inequalities in mental health services uptake based on socioeconomic disadvantage, education status, central obesity, place of residence and age; and (2) Bayesian logistic

**Table 1**  
Definitions of explanatory variables included in the study.

Explanatory variables	Definition
Sex	Sex was categorised as '0' = Male, or '1' = Female
Age group	Age of participants in years were classified as '0' = 18–29 years, '1' = 30–44 years, or '2' = 45+ years
Marital status	Marital status was coded as "0" not married, "1" married.
Educational status	Educational status was categorised as '0' = 'did not complete year 12', '1' = 'completed year 12', '2' = trade certificate or diploma, and "3" tertiary education.
Place of residence	Grouped as '0' major city, '1' inner regional '2' outer regional '3' = 'remote' or '4' = 'very remote'.
Employment status	Employment status was categorised as "0" employed "1" unemployed "2" not in the labour force.
Socioeconomic disadvantage	The wealth index is arranged from lowest to highest as "0" = Quintile 1 (most disadvantage), "1" = Quintile 2, "2" = Quintile 3, "3" = Quintile 4, "5" = Quintile 5 (least disadvantage).
Financial stress	Whether household member could raise \$ 2000 in an emergency: "0" yes or "1" no
Number of household members	This indicates the number of Aboriginal and Torres Islanders person in the household and grouped as '0' household with ≤3 members or '1' ≥4 members
Available health services in local areas	Types of health services available in local areas: classified as ACCHS or any other institution. Grouped as '0' = 'other' or '1' = 'ACCHS'.
Usual healthcare providers	A place where individuals usually go if they have a health problem grouped as '0' = 'other' or '1' = 'ACCHS'.
Presence of Doctor in ACCHS	Whether a doctor is with ACCHS/community clinic. It was categorised as "0" Not available or "1" Available.
Self-rated health	Self-rated health was coded as "0" good which includes excellent, very good and good or "1" poor which includes fair and poor
Central obesity	Central obesity is defined as a measure of waist circumference (WC) in cm and treated as a continuous variable.
Removed from natural family	It is defined as a participant who has ever been removed from the natural family by the government. Grouped as '0' = 'no' or '1' = 'yes'.
State/Territory	A States or Territory are defined as the largest spatial unit within the Australian Statistical Geography Standard (ASGS) Main Structure. States and Territories are recognised as '0' = New South Wales, '1' = Victoria, '2' = Queensland, '3' = South Australia, '4' = Western Australia, '5' = Tasmania, '6' = Northern Territory, and '7' = Australian Capital Territory.

ACCHS, Aboriginal Community Controlled Health Services.

regression analysis to determine the factors driving the mental health service uptake.

#### 2.4.1. Concentration index analysis

The CI depicts how a cumulative share of the mental health services uptake is accounted for by the cumulative percentage of the individuals ranked by selected variables (age, education, socioeconomic disadvantage, central obesity, and remoteness). The index ranges from  $-1$  to  $+1$  and can be calculated as follows:

$$CI_y = \frac{2}{\mu} cov(y_i, R_i)$$

Where  $CI_y$  and  $R_i$  are the mental health service uptake and fractional rank (in terms of the selected indicators) of the  $i$ th individual, respectively;  $\mu$  is the mean of the health service uptake and  $cov$  denotes the covariance.<sup>27</sup> In the absence of any inequalities, the value of the concentration index is zero.<sup>28</sup>

In this study, the variable of interest (mental health services uptake), is dichotomous; as a result, the concentration index is not bounded within the range of  $(-1, 1)$ .<sup>29</sup> Therefore, Wagstaff's normalised concentration index (WCI) was applied as below.<sup>29</sup>

$$WCI = \left( \frac{CI_y}{1 - \mu} \right)$$

Where WCI denotes Wagstaff's normalised concentration index,  $CI_y$  refers to the concentration index of mental health service utilisation, and  $\mu$  represents the mean of health service uptake.

