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Investigating the relevance of mental health for the current equity groups framework: An analysis of multi-agency linked-administrative data

Tomasz Zając, Francisco Perales, Ning Xiang, Wojtek Tomaszewski and Stephen R. Zubrick

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List of abbreviations

ABS	Australian Bureau of Statistics
ADHD	Attention-Deficit Hyperactivity Disorder
AIHW	Australian Institute of Health and Welfare
ATAR	Australian Tertiary Admission Rank
CALD	Culturally and Linguistically Diverse
DESE	Department of Education, Skills and Employment
DHS	Department of Human Services
EG	Equity groups
ESB	English speaking background
HEIMS	Higher Education Information Management System
HILDA	Household Income and Labour Dynamics in Australia
MADIP	Multi-Agency Data Integration Project
MBS	Medicare Benefits Schedule
NDIS	National Disability Insurance Scheme
PMH	Poor mental health
NDIS	National Disability Insurance Scheme
NESB	Non-English Speaking Background
ORs	Odds ratios
PBS	Pharmaceutical Benefits Schedule
PIT	Personal Income Tax
pp	Percentage points
RRR	Regional/rural/remote
SEIFA	Socio-Economic Indexes for Areas
SES	Socioeconomic status
TCSI	Tertiary Collection of Student Information

Executive summary

There are currently six recognised equity groups in the Australian higher education system: people from socioeconomically disadvantaged backgrounds, people from Non-English Speaking Backgrounds, Aboriginal and Torres Strait Islander People, people from regional and remote areas, people with disability and women in non-traditional areas of study. Critics of the Australian higher education equity framework have underscored the existence of other potential sources of educational disadvantage that currently lack official recognition.

Given the increasing prevalence of mental health issues among young people, some scholars and equity stakeholders have recommended refining or complementing the existing disability equity group by explicitly incorporating measures of poor mental health. A recent change to the definitions of higher education data elements might be seen as a step towards recognising poor mental health as a condition that can lead to educational disadvantage. Specifically, the new Tertiary Collection of Student Information (TCSI) system, which replaced HEIMS in 2021, includes mental health and neurological conditions among disabilities, impairments and long-term medical conditions that can impact studies. The present study provides empirical evidence that can help assess the validity of claims to formally incorporate student mental health within the current Australian framework for equity in higher education. Our analyses leverage a unique, customised Multi-Agency Data Integration Project (MADIP) dataset obtained through a partnership with the Australian Government Department of Education, Skills and Employment (DESE) to investigate how pre-existing poor mental health overlaps with the equity groups and their independent and compounding effects on disadvantage at the higher education participation stage. The studied equity groups include students with disability. However, as our study uses data from the 2012-16 period, all of the data pertain to the time before the recent change to the disability indicator in the HEIMS/TCSI data collections, which occurred in 2021. Therefore, the disability indicator in the data used here does not explicitly capture students with poor mental health.

The analyses presented in this report fill two significant knowledge gaps. First, the study investigates the overlap between pre-existing poor mental health and membership in the officially identified equity groups (all of which are also defined on the basis of information preceding the commencement of university studies). Second, the study examines the impact of pre-existing poor mental health on early student outcomes, namely first-year attrition.

To measure student attrition, we relied on students' enrolment status in the academic year following the year in which they commenced their undergraduate degrees. We considered three different measures of attrition: from a field of education, from a given higher education institution, and from the higher education system altogether. To capture poor mental health, we utilised official records from the Pharmaceutical Benefit Schedule and the Medicare Benefit Schedule on the use of mental health-related medication and services, which identify individuals who sought medical help.

Our analyses revealed that members of only two equity groups—Indigenous students and people with disability—were more likely to exhibit poor mental health prior to commencing their university studies than their non-equity counterparts. The disparity was much more substantial for students with and without disability. Overall, 42.1 per cent of students with disability used mental-health services or medication, compared to 11.3 per cent for students without disability. This indicated that students with poor mental health constituted a separate group that did not overlap with the officially identified equity groups, except for students with disability.

Critically, our analyses demonstrated that pre-existing poor mental health adversely affected all types of student attrition. The effects of poor mental health were most pronounced for

student attrition at the higher education system level and weakest for attrition at the field-of-education level. Further, the effect of poor mental health on student attrition was largely independent of equity-group membership. Adjusting the models for equity-group membership did not meaningfully reduce the effects of poor mental health. In fact, the negative effect of poor mental health on student attrition was larger in magnitude than the effect of membership in each of the equity groups. Poor mental health was associated with a rise in the attrition rate ranging between 4.4 and 5.2 percentage points. Only the effect of being Indigenous was of a comparable magnitude (4.7 to 4.9 percentage points).

The impact of poor mental health on student attrition was similar among equity and non-equity students, except for students from Non-English Speaking Background. Poor mental health affected the attrition rates of students from Non-English Speaking Background to a greater extent than for their English-speaking background counterparts.

Altogether, our results unequivocally stress the critical importance of pre-existing poor mental health as a predictor of student attrition during the first year of university. Despite some overlap between students with poor mental health and students who belong to the officially identified equity groups—chiefly students with disability—our results indicate that the disadvantage stemming from pre-existing poor mental health is distinct from that stemming from being a member of any of the designated equity groups.

Recommendations

Based on our findings we formulate the following three recommendations:

Recommendation 1. Stakeholders at all levels should consider poor mental health as an important factor contributing to first-year student attrition and design more mental health-focused interventions.

Equity practitioners should be particularly mindful of poor mental health's negative effects among students from Non-English Speaking Backgrounds, as this is the equity group whose members are most negatively affected by poor mental health. This pattern of results also deserves further consideration by future research studies.

Recommendation 2. The Australian Government should consider allocating more funding to support students with disabilities.

Our results show that despite the significant overlap between poor mental health and disability, as defined before 2021, the previous disability category did not capture a vast portion of students with poor mental health. The inclusion of students with poor mental health in the disability category results in a significant expansion of the category.

Recommendation 3. The Australian Government should consider funding (a) the collection or linkage of data that enable a more robust examination of the extent and repercussions of poor mental health amongst university students, and (b) research that expands the analytic scope of this report to other phases of the student life cycle.

These new data sources and research studies would significantly expand current understandings of how mental health impacts all aspects of students' access, participation and success in higher education.

Introduction

There are currently six recognised equity groups in the Australian higher education system: people from socioeconomically disadvantaged backgrounds, people from Non-English speaking backgrounds, Aboriginal and Torres Strait Islander People, people from regional and remote areas, people with disability, and women in non-traditional areas of study (Martin, 1994; Tomaszewski et al., 2018). Critics of the present equity framework have underscored the existence of other potential sources of educational disadvantage, which currently lack official recognition. Mental health is just one example. Although the Disability Discrimination Act 1992 and National Disability Insurance Scheme (NDIS) recognise mental health conditions as a disability, in the context of equity in higher education—until recently—the focus was on physical disability. Over the last decade, there have been documented increases in the prevalence of mental health conditions among higher education students (Brett, 2016; Browne et al., 2017; Orygen, 2017, 2020; Rickwood et al., 2017). These increases drew the attention of policymakers, with students with poor mental health being subsequently suggested as a potential addition to the equity framework (AIHW, 2014; DESE, 2020a; James et al., 2004; Norton & Brett, 2011, Koshy et al., 2020; Pitman et al., 2021). A recent change to the collection of higher education data might be seen as a step towards explicitly recognising potential educational disadvantage faced by students with poor mental health. Specifically, the new Tertiary Collection of Student Information (TCSI) system, which replaced HEIMS in 2021, includes mental health and neurological conditions among disabilities, impairments and long-term medical conditions that can impact studies.

Despite a wealth of research on the sources of disadvantage in the Australian higher education system (Harvey et al., 2016), little is known about how mental health conditions interact with other sources of disadvantage. Recent studies suggest complex intersections between membership in selected equity groups and health and wellbeing outcomes (e.g., Tomaszewski et al., 2019). However, robust and comprehensive evidence is lacking. This includes evidence on the degree to which poor mental health is associated with membership in the designated equity groups, as well as evidence on the impact of poor mental health on student success. The few studies on the topic are limited in scope and methodology (Cvetkovski et al., 2018; Mojtabai et al., 2015).

Within this context, the goal of this study is to evaluate the relevance of mental health to the higher education equity framework in Australia and empirically validate claims that students with mental health problems should be explicitly incorporated in the equity framework. Our analyses leverage a unique, customised Multi-Agency Data Integration Project (MADIP) dataset obtained through a partnership with the Australian Government Department of Education, Skills and Employment (DESE) to investigate how poor mental health overlaps with the equity groups and their independent and compounding effects on disadvantage at the higher education participation stage. The studied equity groups include students with disability. However, as our study uses data from the 2012-16 period, all of the data pertain to the time before this change to the disability indicator in the HEIMS/TCSI data collections, which occurred in 2021. Therefore, the disability indicator in the data used here does not explicitly capture students with poor mental health.[1]

The analyses presented in this report fill two significant knowledge gaps. First, the study examines the relationships between pre-existing mental health, that is captured prior to commencing university, and membership in the officially identified equity groups. The research questions for this part of the study are:

[1] Nevertheless, since disability is self-reported in these data collections, it is possible that some individuals suffering from poor mental health were captured as part of the 'disability' group prior to 2021 through self-classifying as suffering from 'other' disability type.

1. Are there overlaps between equity-group membership and pre-existing poor mental health?
2. If so, for which of the officially identified equity groups are such overlaps most pronounced?

For students with mental health problems to constitute an equity group the overlap between poor mental health and membership in designated equity groups has to be limited.

Second, the study examines the effects of poor mental health in the year preceding the commencement of an undergraduate degree on student first-year attrition and the interplay between any such effects with membership in different equity groups. Our decision to focus on first-year attrition was informed by ample evidence indicating that a vast majority of student departures from higher education take place during the first year of study (Norton & Cherastidtham, 2018). The research questions for this part of the study are:

3. To what extent does pre-existing poor mental health impact student attrition from higher education, over and above membership in the current equity groups?
4. Are the effects of pre-existing poor mental health independent of the disadvantage captured by the officially recognised equity groups? In other words, does poor mental health constitute a separate type of higher education disadvantage?
5. How do the effects of poor mental health compound with the effects of membership in the officially designated equity groups?

The effect of poor mental health on student outcomes (net of the effects of membership in the existing equity groups) needs to be substantial to validate the recognition of students with mental health problems as an equity group.

The remainder of this report is structured as follows. The next section offers an overview of the existing literature on the mental health of higher education students and its impacts on student performance. It also introduces the Australian higher education equity framework. This is followed by a section introducing the data sources and analytic approach used in the study, and a section presenting the key findings. The report concludes with a discussion of the results and a concluding section containing recommendations for policy, practice, and further research.

Background

The World Health Organisation (2004) defines mental health in broad terms, as a state of well-being in which individuals can realise their own potential, handle the normal stresses of life, work productively, and contribute to the community. However, the specific operationalisations and definitions of mental health vary across studies. For example, poor mental health may refer to the presence of a diagnosed mental disorder, high or very high levels of self-reported psychological distress, or self-identified or diagnosed depressive symptoms, to name a few possible operationalisations. When reviewing the scholarly evidence presented in this section, we take an encompassing approach and consider studies focusing on these and other facets of mental health. In doing so, we recognise that these studies may be based on mental health measures that differ in nature, duration and severity. Given the data available, and as detailed below, our empirical analyses rely on proxy measures of poor mental health based on official records on use of mental health-related medication and services, as outlined in more detail in the Methods section.

The growing prevalence of poor mental health

Because of the significant and long-term impacts of mental health on educational, social, economic, and quality-of-life outcomes (for a review, see Herrman et al., 2005), improving population mental health has become a salient policy issue (Knifton & Quinn, 2013). The mental well-being of youth has been of particular concern in recent years, partially because most mental health problems have their onset during adolescence (Reavley & Jorm, 2010). Numerous studies have shown that up to three quarters of mental conditions emerge before the age of 25 (for a review, see Kessler et al., 2007). Further, global estimates for the last decade indicate that about one in five adolescents have mental health problems that affect their functioning (World Health Organization, 2020).

Australia is no exception. Based on a survey focused specifically on mental health and well-being, the Australian Bureau of Statistics (ABS) (2008b) estimated that in 2007 nearly half of Australians (45%) had experienced a mental disorder in their lifetime. The most recent ABS National Health Survey (ABS, 2018b) showed that, in 2017-18, around 20 per cent of Australians (approximately 4.8 million) had a mental or behavioural condition, an increase from 17.5 per cent in 2014-15. As in other countries, the proportion of people with a mental or behavioural condition in Australia was highest among individuals aged 15-24. The share of people in this age group exhibiting mental or behavioural issues was 30 per cent among women and 21 per cent among men (ABS, 2018b). Results from a national survey on children and adolescents' mental health in 2013-14 (Lawrence et al., 2015) suggested that approximately 14 per cent of young people aged 4-17 experienced a mental disorder in the 12 months prior to responding to the survey. In fact, nearly half of all lifetime cases of mental illness in Australia emerged by the age of 14 (ABS, 2008; Australian Institute of Health and Welfare (AIHW), 2011).

Among young people, tertiary education students have been identified as a high-risk population, not only due to their age but also because of the additional stress associated with their educational transitions and studies (Barden & Caleb, 2019; Crawford, 2021; Markoulakis & Kirsh, 2013; Orygen, 2017, 2020; Querstret, 2019; Rickwood et al., 2017; Stallman, 2010; van Agteren et al., 2019). According to some estimates, at least 20 per cent of U.S. and Canadian university students experienced a mental health problem (Markoulakis & Kirsh, 2013). In Australia, the prevalence and nature of mental health problems among tertiary education students remain under-researched (Carter et al., 2017; Orygen, 2017). Yet the scant evidence available suggests that university students aged 16-25 experienced a higher level of psychological distress than their peers who were not students (Orygen, 2020; Rickwood et al., 2017). For instance, one third of respondents to the 2016 National Union of Students National Tertiary Student Wellbeing Survey reported experiencing poor mental

health. Further, two thirds of students participating in the survey reported 'high' or 'very high' levels of psychological distress in the 10-item Kessler Psychological Distress Scale (Rickwood et al., 2017). This is a much higher proportion than that observed among the general population of similar age. For instance, in the 2014-15 National Health Survey, 20 per cent of women and 11 per cent of men aged 18-24 reported "high" or "very high" levels of distress
(ABS, 2015).

Associations between social disadvantage and poor mental health

The growing prevalence of poor mental health in the overall youth and student population has not been evenly distributed. Previous studies have provided evidence of associations between multiple markers of social disadvantage and poor mental health. Overall, the available literature indicates that mental health is largely determined by diverse social and economic factors operating at different stages of life (Allen et al., 2014). As Allen et al. (2014) argued, many mental disorders are highly associated with social inequalities, with individuals who are socioeconomically disadvantaged being disproportionately more likely to experience mental health problems. Similarly, based on a systematic review of 52 studies published between 1990 and 2011, Reiss (2013) concluded that socioeconomically disadvantaged children and young people were two-to-three times more likely to suffer from poor mental health. The indicators of socioeconomic status (SES) examined in these studies included household income, parental education, employment, and occupation. The review suggested that financial hardship was particularly strongly related to the onset of mental health problems, while parental education was more strongly associated with the persistence and severity of such problems (Reiss, 2013).

In Australia, studies focused on selected groups of young people suggest that school students with disabilities (McMillan & Jarvis, 2013) and Indigenous youth (Azzopardi et al., 2018; Dudgeon, 2017; Toombs & Gorman, 2011; Wilks & Wilson, 2015) are at an increased risk of experiencing mental health issues. For instance, McMillan and Jarvis (2013) reviewed studies on mental health among school students with disabilities. Their findings indicated that students with a diagnosed disability had higher chances of experiencing poor mental health than their peers without disabilities (McMillan & Jarvis, 2013). However, the authors warned about the difficulties inherent to estimating the prevalence of poor mental health among students with disabilities in Australia, due to researchers using multiple definitions and operationalizations of mental health. Indigenous youth are another group at high risk of poor mental health. For example, Azzopardi et al. (2018) undertook a systematic synthesis of population data on the health and wellbeing of Indigenous adolescents. They found that approximately one third of Indigenous youth aged 18-24 reported high levels of psychological distress, which was twice as high as the proportion among non-Indigenous youth in the same age group.

Orygen's (2017) report "*Under the radar: the mental health of Australian university students"* focused more especially on young people enrolled in tertiary education institutions. The report argued that previous research had predominantly focused on school students, while university students had been omitted. It further highlighted the prevalence of poor mental health and its' impact among university students, as well as the gaps in policy and institutional responses. Building upon this report, and with the support of the Australian Government Department of Health, Orygen developed an Australian University Mental Health Framework (Orygen, 2020). The framework identified structural barriers to enhancing university students' mental health and set up principles to provide concerted support to address such issues.

Impact of poor mental health on early educational outcomes

The disproportionate burden of poor mental health borne by individuals from disadvantaged backgrounds, particularly young people and students from such backgrounds, has important repercussions for their subsequent educational trajectories. This is because it is well established that mental health problems, such as depressive symptoms and psychological distress, can lead to poor educational outcomes through impaired cognitive, emotional, physical and interpersonal functioning (Bowman et al., 2020; Bowman et al., 2017; Kessler et al., 1995). Poor mental health can lead to low levels of attention, information processing, decision-making, memory and motivation (American Psychiatric Association, 2013), which can in turn affect students' capacity to learn, enjoy, and persist in their studies. For example, a recent review of the literature found that high school students who experience depression and anxiety are more likely to have difficulties with processing speed, perceptual reasoning, and verbal comprehension, resulting in learning problems, low grades, and a higher probability of dropping out of school (Bowman et al., 2020).

Numerous studies, both international (Brännlund et al., 2017; Dalsgaard et al., 2020; Mojtabai et al., 2015; Riglin et al., 2014) and Australian (Bowman et al., 2020; Bowman et al., 2017; Leach & Butterworth, 2012; Weidman et al., 2015), have documented elevated high school drop-out rates among children with poor mental health. For instance, Riglin et al. (2014) conducted a meta-analysis on 26 longitudinal studies and found significant effects of emotional problems (e.g., depression and anxiety) on subsequent school attainment. In Australia, drawing on data from individuals aged 20-34 from the 2007 Australian National Survey of Mental Health and Wellbeing (n=2,055), Leach and Butterworth (2012) found early-onset mental disorders to be significantly associated with the early termination of secondary education, particularly Year 10 completion. Bowman et al. (2017) conducted a narrative review to bring together quantitative and qualitative Australian studies on the impact of poor mental health on young people's educational attainment. Based on 23 studies identified through a systematic search, they found that about two fifths of adolescents experiencing depression or anxiety disorders did not complete secondary school, much higher than the national average (e.g., the national Year 7 to Year 12 full-time retention rate was 84 per cent in 2019, ABS, 2020).

Mental health and student dropout from higher education

Despite a growing interest in student mental health and a long tradition of research on factors predicting student attrition (Bean, 1980; Burke, 2019; Kember et al., 2021; Metzner & Bean, 1987; Tight, 2020; Tinto, 1975, 2006), few Australian or international studies have considered how poor mental health affects dropout from higher education.[2] Australia proves an interesting case study to examine these relationships as the country has witnessed a considerable expansion in the higher education sector in recent decades due to a demand-driven funding system (Productivity Commission, 2019). While this system successfully increased higher education enrolments, it also increased dropout rates among students, particularly those from disadvantaged backgrounds (Kemp & Norton, 2014; Productivity Commission, 2019).

Numerous studies have considered how individual student attributes (e.g., educational aspirations, test results, and socioeconomic background) as well as institutional factors (e.g., admission selectivity, institution size, and degree of financial aid to students) contribute to

[2] A separate strand of the literature has focused on the impact that tertiary studies may have on students' mental health, reporting that universities can be stressful settings that can contribute to students developing poor mental health (Carter et al., 2017). As Carter et al., (2017) highlight, the transition into university can be a complex and demanding process for students. This occurs not only because students need to cope with higher-level studies, but also because of increased responsibilities related to managing their life independently – including financial constraints and distance from family. As a result, many young people develop mental health symptoms due to participation in higher education. This study is not concerned with this literature, but rather explores how pre-existing poor mental health can affect subsequent student outcomes.

the likelihood of early departure (see e.g., Bowles & Brindle, 2017; Pascarella & Terenzini, 2005). However, the role of student mental health as a factor that potentially contributes to university dropout has received relatively little attention, both in Australia and internationally. We attribute this to a lack of suitable data, particularly data with high-quality indicators of mental health among higher education students (Orygen, 2017, Brett, 2016; Orygen, 2020).