#### 2.4.2. Bayesian logistic regression analysis

Bayesian binary logistic regression analysis was fitted to identify the factors associated with mental health services uptake. For this study, Bayesian inference was selected for three reasons: firstly, it provides a natural and principled way of combining prior information with data.<sup>30,31</sup> Secondly, it gives better results than maximum likelihood estimation, particularly with small samples, even when using a non-informative prior, as it allows probabilistic interpretations of the model coefficients.<sup>32,33</sup> Thirdly, it provides interpretable answers, such as 'the true parameter has a probability of 0.95 of falling in a 95 % credible interval'.

The Bayesian approach has three components (the likelihood function, prior distribution, and posterior distribution).<sup>34</sup> 1) *The likelihood*

*function* exploits information about the parameters from the data at hand (in our case, mental health uptake using NATSIHS data). 2) *The prior distribution* is the probability distribution that expresses prior uncertainty associated with the parameter of interest. There are two common types of priors in Bayesian statistics (Informative and Non-informative). Since there was insufficient prior knowledge, this study used a non-informative prior and a normal flat (0, 1000) prior distribution for the random (population and intercept) parameters. 3) *The posterior distribution* is a method to summarise what we know about uncertain quantities after the data has been observed in the Bayesian statistical analysis. It can be obtained by multiplying the prior normal distribution for  $\beta$  parameters and the binary logistic regression likelihood function.

The convergence of the MCMC algorithm was used to check whether the algorithm attained its target distribution. Convergence assessments were done using Gelman-Rubin statistics, trace plots, density plots and autocorrelation plots. The Markov Chain Monte Carlo (MCMC) process converged after 89500 iterations, following a burn-in period of 4500 samples, and an MCMC sample size of 85000 (Supplementary Fig. 1). In this study, we accounted for the sample weight during the analyses so that the estimates represent the study population. Moreover, we checked for multicollinearity with the Variance Inflation Factor (VIF) and found no multicollinearity.<sup>35</sup> Finally, an adjusted odds ratio (aOR) with 95 % Bayesian credible intervals (CrIs) was reported for statistically significant factors associated with mental health services uptake. All statistical analyses were conducted using Stata MP version 18.0 (Stata Corp, College Station, TX, USA).

### 3. Results

#### 3.1. Study participants

The study involved a weighted sample of 1870 Indigenous individuals with mental and behavioural health conditions. The mean age of the participants was 39.0 years (SD =  $\pm 14.86$ ), of which 59.5 % were female. The most common mental conditions among the Indigenous Australians were depression (n = 1,483, 79.3 %), anxiety (n = 1,416, 75.7 %) and alcohol and drug-related problems (n = 223, 11.9 %).

Of the respondents, 64.1 % (n = 1199) were unmarried, 38.2 % (n = 684) did not complete year 12, 58 % (n = 1084) were unemployed, 47.6 % (n = 890) were most economically disadvantaged, and 53.4 % (n = 1000) reported financial stress. 63 % (n = 1195) of participants

**Table 2**  
 Characteristics of the Australian Aboriginal and Torres Strait Islander aged  $\geq 18$  years included in this study [N = 1870].