In the absence of optimal datasets, researchers have resorted to collecting indirect evidence to ascertain the potential effects of poor mental health on student attrition and other outcomes. For example, Crawford (2021) conducted a survey of approximately 1,800 mature-aged students in and from regional and remote Australia. She found that nearly half of the respondents (47.7%) considered deferring/withdrawing from their university course, with the top reason being stress (65.6%). Similarly, results from the Student Experience Survey (QILT, 2020), a major national survey of current higher education students, revealed that around one fifth of undergraduate students in 2019 had considered leaving university, with nearly half of them (46%) listing 'health' or 'stress' as the main reason.

In contrast, a study by Cvetkovski et al. (2018) led to the counterintuitive conclusion that psychological distress does not hamper student outcomes. Cvetkovski and colleagues drew on data from the Household Income and Labour Dynamics in Australia (HILDA) Survey and survival analyses to examine the impact of poor mental health on university dropout and completion among 1,265 undergraduate students. Students with poor mental health were significantly less likely to drop out and more likely to complete their degree after adjusting for confounds.

The most conclusive evidence to date comes perhaps from a recent analysis by DESE (2020a), which utilised the same linked administrative dataset as this study but had a different focus and featured different methods. The study showed that using mental health services during undergraduate studies was associated with a lower probability of completing a degree within a six-year window. The completion rate was 62 per cent among students who used the services, compared to 71 per cent among students who did not. The effect of mental health was as significant as that of the officially identified equity groups.

The international evidence also documents an adverse effect of poor mental health on student outcomes. For example, Mojtabai et al. (2015) used US National Comorbidity Survey data from 3,954 people aged 15-54 and discrete-time survival analyses to investigate the association between mental disorders and educational outcomes. Their results indicated that, on average, mental disorders accounted for 5.8 per cent to 11 per cent of high school dropouts, and for 3.2 per cent to 11.4 per cent of university dropouts.

The Australian higher education equity framework: Where does mental health fit?

The growing prevalence of poor mental health among young people, together with its recognised detrimental effects on student outcomes, have led to calls for recognising mental health problems within the Australian higher education equity framework.

Equity in the higher education sector has been one of the policy focus areas of successive Australian Governments since the 1960s. It stemmed from the recognition of the crucial role of higher education in improving socioeconomic circumstances and life quality among disadvantaged people, and from the premise that the under-representation of certain groups in higher education limited individuals' life chances and signalled the under-utilisation of human capital (National Board of Employment Education and Training (NBEET), 1996). In 1988, the Federal Government expressed its commitment to improving equity in higher education in the Dawkins White Paper on Higher Education Policy (Dawkins, 1988), which outlined barriers and associated inequalities in access to and success in higher education for several disadvantaged groups. This report served as the inspiration for a key discussion

paper in the field, *"A fair chance for all: national and institutional planning for equity in higher education"* (DEET, 1990). This paper along with the subsequent *"Equity and general performance indicators in higher education"* by Lin Martin (1994) laid out the foundations for the existing equity framework, by outlining six equity groups as follows:

- People from socioeconomically disadvantaged backgrounds;
- Aboriginal and Torres Strait Islander people;
- Women (with particular emphasis on those participating in non-traditional courses, and Research and Higher Degrees);
- People from Non-English Speaking Backgrounds;
- People with disability; and
- People from regional and remote areas (originally rural and isolated areas).

These equity groups were defined based on characteristics thought to be associated with barriers to participation and success in higher education, as well as manifestations of educational disadvantage. These were captured through five main performance indicators in higher education: access, participation, success, retention and completion. This framework was further refined in *"Equity and general performance indicators in higher education"* (Martin, 1994). More recently, the equity framework has been scrutinised in several major reviews (e.g., James et al., 2004; AIHW, 2014; Pitman & Koshy, 2014; Tomaszewski et al., 2018).

One of the main concerns emerging from these reviews was that the disability indicators did not explicitly include indicators of poor mental health (Brett, 2016), as was the case when data used in this study were collected. This could be explained by the fact that, historically, mental conditions have been held distinct from physically disabling conditions. Reflecting changing societal and scientific conventions, and given the increasing prevalence of mental health issues, various scholars and stakeholders recommended refining or complementing the disability indicator by including measures of poor mental health (e.g., AIHW, 2014; Brett, 2016) or adding students with poor mental health as an equity group in its own right (DESE, 2020a). The updated disability indicator in TCSI, which replaced HEIMS in 2021, addresses the issue by explicitly including mental health conditions among disabilities, impairments and long-term medical conditions.

The present study

Our study aims to provide empirical evidence that helps assess the validity of claims to formally incorporate student mental health within the Australian framework for equity in higher education. It will do so by investigating the overlap between pre-existing poor mental health and membership in the designated equity groups, and the impact of pre-existing poor mental health on early student outcomes. As noted before, few studies have provided robust and comprehensive evidence on these matters. The lack of suitable data has been a key reason why current understandings of the field remain blurred. In this study, we overcome many of the methodological limitations of previous research by leveraging large-scale linked administrative data covering the entire population of individuals commencing an undergraduate degree. Further, the richness of the available data allows us also to complement the existing literature through the consideration of additional analytical pathways. As a result, this report makes several contributions to the literature.

A first set of contributions is methodological. First, studies of student dropout from higher education often rely on small sample sizes and/or on data from single institutions. In contrast, our linked administrative dataset allowed us to analyse the full population of domestic undergraduates in Australia commencing their studies between 2012-2015. This maximises the external validity of the findings and minimises estimation errors. Second, most existing studies on the relationship between mental health and student outcomes utilised self-reported measures of mental health that suffer from significant social desirability

biases (Martin, 2010). Relying on administrative records allowed us to create an objective measure of poor mental health. A drawback of relying on such data is that they cannot capture individuals with mental health conditions who never sought medical help. Despite this, administrative records are an invaluable data source offering insight into the health of the entire population while avoiding relying on respondents' memory and costs associated with data collection. Similar data are used in public health studies by researchers and government agencies both in Australia and abroad (e.g., DESE 2020a, Bortes et al., 2021; Brännlund et al., 2017; Saxby et al., 2020). Further, the longitudinal nature of the data made it possible to capture poor mental health before the commencement of an undergraduate degree (i.e., before mental health issues stemming from higher education participation could occur). This reduced the risk of bias due to reverse causation.[3] Third, many studies of student attrition, especially those based on cross-sectional surveys, do not capture actual dropout. Instead, they rely on withdrawal intentions as a proxy measure. In this study, students who left their studies could be reliably identified, thanks to the availability of longitudinal data on university enrolment.

A second set of contributions relates to expanding the analytic scope beyond a mere examination of the impact of mental health on student attrition. First, our inquiry considers overlaps between students' membership in each of the equity groups and experiences of poor mental health. This improves on existing scholarship by investigating the relationship between mental health and multiple equity groups at the same time. Constrained by data availability, most previous studies were only able to examine the overlap of poor mental health with a single disadvantaged group at a time—precluding comparisons across equity groups. The recent report by DESE (2020a) discussed before is a notable exception. However, this report focuses on students' mental health while they are undertaking their studies and on its impact on their outcomes at a more distant future time point. Second, we add to current knowledge by explicitly considering interconnectedness in the effects of equity-group membership and mental health on student attrition. Other studies have failed to disentangle what portion of the impact of poor mental health on student outcomes is explained by equity-group membership. Third, we explore whether students who simultaneously belong to an equity group *and* experience poor mental health exhibit particularly suboptimal outcomes. This analytic approach is consistent with tenets of intersectionality and cumulative-disadvantage theories, by recognising that holding multiple disadvantaged statuses may exert multiplicative negative effects on student outcomes (Tomaszewski et al., 2018). To our knowledge, no previous studies in this field have followed these approaches.

In the next section, we describe the data and methods used in our empirical analyses.

[3] The annual cycle of data collection does not allow precise reconstruction of the chronology of events. Therefore, we cannot distinguish between mental health conditions diagnosed before and after dropout if both the diagnosis and dropout occurred in the same year. A first-year student leaving university due to a condition developed during the first year and a person diagnosed with a mental health condition are indistinguishable in the data. For this reason, it is important to measure mental health in the year before the commencement of a degree. Given the data constraints, this is the only course of action assuring proper modelling of the direction of the relationship between poor mental health and first-year student attrition.

Methods

Dataset and sample selection

This research utilised a customised MADIP dataset made available to the research team by the Australian Government Department of Education, Skills and Employment (DESE). The data included information from the Higher Education Information Management System (HEIMS), Medicare Benefits Schedule (MBS), Pharmaceutical Benefits Schedule (PBS), and Personal Income Tax (PIT) records. The Australian Bureau of Statistics (ABS) was responsible for linking the information across these datasets (achieving a high linkage rate) and facilitated access to linked de-identified unit-level records. Mental health data were available for 97 per cent of the population in scope. For more detailed information about the standard MADIP dataset, including the linkage methodology, see ABS (2018).

The spine of the analytical dataset was based on HEIMS and contained higher education records of all domestic undergraduate students enrolled in Australian universities for the first time between 2012-2015. The data included information on the timing of enrolment in a higher education institution, type of course attended, field of education, and students' characteristics such as age, gender, country of birth, language spoken at home, and disability. The MBS and PBS datasets added rich and accurate information on mental health-related services and medication, respectively. In turn, the PIT data provided information on labour-market activity.

Overall, data on 657,777 individuals were drawn from HEIMS. Less than one per cent of observations were excluded from the sample due to missing data on analytic variables, most often those derived from address records (0.6 per cent). The final dataset comprised 652,023 individuals.

Measures

Poor mental health

Our primary variable of interest was mental health in the year preceding the commencement of an undergraduate degree. Since our interest is in the overlaps between poor mental health and officially designated equity groups (all of which are identified using data preceding university commencement), and in the effects of mental health on higher education outcomes, we deliberately chose to capture poor mental health prior to commencing university. In defining this key outcome, we followed Australian government agencies such as the Australian Institute of Health and Welfare (AIHW). Specifically, we used the MBS and PBS records on the use of mental health-related services and medication to derive proxy measures for mental health conditions. The MBS records allowed us to identify individuals who accessed mental health-related services provided by general practitioners, psychiatrists, clinical psychologists, other psychologists, and other allied health specialists.[4] The PBS records contained information on the following classes of drugs: antipsychotics, anxiolytics, hypnotics, sedatives, antidepressants, psychostimulants, Attention-Deficit Hyperactivity Disorder (ADHD) agents, and nootropics.[5] Our main indicator of poor mental health was a binary variable identifying individuals who accessed at least one mental health-related service (from the MBS) *or* who were prescribed at least one mental

[4] MBS includes only records of services provided on a fee-for-service for which MBS benefits were paid. Mental health support obtained outside of the system is not included in the data. The dates in the records indicate when the service was processed by Medicare rather than when it was provided.