Characteristics	Male	Female	Total	Mental health services uptake
	n (%)	n (%)	n (%)	% (95 % CI)
<b>Overall</b>	<b>758 (40.5)</b>	<b>1112 (59.5)</b>	<b>1870 (100)</b>	<b>75.5 (72.2 to 78.5)</b>
<b>Mental health and behavioural conditions</b>				
Depressive disorders	559 (73.7)	924 (83.1)	1483 (79.3)	–
Alcohol and drug problems	125 (16.5)	98 (8.8)	223 (11.9)	–
Anxiety-related problems	446 (58.8)	970 (87.2)	1416 (75.7)	–
The problem of psychological development	24 (3.1)	12 (1.1)	36 (1.9)	–
Behavioural, emotional, or other mental problems	266 (35.1)	233 (20.9)	499 (26.7)	–
<b>Age group (years)</b>				
18-29	274 (36.2)	371 (33.4)	645 (34.5)	76.6 (69.8–82.3)
30-44	230 (30.3)	323 (29.0)	553 (29.6)	80.2 (75.4–84.3)
45+	254 (33.5)	418 (37.6)	672 (35.9)	70.5 (65.2–75.2)
<b>Marital status</b>				
Married	257 (33.8)	414 (37.3)	671 (35.9)	76.0 (70.8–80.4)
Not married	502 (66.2)	697 (62.7)	1199 (64.1)	75.2 (70.9–79.0)
<b>Highest level of education (n = 1788)</b>				
Did not complete year 12	293 (40.0)	391 (37.1)	684 (38.2)	68.3 (63.1–73.1)
Completed year 12	87 (11.9)	128 (12.1)	215 (12.0)	72.5 (60.1–82.2)
Trade certificate or diploma	295 (40.2)	441 (41.8)	736 (41.2)	81.5 (76.2–85.8)
Tertiary education	58 (7.9)	95 (9.0)	153 (8.6)	82.4 (71.4–89.8)
<b>Employment status</b>				
Employed	334 (44.1)	452 (40.6)	786 (42.0)	75.2 (69.7–80.1)
Unemployed	424 (55.9)	660 (59.4)	1084 (58)	75.6 (71.6–79.3)
<b>Socioeconomic disadvantage</b>				
Quintile 1 (most disadvantage)	340 (44.8)	550 (49.5)	890 (47.6)	74.5 (70.5–78.2)
Quintile 2	188 (24.8)	232 (20.9)	420 (22.5)	74.6 (66.6–81.2)
Quintile 3	118 (15.6)	189 (17.0)	307 (16.4)	76.3 (65.8–84.3)
Quintile 4	62 (8.2)	103 (9.2)	165 (8.8)	74.1 (61.3–83.8)
Quintile 5 (least disadvantage)	50 (6.6)	38 (3.4)	88 (4.7)	88.7 (74.0–95.5)
<b>Financial stress (n = 1781)</b>				
Yes	408 (55.7)	592 (56.4)	1000 (56.1)	73.3 (68.9–77.3)
No	324 (44.3)	457 (43.6)	781 (43.9)	79.2 (74.1–83.6)
<b>Number of household members</b>				
$\leq 3$	648 (85.5)	826 (74.3)	1474 (78.8)	75.5 (71.9–78.9)
$\geq 4$	110 (14.5)	286 (25.7)	396 (21.2)	75.2 (67.5–81.6)
<b>Place of residence</b>				
Major city	350 (46.2)	540 (48.6)	890 (47.6)	76.0 (70.4–80.8)
Inner regional	227 (29.9)	284 (25.5)	511 (27.3)	78.3 (72.6–83.0)
Outer regional	128 (16.9)	199 (17.9)	327 (17.5)	72.6 (65.5–78.8)
Remote	26 (3.4)	55 (4.9)	81 (4.3)	73.9 (66.3–80.4)
Very remote	27 (3.6)	34 (3.1)	61 (3.3)	61.7 (52.7–70.0)
<b>Types of health services available in local areas</b>				
AMS	493 (65.0)	702 (63.1)	1195 (63.9)	75.6 (71.6–79.2)
Other institutions <sup>a</sup>	265 (35.0)	410 (36.9)	675 (36.1)	75.2 (69.4–80.2)
<b>Usual healthcare providers (n = 1734)</b>				
AMS	197 (29.6)	293 (27.4)	490 (28.3)	74.7 (69.3–79.5)
Other institutions <sup>a</sup>	469 (70.4)	775 (72.6)	1244 (71.7)	75.9 (71.6–79.7)
<b>Doctor with AMS</b>				
Yes	210 (27.7)	338 (30.4)	548 (29.3)	74.6 (69.2–79.3)
No	548 (72.3)	774 (69.6)	1322 (70.7)	75.8 (71.7–79.5)
<b>Self-rated health</b>				
Good	485 (64.0)	708 (63.7)	1193 (63.8)	74.0 (69.6–77.9)
Poor	273 (36.0)	404 (36.3)	677 (36.2)	78.1 (73.2–82.3)
<b>Central obesity</b>				
Yes	353 (46.6)	756 (68.0)	1109 (59.3)	76.1 (72.0–79.7)
No	405 (53.4)	356 (32.0)	761 (40.7)	74.6 (69.0–79.5)
<b>Removed from natural family (n = 1821)</b>				
Yes	129 (17.7)	196 (17.9)	325 (17.9)	75.5 (68.1–81.7)
No	600 (82.3)	896 (82.1)	1496 (82.1)	75.6 (71.9–79.0)
<b>State/Territory</b>				
New South Wales	294 (38.8)	435 (39.2)	729 (39.0)	74.8 (68.2–80.3)
Victoria	84 (11.1)	95 (8.5)	179 (9.6)	81.3 (75.2–86.2)
Queensland	169 (22.3)	285 (25.6)	454 (24.3)	74.6 (67.2–80.7)
South Australia	45 (5.9)	65 (5.8)	110 (5.9)	78.8 (70.6–85.2)
Western Australia	87 (11.5)	118 (10.6)	205 (10.9)	74.1 (65.8–81.0)
Tasmania	39 (5.2)	56 (5.0)	95 (5.1)	73.7 (66.5–79.8)
Northern Territory	29 (3.8)	42 (3.8)	71 (3.8)	70.4 (60.9–78.5)
Australian Capital Territory	10 (1.4)	17 (1.5)	27 (1.4)	87.0 (78.5–92.5)

<sup>a</sup> Hospital, GP (other than from Aboriginal Medical Service), traditional healer. The difference between the total sample size and certain variable frequencies is due to missing values.

indicated that their Aboriginal Medical Services (AMSs) were available locally, and 26.2 % (n = 490) usually go to AMSs for their medical needs. However, 70.7 % (n = 1319) of respondents mentioned that their AMS did not have a doctor. Regarding one’s personal health and well-being, 63.8 % of participants (n = 1193) rated their health status as good, while 17.8 % of participants (n = 327) were removed from their families by the government during childhood [Table 2].

### 3.2. Mental health services uptake

The overall prevalence of mental health services uptake among Indigenous people with mental health conditions was 75.5 % [95 % CI: 72.2, 78.5]. Mental health service uptake was highest in Australian Capital Territory (ACT) (87.0 %, 95 % CI: 78.5–92.5) and Victoria (81.3 %, 95 % CI: 75.2–86.2), whereas the lowest was in the Northern Territory (70.4 %, 95 % CI: 60.9–78.5) and Tasmania (73.7 %, 95 % CI: 66.5–79.8). Indigenous adults aged 30–44 years had the highest proportion of mental health services uptake (80.2 %), and those with tertiary education reported the highest utilisation of mental health services usage (82.4 %), whilst those who had not completed grade 12 reported the lowest (68.3 %) [Table 2].

### 3.3. Inequalities in mental health services uptake

Fig. 1 illustrates inequalities in mental health service uptake among Indigenous peoples with mental health conditions. Statistically significant pro-rich inequality in mental health service uptake was observed, as indicated by the Wagstaff normalised concentration index (WCI = 0.1122; 95 % CI: 0.0572, 0.1672). This meant that mental health service uptake was concentrated among individuals from higher socioeconomic strata (11.22 %) compared to those from lower wealth strata. These inequalities were particularly pronounced in Western Australia (WCI = 0.3470; 95 % CI: 0.1982, 0.4958) and Southern Australia (WCI = 0.2194; 95 % CI: 0.0447, 0.3942). Similarly, mental health service utilisation was more concentrated among individuals with higher education (WCI = 0.1787; 95 % CI: 0.1267, 0.2307). Education-related

inequalities were highest in Western Australia (WCI = 0.4267; 95 % CI: 0.2836, 0.5698), and New South Wales (WCI = 0.1818; 95 % CI: 0.0572, 0.3063), whereas lowest in Tasmania (WCI = 0.0698; 95 % CI: 0.0622, 0.2019), and in the Northern Territory (WCI = 0.0956; 95 % CI: 0.0631, 0.2544). Age-related inequalities were also evident, with a lower mental health services uptake among the elderly in Australia (WCI = -0.1073; 95 % CI: 0.1624, -0.0524). Western Australia showed the most pronounced age-related inequalities in mental health services uptake (WCI = -0.2335; 95 % CI: 0.3854, -0.0817), followed by Queensland (WCI = -0.1616; 95 % CI: 0.3126, -0.0108) (Supplementary Table 1).