[5] PBS includes information only on medicine listed on the PBS Schedule of Pharmaceutical Benefits and does not include private prescriptions, over the counter medicines, medicines supplied to public hospital inpatients. However, according to AIHW, these constitute only a small portion of all medicines prescribed in Australia (AIHW, 2021). Before 1 April 2012, prescriptions "under co-payment" (i.e., those for medicines with costs below the co-payment threshold) were not recorded in PBS. This may lead to an underestimation of mental health medication use among the earlier cohorts in this study.

health-related medication (from the PBS). Nearly 86,000 individuals, or approximately 13 per cent of the sample, were observed to experience poor mental health using this *proxy* measure. In sensitivity analyses, we also considered alternative measures of poor mental health identifying (i) only individuals who were prescribed mental health-related medication at least once during the year prior to commencement (50,723 individuals, or 7.8% of the sample), and (ii) only individuals who accessed at least one mental health-related service (62,227 individuals, or 9.5% of the sample). Key results for these alternative measures are presented in the Sensitivity analysis section. These were very similar to those using our main measure and reported in the main text.

Equity-group membership

We approximated five of the officially designated equity groups in the Australian higher education system.[6] We constructed these variables approximating the official definitions used by the Australian Government as closely as possible (Tomaszewski et al., 2020; Tomaszewski et al., 2018; Tomaszewski et al., 2017; Tomaszewski et al., 2021).

- *Non-English Speaking Background (NESB) students* were foreign-born individuals who reported coming from a household in which a language other than English was spoken.
- *Low socioeconomic status (Low SES)* students were those who in the year before commencing university lived in the 20 per cent of areas with the lowest values in the Socio-Economic Indexes for Areas (SEIFA) Index of Education and Occupation (ABS, 2018a).[7]
- *Regional/rural/remote (RRR) students* were those who in the year before commencing university lived in areas other than major cities, based on the Australian Statistical Geography Standard (ASGS) Remoteness Structure (ABS, 2016).
- *Indigenous graduates* were those who reported being of Aboriginal and/or Torres Strait Islander descent in their interactions with the Australian Government.[8]
- *Students with disability* were individuals who, at the beginning of their studies, self-reported having disability. A cautionary note on terminology is due here. The definition of disability in higher education data has changed since the data were collected and now explicitly includes mental health conditions. In the period covered by the data, students could explicitly indicate only six types of disability: hearing, learning, mobility, visual, medical or other. We use the old definition throughout the remainder of this report as this definition applies to the data used in the analyses. Nevertheless, it is worth pointing out that since disability is self-reported in the HEIMS/TCSI data collections, it is possible that some individuals suffering from poor mental health were captured as part of the 'disability' group prior to 2021 through self-classifying as suffering from 'other' disability type.

Over 150,000 students (24% of the sample) qualified as RRR, 91,391 (14%) as Low SES, 51,602 (8%) as NESB, 39,489 (6%) as having disability, and 14,385 (2%) as Indigenous.

[6] The WINTA group is not covered in this report. Unlike the other five equity groups with natural reference points (e.g., Indigenous vs. non-Indigenous), WINTA could have multiple reference points such as men in the same fields or women in other fields etc. As such WINTA was not included in the analyses. In addition, the current definition of non-traditional areas of study is too broad to capture systemic disadvantage for women in higher education studies (Tomaszewski et al., 2018). Gender and fields of study were however included in the analyses as control variables.

[7] These data come from MADIP address histories compiled from multiple sources, including individuals' interactions with the Australian public service, Medicare and the income-support system, as well as from Census records.

[8] The variable is based on a flag that uses any available dataset across MADIP to check whether an individual *ever* identified as being Indigenous.

Student attrition

To measure student attrition, we considered students' enrolment status in the academic year following the year in which they commenced their undergraduate degrees. However, student attrition can be measured at various levels, each with a different meaning. For example, departing from an institution may not be equivalent to withdrawing from higher education entirely (Hovdhaugen, 2009; McCormick, 1997; Tinto, 1993). Hence, to obtain a full picture of student early departures in Australia, we constructed three measures of student attrition. While nested within one another, these measures capture progressively poorer outcomes, as well as capturing student attrition from different perspectives. Furthermore, each of them is relevant at a different decision-making level.

- The first measure identified individuals who abandoned fields of education after the first year (166,172 students or 26% of the sample). This was the broadest of the measures. It captured all forms of attrition, which could involve changing their field of education within a given institution, transferring to another institution, or leaving the system entirely.[9] This is of concern to heads of school or deans of faculties, who oversee courses. As leaving FOE might be caused by poor course fit or change of mind, the measure should be of interest to career advisors who help students choose their studies.
- The second measure of student attrition was narrower and focused on more serious cases. It identified students leaving a given higher education institution, which meant either transferring to another institution or leaving the system altogether (133,418 students or 21% of the sample). Leaving an institution might reflect poor institutional fit or student experience. It is important for vice-chancellors and senior university management.
- The third measure focused only on the most serious type of attrition – leaving the higher education system entirely (97,653 students or 15% of the sample), possibly due to disillusionment with higher education or poor university experience. It is paramount from the point of view of the Government, for whom this will be seen as a lost investment

Control variables

In our models, we controlled for a set of potential confounders. In models examining the relationship between poor mental health and equity group membership, the control variables included gender, age group, parental education (highest educational attainment of any parent), state of residence, and commencement year. In models predicting student dropout, we additionally controlled for field of education, attendance mode (internal, external, or multi-modal), attendance type (full-time or part-time), tertiary entrance score (quartiles plus a "no score" category),[10] and labour-market engagement (receiving employment income, receiving business income, and not having any income tax data). Tables 1.1 and 1.2 in Appendix II present descriptive statistics of all variables included in the analyses.

Analytic approach

Our main analysis was divided into two main stages. The first stage aimed at answering the first two research questions concerning the relationship between equity-group membership and poor mental health. A logistic regression model was used to investigate whether equity-group membership (captured by a set of binary variables) was associated with a higher probability of poor mental health.

[9] This measure approximated dropping out from a given course, something we could not capture directly in our data.

[10] The score is based on the Australian Tertiary Admission Rank (ATAR), but a large proportion of students enter higher education through non-ATAR pathways.

The second stage focused on research questions three to five concerning the relationship between poor mental health, equity-group membership, and student attrition. The analyses in this stage consisted of three steps. The first step involved analysing the impact of mental health on student attrition without controlling for equity-group membership. This yielded a "baseline" model against which to compare more complex models. In the second step, variables capturing equity-group membership were introduced in the model to test whether the effects of mental health were independent of equity-group membership. In the third step, interaction terms between the measure of mental health and equity-group membership were introduced in the model to test whether equity-group membership had a moderating effect on the relationship between poor mental health and student attrition. These logistic regression models were fitted on each of the three binary variables capturing student attrition.

A more detailed exposition of the analytical approach, including the model specifications, is presented in Appendix I.

Findings

Overlaps between equity-group membership and poor mental health

Descriptive patterns

Figure 1 shows the proportion of students from different equity and non-equity groups identified as having poor mental health in the year preceding the commencement of an undergraduate degree. Students belonging to at least one equity group are more likely to exhibit poor mental health (15.5%) than their counterparts not belonging to any of the groups (11.4%). There is, however, large variation between the groups. Students with disability were by far the most likely to have poor mental health (42.1%). In comparison, the corresponding value for students without disability was much lower (11.3%). Indigenous students were another equity group more likely to exhibit poor mental health than their non-equity counterparts (19.7% compared to 13.0%), albeit differences were less pronounced than among students with disabilities. The differences were much smaller in the case of RRR students, who were only marginally more likely than students from urban areas to have poor mental health (14.5% compared to 12.7%). Low SES students were slightly less likely to have poor mental health than their non-equity counterparts (12.8% compared to 13.2%), whereas NESB students were substantially less likely (6.4% compared to 13.7%).

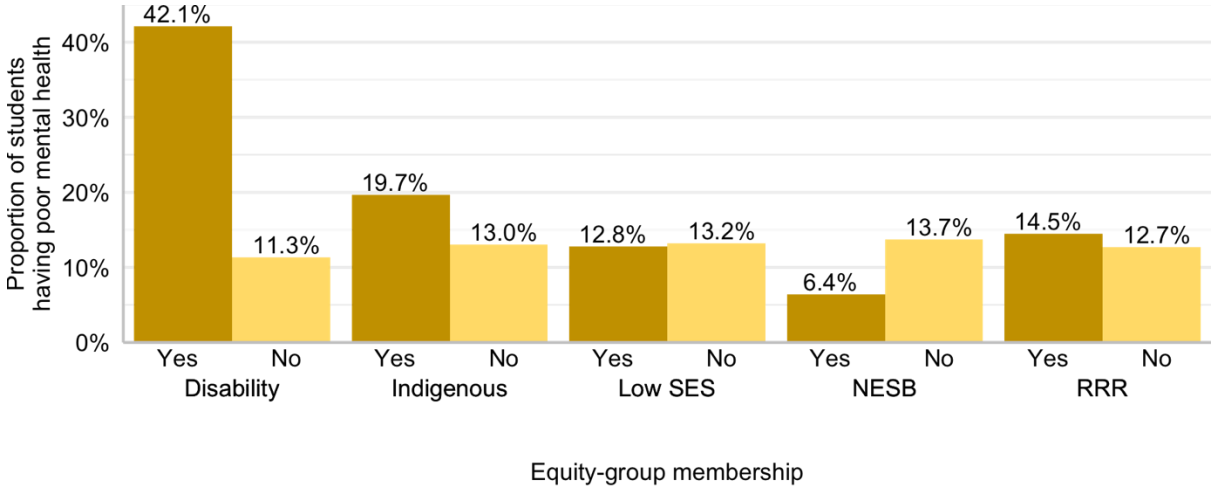

Figure 1. Proportion of students having poor mental health in the year preceding the commencement of their undergraduate studies, by equity-group membership

Notes: Data from customised MADIP dataset (2011-2016). SES: socioeconomic status. NESB: Non-English Speaking Background. RRR: regional, rural or remote.