### 3.4. Determinants of mental health service uptake

The result indicated that married people had higher odds of utilising mental health services [aOR = 1.492, 95 % CrI = 1.255, 1.752] compared to unmarried people. In contrast, participants aged 45 years and older were less likely to use these services than those aged 18–29 years [aOR = 0.652, 95 % CrI = 0.592, 0.714]. Individuals facing financial stress were 18 % less likely to utilise mental health services [aOR = 0.824, 95 % CrI = 0.705, 0.976]. Individuals residing in remote and very remote regions were less likely to utilise mental health services compared to those living in major urban cities [aOR = 0.80, 95 % CrI: 0.63, 0.99 for remote and aOR = 0.64, 95 % CrI: 0.54, 0.75 for very remote] (Table 3). Our study found that highly educated individuals were more likely to use mental health services compared to those who did not complete grade 12 (aOR = 1.55; 95 % CrI: 1.29, 1.84 for certificate or diploma; aOR = 1.65; 95 % CrI: 1.29, 2.08 for tertiary level education). Indigenous individuals who reported that a doctor was available at their AMS were 27 % [aOR = 1.27, 95 % CrI: 1.01, 1.60] more likely to utilise the services compared to their counterparts. Additionally, Indigenous individuals who viewed their health as poor were 23 % [aOR = 1.23, 95 % CrI: 1.04, 1.44] more likely to utilise the services compared to their counterparts [Table 3].

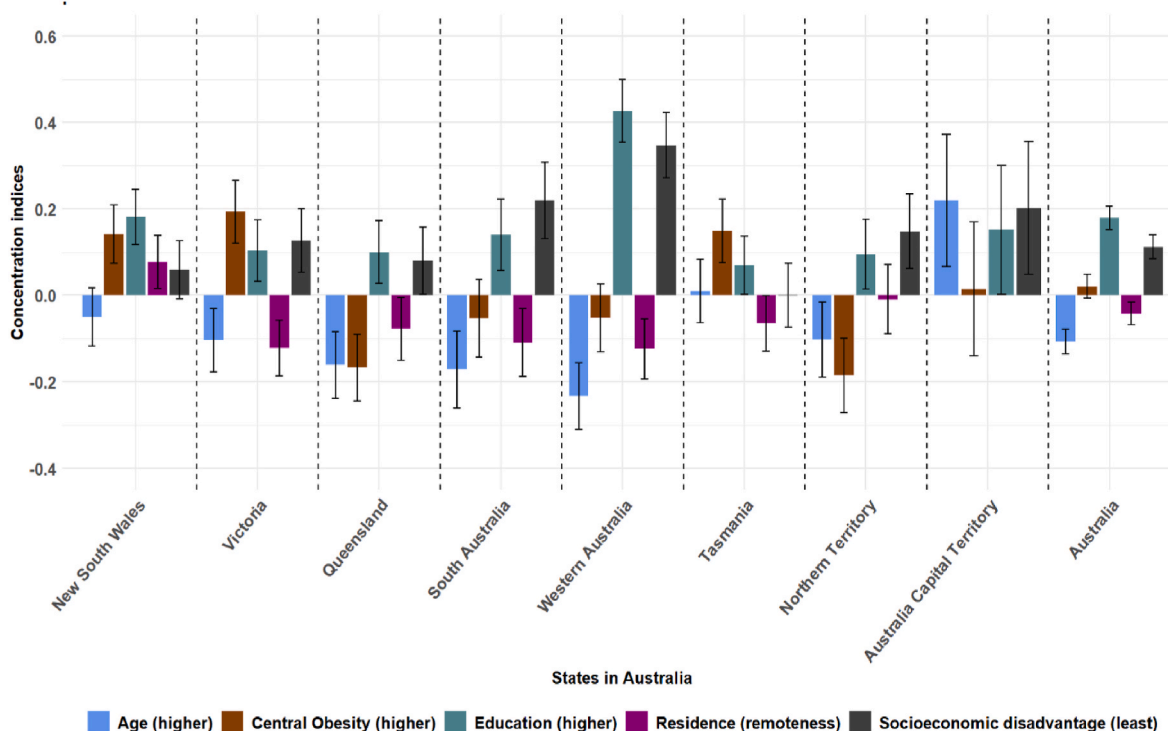


Fig. 1. Concentration indices of mental health service uptake among Indigenous Australians based on selected indicators.

**Table 3**  
Factors associated with mental health services uptake among Australian Indigenous peoples aged  $\geq 18$  years.

Characteristics	SD	MCSE	aOR [95 % CrI]
<b>Sex</b>			
Male	1(reference)		
Female	0.1045	0.0050	1.09 (0.90–1.31)
<b>Age group (years)</b>			
18-29	1(reference)		
30-44	0.0748	0.0050	1.01 (0.87–1.17)
45+	0.0314	0.00195	0.65 (0.59–0.71) *
<b>Marital status</b>			
Married	0.1265	0.0064	1.49 (1.26–1.75) *
Not married	1(reference)		
<b>Highest level of education</b>			
Did not complete year 12	1(reference)		
Completed year 12	0.0752	0.0042	1.07 (0.93–1.23)
Trade certificate or diploma	0.1377	0.0069	1.55 (1.29–1.84) <sup>b</sup>
Tertiary education	0.1995	0.0112	1.65 (1.29–2.08) <sup>b</sup>
<b>Employment status</b>			
Employed	0.0688	0.0032	0.98 (0.85–1.11)
Unemployed	1(reference)		
<b>Socioeconomic disadvantage</b>			
Most disadvantaged	1(reference)		
Least disadvantaged	0.1091	0.0056	1.55 (1.34–1.78) <sup>b</sup>
<b>Financial stress</b>			
Yes	0.1007	0.0050	0.82 (0.71–0.98) <sup>b</sup>
No	1(reference)		
<b>Number of household members</b>			
$\leq 3$	1(reference)		
$\geq 4$	0.0684	0.0039	0.88 (0.75–1.02)
<b>Usual healthcare providers</b>			
AMS	0.0870	0.0062	0.83 (0.67–1.01)
Other institutions <sup>a</sup>	1(reference)		
<b>Place of residence</b>			
Major city	1(reference)		
Inner regional	0.0835	0.0046	0.82 (0.94–1.39)
Outer regional	0.0681	0.0036	0.89 (0.77–1.03)
Remote	0.0938	0.0030	0.80 (0.63–0.99) <sup>b</sup>
Very remote	0.0541	0.0023	0.64 (0.54–0.75) <sup>b</sup>
<b>Types of health services available in local areas</b>			
AMS	0.1013	0.0054	0.99 (0.81–1.21)
Other institutions <sup>a</sup>	1(reference)		
<b>Doctor with AMS</b>			
Yes	0.1526	0.0079	1.27 (1.01–1.60) <sup>b</sup>
No	1(reference)		
<b>Self-rated health</b>			
Good	1(reference)		
Poor	0.0987	0.0045	1.23 (1.04–1.44) <sup>b</sup>
<b>Removed from natural family</b>			
Yes	1(reference)		
No	0.073	0.0044	0.96 (0.83–1.12)
<b>State/Territory</b>			
New South Wales	1(reference)		
Victoria	0.0794	0.0063	0.97 (0.82–1.13)
Queensland	0.1063	0.0061	0.85 (0.66–1.08)
South Australia	0.1140	0.0077	0.96 (0.76–1.21)
Western Australia	0.1043	0.0068	0.88 (0.70–1.11)
Tasmania	0.1067	0.0067	0.92 (0.73–1.15)
Northern Territory	0.1016	0.0052	1.01 (0.82–1.22)
Australian Capital Territory	0.1055	0.0066	0.94 (0.76–1.17)

Abbreviations: SD, standard error; MCSE, Monte Carlo Standard error; aOR, adjusted Odds Ratio, CrI: credible interval.