Regression modelling

To verify the descriptive results, we turned to a multivariable logistic-regression model examining the relationships between equity-group membership and poor mental health while accounting for a range of potential confounds (i.e., gender, age group, parental education, state of residence, and commencement year). Figure 2 summarises the key results from the model using predictive margins while holding covariates at the observed values. The figure presents the estimated proportions of students with poor mental health across all equity and non-equity groups. Complete sets of model parameters are presented in Column VI of Table 2.1 in Appendix II.

Compared with the bivariate statistics presented before, the regression analyses revealed smaller differences between students with disability and Indigenous students and their non-

equity counterparts. This pattern of results suggests that some of the initial differences observed in the bivariate analyses stemmed from confounding on the control variables. That is, some of the effects of poor mental health stemmed from its correlation with other factors (e.g., age or gender). In the regression model, the predicted probability of poor mental health among students with disabilities was 38.4 per cent compared to 11.4 per cent among students without disability. For Indigenous and non-Indigenous students, the predicted probabilities of having poor mental health were 15.1 per cent and 13.1 per cent, respectively.

In the regression models, students from all other equity groups (i.e., Low SES, RRR and NESB) exhibited a *lower* predicted probability of poor mental health than their non-equity peers. The gap was smallest for RRR students (0.4 percentage points [pp]) and largest for NESB students (7.3 pp), with Low SES students (1 pp) falling in-between.

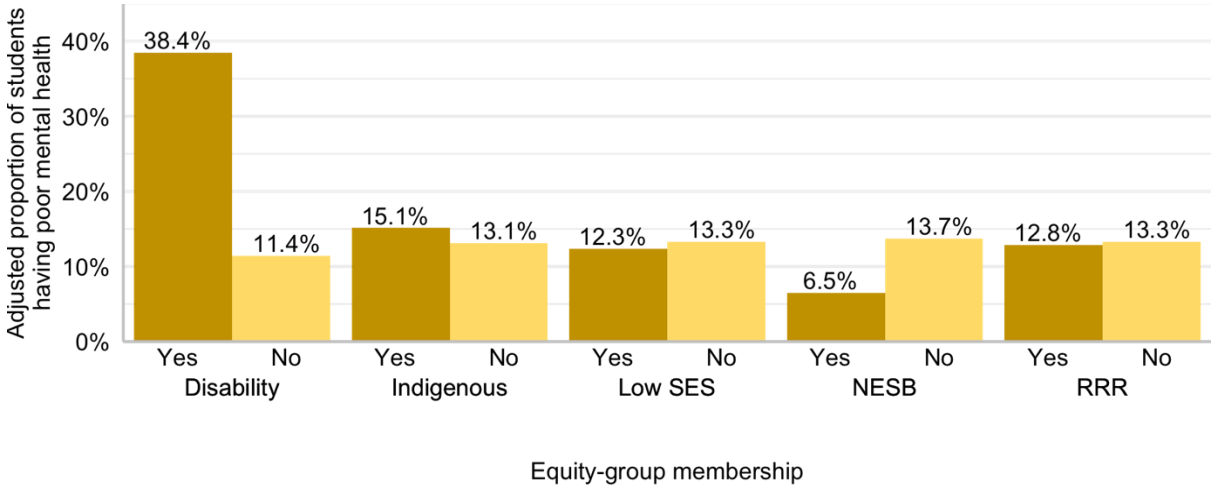

Figure 2. Adjusted proportion of students having poor mental health in the year preceding the commencement of their undergraduate studies, by equity-group membership

Notes: Data from customised MADIP dataset (2011-2016). SES: socioeconomic status. NESB: Non-English Speaking Background. RRR: regional, rural or remote. Predicted probabilities based on the model results presented in Column VI of Table 2.1 in Appendix II

Impact of poor mental health and equity-group membership on student attrition

Descriptive patterns

Figure 3 shows the bivariate relationships between student attrition rates and mental health. The results suggest that poor mental health is associated with higher attrition rates. For example, 24.5 per cent of students with good mental health dropped out of their field of education, compared to 31.9 per cent of students with poor mental health. Similar differences between students with good and poor mental health were observed for attrition from an institution (19.4% compared to 27.5%) and attrition from higher education (13.9% compared to 22.2%).

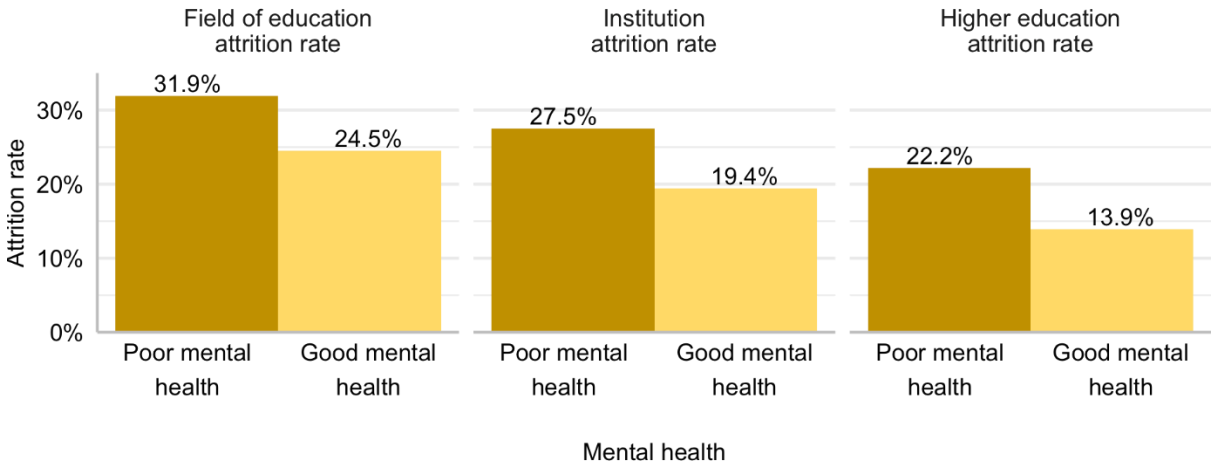

Figure 3. Field of education, institution, and higher education first-year attrition rates, by mental health status

Notes: Data from customised MADIP dataset (2011-2016).

Figure 4 shows the bivariate relationships between equity-group membership and student attrition. Attrition rates varied markedly between equity groups. All measures indicated that Indigenous students were the most likely to drop out after the first year, with 25.9 per cent leaving higher education, compared to 14.7 per cent for non-Indigenous students. Low-SES and RRR students also had higher dropout rates from their field, institution, and higher education overall than their non-equity peers. Students with disability had similar attrition rates across all measures relative to students without disability, while NESB students were less likely to drop out than other students.

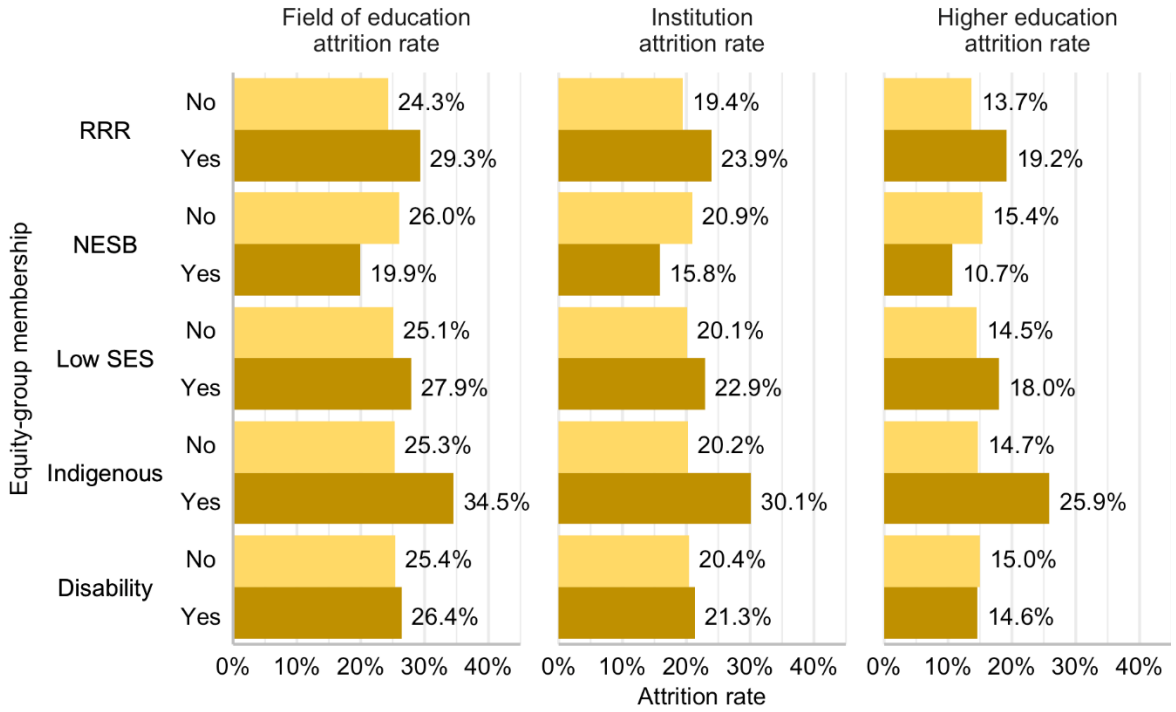

Figure 4. Field of education, institution, and higher education first-year attrition rates, by equity-group membership

Notes: Data from customised MADIP dataset (2011-2016). SES: socioeconomic status. NESB: Non-English Speaking Background. RRR: regional, rural or remote.

Regression modelling

To investigate the multivariable relationships between equity-group membership, poor mental health and student attrition, we again turned to logistic regression models.

Impact of equity-group membership on student attrition

The first set of models (see Models I, V, and IX in Table 1) aimed to verify the descriptive patterns shown in Figure 4. The models considered the effects of equity-group membership on student attrition after introducing the control variables, but without including the indicator of poor mental health. Whereas Indigenous and Low-SES students were significantly more likely than other students to drop out, NESB students were comparatively less likely to do so. The results for RRR students and students with disabilities were less consistent. RRR students were significantly more likely than their non-RRR peers to drop out from their field of education and from higher education overall, but not from their institution. In turn, students with disabilities were significantly less likely than those without disabilities to leave higher education, but not their fields or institutions.

Impact of poor mental health on student attrition

The second set of models (see Models II, VI, and X in Table 1) examined the effects of poor mental health on student attrition after introducing the control variables, but without controlling for equity-group membership. The aim was, again, to verify descriptive patterns presented in Figure 3. Across the models, poor mental health retained a statistically significant effect on the probability of students dropping out.