<sup>a</sup> Hospital, GP (other than from Aboriginal Medical Service), traditional healer.

<sup>b</sup> Significant factors.

#### 4. Discussion

Despite various public health policies and initiatives in place,<sup>36,37</sup> we observed substantial inequalities in mental health services uptake, favouring the wealthiest, the most educated, and the youngest in society. This study also revealed various factors determining mental health services uptake, including financial stress, perceived health status, and the availability of a GP at one's local AMS. Social and economic challenges, coupled with structural harms including systemic racism, discrimination, and unemployment, were associated with lower mental health services uptake. To effectively reduce inequalities and improve

the uptake of mental health services, a multi-component intervention package should be implemented including economic empowerment, mental health literacy, the provision of digital mental healthcare (e.g. web-based peer support and mobile-based therapy programs) for regional and rural areas and tailored mental health interventions (e.g. farmer mental health program and mental health first aid training) to support the most vulnerable subpopulations within Australian Indigenous communities. Furthermore, increased investment is critical to enhance the accessibility and scope of mental health services through ACCHS, and to ensure the provision of Indigenous-led services.<sup>38</sup>

This study demonstrated that socioeconomic status and financial

stress were significantly associated with inequalities in mental health services utilisation. This association may operate in three interconnected pathways: individuals with lower socioeconomic status tend to experience higher rates of mental illness; those with a mental illness often face economic disadvantage due to discrimination in employment and reduced work capacity; and individuals living in poverty may have financial stress or constrained access to quality mental health services, particularly in rural and remote areas. Increasing investment in a range of cost-effective and ethically imperative measures to promote mental health and treat mental health problems is crucial to address the health gap in Australia.<sup>38</sup>

It was evident in this study that a rural Indigenous mental health gap exists, consistent with previous research findings.<sup>39–41</sup> In over 2000 towns and villages across Australia, with populations of 5000 or fewer, access to mental health services is hindered by a lack of doctors or mental health professionals in nearby health facilities or due to long distances to the closest healthcare facility with such professionals. Given the high rates of unemployment in rural Indigenous communities, transportation costs, and the high cost of specialist care, access to mental health services in nearby regional urban centres is also limited for many individuals.<sup>42</sup> According to the Australian Indigenous Doctors' Association (AIDA), 0.44 % of doctors in Australia in 2019 were Indigenous doctors, while the remaining were non-Indigenous.<sup>43</sup> This makes it more difficult for Indigenous individuals to receive culturally appropriate, high-quality healthcare. To promote more equitable and sustainable access to mental health services, it is recommended to encourage intersectoral collaboration and transformative, integrated planning for developing and deploying the rural mental health workforce. Such planning must involve Indigenous stakeholders and further develop an Indigenous mental health workforce. This planning should address social and environmental determinants of rural health by developing inclusive digital mental health resources in diverse Indigenous languages, targeting individuals in remote areas and those who are economically disadvantaged.<sup>44</sup> Furthermore, providing people with direct access to subsidised mental health services and integrating telehealth into standard practice to facilitate access to specialists may mitigate provider-related barriers to care.<sup>45</sup>

Our study highlights the association between education status and mental health service use in Indigenous communities. Vocational qualifications significantly influence one's lifestyle, health-seeking behaviour, and utilisation of health services.<sup>46,47</sup> Strategies should include targeted mental health literacy campaigns using simple, culturally relevant, and appropriate materials, such as those available on phone apps (which most people have), and Indigenous community health workers. Additionally, forming partnerships with Indigenous-led, community-based organisations (e.g., REDIE, CAHS) can help foster trust and reduce stigma, as well as co-designing integrated mental health care that also combines Elder-based approaches, including Indigenous healing, traditions, and lifestyles.

To the best of our knowledge, this is the first study to use a nationally representative dataset to investigate inequities in mental health service uptake among Indigenous adults with mental health conditions. We also employed rigorous analytical techniques to ensure that our findings are reliable and can effectively inform national and local policy decisions in Australia. Our results should also be interpreted with caution. First, the use of cross-sectional data presents difficulties in establishing a temporal relationship between covariates and the outcome variable. Second, the outcome variables and most of the explanatory variables were measured based on self-reported questionnaires, which could be a source of recall bias. This bias could result in either overestimation or underestimation of service utilisation. However, while these biases are inherent to self-reported data, they are unlikely to be systematically different across socioeconomic groups, and thus the overall pattern of inequalities remains robust. Third, we did not use any specific cultural frameworks (such as Anangu cultural domains, including Tjukurpa, Kanyi, Walta, and Ngura) in this study. This was primarily due to limitations in the

data collected by the 2018–19 NATSIHS, which did not comprehensively include information across all these cultural domains. As a result, it was not feasible to fully implement one of these cultural frameworks, so we chose variables based on their relevance to the research topic and the extent to which complete data were available for analysis. Fourth, subnational variations should be interpreted with caution, as estimates based on small subsamples in certain states (e.g. ACT, Tasmania) may not be precise due to sampling variability. Fifth, although this study utilised the most recent available National Aboriginal and Torres Strait Islander Health Survey data (NATSIHS, 2018–19), it is important to acknowledge that socioeconomic conditions and patterns of service uptake may have evolved since then.

In conclusion, this study found that Indigenous populations who were younger, married, educated, wealthier, and had access to a doctor at their local AMS were more likely to utilise mental health services. Mental health service use was significantly lower among those facing financial stress and residing in rural and remote areas. Key policy interventions to address these rural disparities include promoting economic empowerment, improving telehealth services, providing support for travel to regional urban centres with specialty care, and strengthening social services for follow-up care. Priority should be given to Indigenous communities in Western and Southern Australia, where significant inequalities in mental health service uptake have been identified. Finally, future research using primary data will be essential to explore how evolving socioeconomic contexts and post-COVID-19 developments, such as the expansion of telehealth and digital mental health services, have shaped mental health service patterns.

#### Ethical statement

Ethical clearance was obtained from the Charles Sturt University Human Research Ethics Committee (H23808). The Australian Bureau of Statistics (ABS) is the custodian of the NATSIHS data, and the ABS provided clearance to the data analysis output files. The involvement of Indigenous People in reviewing the study's concept, design, and implementation was facilitated through the Coonamble Aboriginal Health Service (CAHS) and the Regional Enterprise Development Institute (REDI), aligning with the NHMRC guideline for conducting ethical research with Aboriginal and Torres Strait Islander peoples. This study followed the Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) reporting guidelines for cross-sectional studies.

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#### Declaration of competing interests

The authors declare no conflict of interest.

#### Data availability

The Australian Bureau of Statistics (ABS) stores the deidentified unit record-level data that underlie national surveys on their DataLab online platform. Users can perform more detailed analyses, such as generating publicly unavailable variables, and all results are vetted by ABS staff before release. Access to ABS TableBuilder and the ABS DataLab requires formal approval processes (<https://new.datalab.abs.gov.au/>)

#### Author contributions

F.H.A: conceptualised the study, designed the method, accessed, and analysed the data, interpreted the results, and drafted the original manuscript. K.Y.A, S.B.A and S.T critically revised the manuscript for

intellectual content and interpreted the findings. A.G.R, S.T, K.Y.A, S.B. A, A.E.A, Z.S.N, Z.Y.K, C.T.L, B.W.D, M.G.B, S.M, H.M.K.A, U.K.M, M.M. H, and U.K.M: provided input and editing by critically revising the draft manuscript. P.G and J.N, who are Indigenous community leaders and the CEOs of two Aboriginal-led health institutions, were involved in the study conception, variable selection, and interpretation of the findings, and both revised the manuscript, focusing on improving cultural sensitivity, methodological appropriateness, respect for cultural values, and ensuring ethical considerations. A.G.R: supervision. All authors reviewed and approved the final manuscript for publication.

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## Appendix A. Supplementary data

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