Impact of poor mental health and equity-group membership, net of each other

The third set of models (see Models III, VII, and XI in Table 1) included measures of both equity-group membership and poor mental health. The aim of these models was to test whether the effects of poor mental health on student attrition decrease after adding equity group membership to the model. They also serve to test whether the effects of equity group membership on student attrition decrease after adding poor mental health to the model. In other words, the models tested whether poor mental health and equity group membership affected student attrition independently of each other. There was little evidence of this, with the model coefficients on both the equity groups and the poor mental health indicator remaining similar in magnitude and statistical significance to those in the previous models. Students with disabilities were the only exception. Compared to the previous models, their odds ratios for all types of attrition became smaller and statistically significant, meaning that students with disabilities were less likely to drop out. This pattern of results can be interpreted as indicating that equity-group membership and poor mental health are largely independent factors affecting student attrition.

To compare the magnitude of the impact of equity-group membership and poor mental health on student attrition we turned to marginal predictions. Figure 5 visualises the adjusted differences in student attrition between the equity groups using predicted probabilities. Differences in attrition rates were largest between Indigenous and non-Indigenous students (between 4.7 pp and 4.9 pp, depending on the attrition measure). Differences by Low-SES and RRR status were noticeably smaller, even negligible in some cases (0.2 pp to 0.9 pp). In contrast, the predicted attrition rates for students with disability and NESB students were 1.5 pp to 2.9 pp lower than those exhibited by their non-equity counterparts.

Figure 6 visualises the adjusted differences in student attrition by mental health using predicted probabilities. Regardless of which attrition indicator is used, poor mental health was associated with a higher probability of dropping out. The predicted higher education attrition rate among students with poor mental health was 18.7 per cent, whereas the analogous rate among their counterparts with good mental health was 14.3 per cent. The field-of-education

attrition rates for these groups were 29.9 per cent and 24.8 per cent, respectively. This means that the effect of poor mental health on student attrition was on par with the effect of Indigenous status.

Converting these differences in adjusted attrition rates into the numbers of students that they represent helps illustrate the magnitude of the predicted impact of poor mental health on student attrition. To this avail, we compared the number of students with poor mental health who dropped out with the number of students who would have dropped out had the attrition rate been the same for both groups (i.e., had there been no relationship between mental health and student attrition).[11] Using this counterfactual, poor mental health was associated with approximately 4,400 more students dropping out of their field of education, 4,200 more students dropping out from their institution, and 3,750 more students dropping out of the higher education system.

[11] To calculate the relevant statistic, we multiplied the difference in attrition rates between students with poor and good mental health by the number of students with poor mental health.

Table 1. Selected model coefficients (odds ratios) from logistic regression models of student attrition

	FIELD OF EDUCATION ATTRITION				INSTITUTION ATTRITION				HIGHER EDUCATION ATTRITION			
MODEL NUMBER	**I**	**II**	**III**	**IV**	**V**	**VI**	**VII**	**VIII**	**IX**	**X**	**XI**	**XII**
MODEL TITLE	**EG**	**PMH**	**EG+PMH**	**EG×PMH**	**EG**	**PMH**	**EG+PMH**	**EG×PMH**	**EG**	**PMH**	**EG+PMH**	**EG×PMH**
PMH		1.31***	1.31***	1.29***		1.35***	1.35***	1.33***		1.39***	1.42***	1.41***
Equity groups												
Indigenous	1.29***		1.28***	1.30***	1.36***		1.35***	1.37***	1.45***		1.44***	1.48***
With disability	0.99		0.92***	0.93***	0.99		0.90***	0.92***	0.87***		0.78***	0.78***
NESB	0.83***		0.85***	0.84***	0.82***		0.85***	0.83***	0.77***		0.80***	0.79***
RRR	1.05***		1.05***	1.04***	1.01		1.02	1.00	1.07***		1.07***	1.07***
Low SES	1.03***		1.03***	1.03**	1.04***		1.05***	1.04***	1.06***		1.06***	1.06***
Interaction												
PMH × Indigenous				0.93				0.92				0.90*
PMH × With disability				0.97				0.96				0.99
PMH × NESB				1.18***				1.17***				1.14**
PMH × RRR				1.06**				1.07***				1.03
PMH × Low SES				1.02				1.02				1.01
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	652,023	652,023	652,023	652,023	652,023	652,023	652,023	652,023	652,023	652,023	652,023	652,023
Pseudo R^2	0.04	0.05	0.05	0.05	0.06	0.06	0.06	0.06	0.10	0.10	0.10	0.10

Notes: Data from customised MADIP dataset (2011-2016). EG: equity groups. PMH: poor mental health. SES: socioeconomic status. NESB: Non-English Speaking Background. RRR: regional, rural or remote. Complete sets of results are presented in Tables 3.1 to 3.4 in Appendix II. All coefficients reported in this table are exponentiated coefficients. Statistical significance: * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.

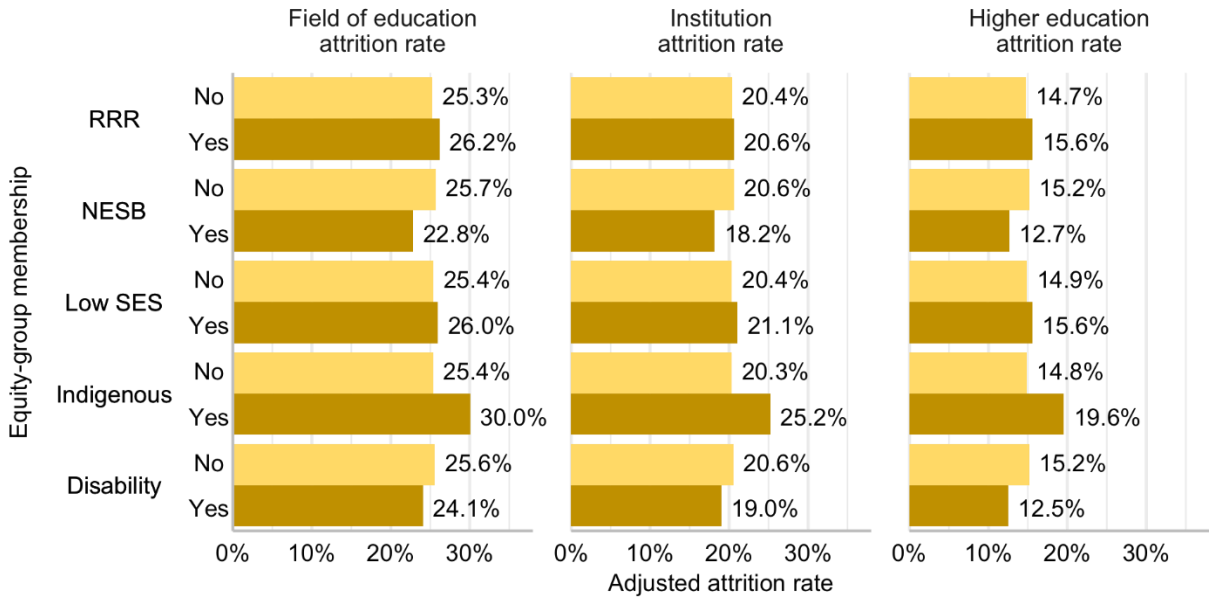

Figure 5. Adjusted field of education, institution, and higher education first-year attrition rates, by equity-group membership

Notes: Data from customised MADIP dataset (2011-2016). SES: socioeconomic status. NESB: Non-English Speaking Background. RRR: regional, rural or remote. Predicted probabilities based on the model results presented in Columns IV, VII, and X of Table 3.3 in Appendix II

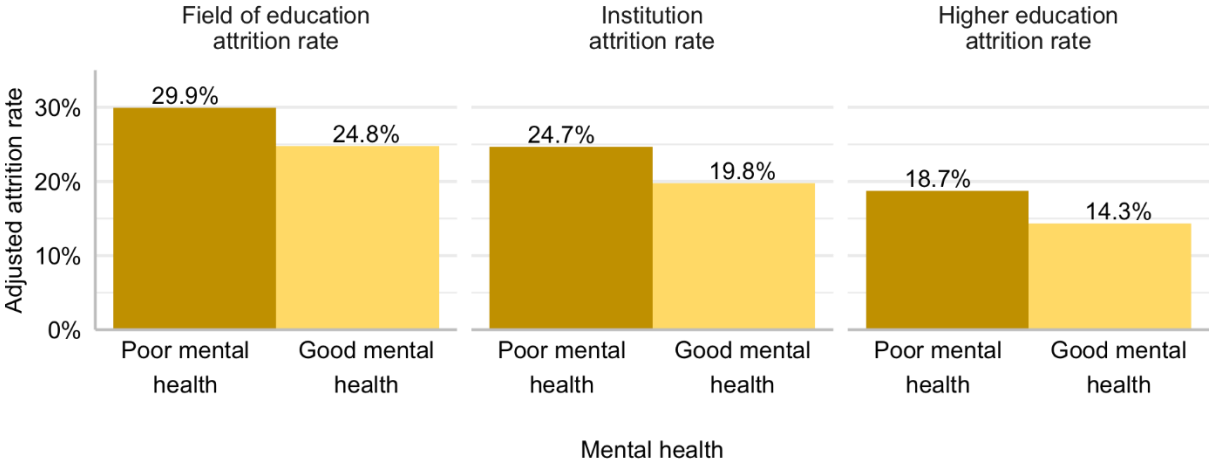

Figure 6. Adjusted field of education, institution, and higher education first-year attrition rates, by mental health status

Notes: Data from customised MADIP dataset (2011-2016). Predicted probabilities based on the model results presented in Columns IV, VII, and X of Table 3.3 in Appendix II.

Impact of poor mental health on student attrition across different equity groups

The fourth and final set of models, presented in Columns IV, VIII, and XII in Table 1, tested whether the effects of poor mental health were moderated by equity group membership. As explained before, this was accomplished through the inclusion of interaction terms in the regression models. The purpose of these models was to examine whether the estimated impact of poor mental health on student attrition was the same or different among members of each equity group, relative to non-members. The results provided little evidence of moderation, as indicated by the fact that most interaction terms were statistically non-significant.

NESB students were the only exception.[12] In all but one model, the interaction term between the poor mental health indicator and the NESB status indicator was statistically significant, and the odds ratios on both of these binary variables were greater than one. This indicates that, while NESB students were less likely to drop out and suffer from poor mental health, poor mental health increased their chances of dropping out to a greater extent than it did for their English-Speaking Background (ESB) peers. That is, poor mental health is particularly detrimental to the attrition of NESB students.

This pattern of results is visualised in Figure 7, which shows the associated predicted probabilities. This shows that the gap in the estimated attrition rates between NESB and ESB students was smaller for students who had poor mental health compared with students who had good mental health. For example, the gap in the predicted rate of attrition from higher education between students with poor and good mental health among NESB students was 5.5 pp, compared to 4.4 pp among ESB students. The effects are even more pronounced for other types of attrition.

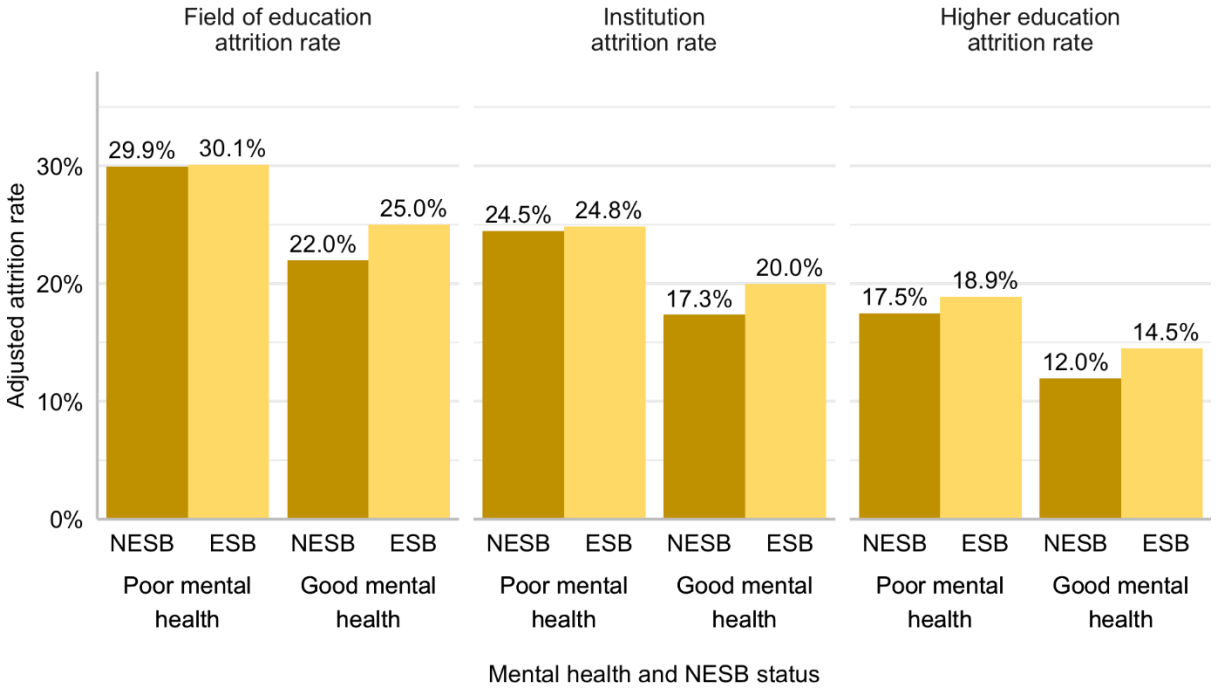

Figure 7. Adjusted field of education, institution, and higher education first-year attrition rates, by mental health and NESB status

Notes: Data from customised MADIP dataset (2011-2016). NESB: Non-English Speaking Background. ESB: English Speaking Background. Predicted probabilities based on the model results presented in Columns IV, VII, and X of Table 3.4 in Appendix II.

Impact of control variables

The third set of models was used to evaluate whether the control variables are important in their own right as factors affecting student attrition and to confirm the original assumption that they should be included in the models (results are shown in Table 3.3 in Appendix II). Although the effects of the control variables varied depending on the measure of attrition used as an outcome, there were some general patterns. Across the different models, student characteristics that were associated with significantly higher attrition rates included: being male, lower levels of parental educational attainment, receiving employment income, and a lower tertiary-entrance score.

[12] There was also some evidence of a moderating effect of RRR status when medication records were used to capture poor mental health. However, the effect was neither consistent across types of attrition nor substantive in magnitude.

The state or territory of residence was also an important factor. The odds ratios were almost always greater than one, indicating that students living in New South Wales (the reference category) were least likely to drop out. The odds ratio was highest for Tasmania, indicating that students from this state were the most likely to drop out.

In all models, the variables capturing study characteristics significantly affected attrition. Studying part-time and studying in external mode increased the probability of dropping out. Dropout rates also varied significantly across fields of education, with students of engineering and related technologies being least likely to drop out and students of creative arts among the most likely to drop out.

Sensitivity analyses

To examine the robustness of our results, we repeated all analyses for the other two measures of pre-existing poor mental health: (i) using mental health-related medication and (ii) using mental health-related services. Tables presenting results can be found in Appendix II. Overall, the conclusions from these analyses remained similar. Regardless of which poor mental health indicator was used, students with disability were most likely to have poor mental health (see Columns II and III of Table 2.1). Both alternative measures of poor mental health were associated with a higher risk of attrition (see Columns II, III, V, VI, VII, and VIII in Table 3.2). The effect of poor mental health remained significant even after introducing measures of equity-group membership as model controls. At the same time, the models showed that including the poor mental health indicator in the models did not diminish the effect of equity-group membership and the effects did not depend on the measure of mental health used (see Columns II, III, V, VI, VII, and VIII in Table 3.3 and marginal predictions in Table 3.6). The predicted attrition rates for students with poor mental health were, depending on the measure of dropout, between 4.4 and 5.2 pp higher than for those with good mental health (see Table 3.5). The outcomes from the final set of models showed that only the NESB status had a moderating effect on the association between poor mental health and first-year attrition (see model estimates in Columns II, III, V, VI, VII, and VIII in Table 3.4 and marginal predictions in Table 3.7).

Discussion

This project set out to generate unique empirical evidence on the relevance of mental health to Australia's higher education equity framework. In doing so, it can also help validate the inclusion of mental health conditions in the definition of disability in higher education data collections, a change that occurred in more recent years. Our analyses utilised new and powerful linked administrative data to shed light on two under-researched areas: (i) the relationship between equity-group membership and mental health at the commencement of an undergraduate degree, and (ii) the impact of poor mental health on first-year student attrition.

The first part of the report focused on the overlaps between equity groups and pre-existing poor mental health in the year before commencing an undergraduate degree. Our analyses revealed that members of only two equity groups—Indigenous students and people with disability—were more likely to exhibit poor mental health prior to commencing their university studies than their non-equity peers. The disparity was only substantial for people with and without disability. Depending on the indicator of poor mental health used, the predicted share of students with poor mental health was 3.4 to 4.2 times higher among students with disability than among students without disability. Overall, the adjusted proportion of individuals using mental-health services or taking mental-health medication was 38.4 per cent among students with disability, compared to 11.4 per cent among students without disability. This finding was consistent with previous literature showing that students with disabilities (AIHW, 2020; McMillan & Jarvis, 2013) and Indigenous students (Azzopardi et al., 2018; Dudgeon, 2017; Toombs & Gorman, 2011) are at an increased risk of experiencing mental health issues. While the overlap between having poor mental health and having a disability is significant, the number of students who used mental health-related medication or services in the year before commencement (13.1% of all students or 85,717 students in our cohort) exceeded the number of students with disability (6.1% or an estimated 39,489 students) by a wide margin. This suggests that students with poor mental health were not fully captured by the previous equity group for students with disabilities and that mental health conditions were rightly included in the current definition of disability.

The lack of overlap with the low SES equity group may seem surprising, given a body of research documenting higher rates of poor mental health among low SES children and young people compared to their higher SES counterparts (Reiss, 2013). A possible explanation is that the cost of mental health-related services, or perceived stigma associated with using them, may deter low SES students from seeking help so some low SES students who suffer from poor mental health might not be captured in our data.

The second part of the report aimed at answering three research questions concerning the effect of pre-existing poor mental health on student attrition, and how this effect relates to the effects of equity-group membership:

1. To what extent does poor mental health impact student attrition from higher education?
2. Does poor mental health constitute a separate type of higher education disadvantage?
3. How do the effects of poor mental health compound with the effect of membership in the officially identified equity groups?

The analyses showed that only for three of the five equity groups considered, Indigenous, Low SES, and RRR students, attrition rates were higher than for their non-equity counterparts. However, only in the case of Indigenous students the difference was pronounced. For example, the adjusted higher education rate among them was 19.6 per cent, compared to 14.8 per cent for non-Indigenous students. NESB students and students

with disability were in fact *less* likely to drop out than their peers.[13] Our results echo those of previous research by the Australian Government Department of Education and Training (2020b), which showed that students who self-identified as Indigenous and from remote areas had the lowest retention rates of all groups considered in their analyses. Previous research suggests that members of these two equity groups face more hurdles to succeeding in the higher education system than their peers, including financial problems, difficulties combining study and work, geographical isolation, and socio-cultural dissonance at higher education institutions (e.g., Edwards & McMillan, 2015; Li & Carroll, 2020; Nelson et al., 2017). Some, or all, of these factors may be responsible for the particularly high attrition rates for Indigenous and RRR students observed here.

Our analysis also demonstrated that pre-existing poor mental health adversely affected student attrition. This pattern of effects emerged for all of the attrition measures considered: attrition from a field of education, an institution, and the higher education system altogether. Poor mental health was associated with approximately 4,400 additional students in our cohort dropping out of their field of education, 4,200 additional students dropping out from their institution, and 3,750 additional students dropping out of higher education altogether.[14] However, in terms of the percentage increase, the effects of poor mental health were most pronounced for student attrition at the higher education system level and weakest for attrition at the field-of-education level. These results are consistent with the findings of earlier studies highlighting the adverse consequences of poor mental health on a variety of educational outcomes, including high school attrition (e.g., Bowman et al., 2020; Bowman et al., 2017; Dalsgaard et al., 2020; DESE, 2020a; Leach & Butterworth, 2012; Weidman et al., 2015). The data used in this report are not designed to explain the underlying mechanisms that produce the attrition of students with poor mental health from the higher education sector. However, previous literature suggests that poor mental health can negatively impact on attention, information processing, and learning motivation, all of which could be contributing to explaining our results. The adverse effects of poor mental health on cognitive functioning might also be exacerbated by the known stresses associated with beginning tertiary education (Bowman et al., 2020).

Importantly, we found that the effect of poor mental health on student attrition was largely independent of equity-group membership. Adjusting the models for equity-group membership did not meaningfully reduce the effects of poor mental health. In fact, the negative effect of poor mental health on student attrition was larger in magnitude than the effect of membership in each of the equity groups. Poor mental health was associated with a rise in the attrition rate ranging between 4.4 and 5.2 pp. Only the effect of being Indigenous was of a comparable magnitude (4.7 to 4.9 pp). This result echoes findings reported by DESE (2020a), who concluded that the effect of mental health on six-year degree completion rates was of a similar magnitude as the effects of the current equity groups. Altogether, these results unequivocally stress the critical importance of poor mental health as a predictor of student attrition during the first year of university. Despite the overlaps between students with poor mental health and students who belong to the equity groups noted before, our results indicate that the disadvantage stemming from having poor mental health is distinct from that stemming from being a member of an equity group. This finding is consistent with earlier calls to incorporate mental health within the Australian higher education equity framework (e.g., AIHW, 2014; Brett, 2016; DESE, 2020a; Norton & Brett, 2011). It also supports listing mental health conditions among disabilities, impairments or long-term medical conditions which may affect students' experiences and performance.

We also found little evidence of differences in the effect of poor mental health on student attrition by equity-group membership. In other words, we observed that the impact of poor

[13] It is worth remembering that these are already positively selected individuals as people from disadvantaged social backgrounds are less likely to commence higher education studies in the first place (Tomaszewski et al., 2018).

[14] Compared to a counterfactual situation in which poor mental health was not related to higher attrition.

mental health on student attrition was similar among equity and non-equity students. NESB students were the only exception. Although NESB students were the least likely to exhibit poor mental health, poor mental health affected their attrition rates more than it did the attrition rates of their ESB counterparts. This finding resonates with concerns about the wellbeing of young NESB people and the unavailability of culturally appropriate services to assist them. Research shows that people from a Culturally and Linguistically Diverse (CALD) background underutilise the National Disability Insurance Scheme (NDIS) (see e.g., Adibi, 2020) and mental health services (see e.g., Minas et al., 2013). Additional barriers to accessing mental health services among this group include lack of information about mental health, language and communication problems, and lack of knowledge on service availability (e.g., Curtis et al., 2018; Wohler & Dantas, 2017). Children and adolescents from a CALD background are also less likely to disclose mental health concerns and/or seek help due to enhanced mental health stigma in their communities (see e.g., Curtis et al., 2018). Collectively, these factors may be part of the reason behind the particularly deleterious impacts of poor mental health on student attrition that we observe among NESB higher education students.

Study limitations

Notwithstanding the importance and robustness of our findings, some study limitations must be acknowledged. Most of these limitations relate to the nature of the data used in our analyses. Despite some advantages of using MBS and PBS records (e.g., not being prone to social desirability issues affecting self-declared mental health measures, Martin, 2010), it is important to remember that these are only proxy indicators of students' actual mental health. For instance, the data do not capture individuals with poor mental health who do not seek professional support, including those who cannot access services or medication due to financial, cultural or other barriers. Further, the MBS and PBS do not cover all treatments and medicines. "Blind spots" include treatments obtained outside the system, private prescriptions, over-the-counter medicines, drugs supplied to public-hospital inpatients, and some Aboriginal health services. Direct measurements of mental health (e.g., diagnoses) or self-reports were not available in the MADIP data. Therefore, the percentage of students suffering from mental health conditions probably exceeds the percentage of students accessing mental health-related services and medications. That, however, should not affect the overall conclusion on the effect of mental health on student attrition. An untreated or undiagnosed mental health condition is quite unlikely to improve student outcomes. Thus, misclassifying individuals with undiagnosed or untreated mental health conditions as students with good mental health probably resulted in an underestimation of the effects of poor mental health on student first-year attrition.

In addition, our study was also targeted in scope, focusing on just one student outcome at the beginning of the participation stage. It would further our understanding of the impact of poor mental health thoroughly if future research could examine its impact on other stages of the student life course, i.e., access, success, completion and labour-market outcomes (Bennett et al., 2015). It is well established that the effects of poor mental health can be observed at earlier stages such as high school dropout (see e.g., Bowman et al., 2017; Riglin et al., 2014) and long-term quality-of-life outcomes (see e.g., Herrman et al., 2005).

Conclusion

Our study carries important lessons for policy and practice. In this section, we summarise the implications of our findings for the development of responses to increase equity in the Australian higher education system.

Over the past decade, multiple scholars and stakeholder groups have advocated for the inclusion of 'people with poor mental health' as an additional, independent group within the Australian higher education equity framework (e.g., AIHW, 2014; Brett, 2016; DESE, 2020a; Norton & Brett, 2011). The recent change in the definition of disability within TSCI partially responds to these calls, and this study empirically validated this decision. We posited that the following two conditions needed to be satisfied for students with poor mental health to constitute an equity group: (i) that there is only limited overlap between poor mental health and membership in the current equity groups, and (ii) that poor mental health exerts a substantial effect on student outcomes net of the effects of membership in the existing equity group. Our analysis generated robust evidence of the relationship between mental health and multiple measures of student attrition (from a field of education, from an institution, and from the higher education system). Specifically, and as detailed before, poor mental health was found to be positively and significantly related to all three measures of attrition. In fact, the negative influence of poor mental health on student attrition was stronger than the analogous influences of membership in any of the officially designated equity groups. This finding leads us to issue the following recommendation:

Recommendation 1. Stakeholders at all levels should consider pre-existing poor mental health as an important factor contributing to first-year student attrition and design more mental health-focused interventions.

Equity practitioners should be particularly mindful of poor mental health's negative effects among NESB students, as this is the equity group whose members are most negatively affected by poor mental health. This pattern of results also deserves further consideration by future research studies.

The interventions should aim at improving students' mental health and well-being overall, as well as supporting students with poor mental health, which should result in higher retention rates. The principles of the Mental Health Framework developed by Orygen (2020) are a useful guide for designing such interventions.

Our results show that despite the significant overlap between poor mental health and disability, as defined before 2021, the previous disability category did not capture a vast portion of students with poor mental health. The inclusion of students with poor mental health in the disability category potentially results in a significant expansion of the category. We therefore further recommend that:

Recommendation 2. The Australian Government should consider allocating more funding to support students with disabilities.

Furthermore, we noted above significant gaps in the data and scope of this project. Specifically, our findings need to be replicated using datasets containing better measures of student mental health and in studies considering other outcomes across the different stages of the student life cycle (e.g., access to higher education, program completion, and indicators of post-graduation labour-market success). Existing datasets are limited in their ability to yield optimally robust answers to these questions. This leads us to our final recommendation:

Recommendation 3. The Australian Government should consider funding: (a) the collection or linkage of data that enable a more robust examination of the extent and repercussions of poor mental health amongst university students, and (b) research that expands the analytic scope of this report to other phases of the student life cycle.

These new data sources and research studies would significantly expand current understandings of how mental health impacts all aspects of students' access, participation and success in higher education.

To conclude, this report demonstrates that poor mental health is a significant barrier to equity in higher education. Stakeholders at all levels should redouble their efforts to redress this situation and ensure that all students have the potential to succeed in higher education irrespective of their mental health.

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Technical appendix

Appendix I - Modelling approach

First, we investigated the relationship between equity-group membership and using mental health services or medication. We did it by fitting a series of logistic regression models of the following form:

$$\ln\left(\frac{p(PMH=1)}{1-p(PMH=1)}\right) = \alpha + \beta_1 EG + \beta_2 C_1 + e$$

Where *PMH* was one of the binary poor mental health indicators; *EG* was a set of dummy variables capturing membership in the equity groups; C_1 was a set of control variables including gender, age, parental education, state of residence, and cohort; α was the model's intercept; β_1 *and* β_2 were vectors of coefficients to be estimated; and *e* was the regression error. For ease of interpretation, model results are expressed as odds ratios (ORs)—i.e., exponentiated coefficients. ORs greater than 1 indicate that a one-unit increase in a given explanatory variable is associated with an increase in the odds of respondents taking the value 1 in the outcome variable, all else being equal. Correspondingly, ORs smaller than 1 indicate that a one-unit increase in a given explanatory variable is associated with a decrease in the odds of respondents taking the value 1 in the outcome variable, all else being equal.

Second, we examined the relationship between poor mental health and first-year attrition. We initially assessed the role of poor mental health without controlling for equity-group membership.

$$\ln\left(\frac{p(D=1)}{1-p(D=1)}\right) = \alpha + \beta_3 PMH + \beta_4 C_2 + e$$

Here, *D* was a binary variable capturing students' dropout, whereas C_2 was a set of control variables including all variables from C_1 as well as field of education, attendance mode and type, tertiary entrance score, receiving employment and business income.

We then investigated whether the effects of poor mental health are independent of equity-group membership by introducing measures of the latter as model controls. We assessed the results by comparing the coefficients on poor mental health across the models.

$$\ln\left(\frac{p(D=1)}{1-p(D=1)}\right) = \alpha + \beta_5 PMH + \beta_6 EG + \beta_7 C_2 + e$$

Finally, we tested whether equity-group membership had a moderating effect on the relationship between poor mental health and student attrition. We did so by introducing interaction terms, as follows:

$$\ln\left(\frac{p(D=1)}{1-p(D=1)}\right) = \alpha + \beta_8 PMH + \beta_9 EG + \beta_{10}(PMH \times EG) + \beta_{11} C_2 + e$$

Appendix II - Additional tables

Table 1.1. Descriptive statistics on key variables

Measure type	Variable	Per cent	n
Student attrition	Field of education	26%	166,172
	Institution	21%	133,418
	Higher education	15%	97,653
Student poor mental health	Using mental health services	10%	62,227
	Using mental health medication	8%	50,723
	Using mental health services or medication	13%	85,717
Equity groups	Indigenous	2%	14,385
	With disability	6%	39,489
	NESB	8%	51,602
	RRR	24%	153,028
	Low SES	14%	91,391
	Total	100%	652,023

Notes: Data from customised MADIP dataset (2011-2016). SES: socioeconomic status. NESB: Non-English Speaking Background. RRR: regional, rural or remote.

Table 1.2. Descriptive statistics on control variables

Variable	Values	Per cent	n
Gender	Female	59%	381,411
	Male	42%	270,612
Age	18 years or less	25%	163,703
	19 years	34%	220,159
	20-24 years	20%	132,831
	25-39 years	14%	91,990
	40+ years	7%	43,340
Parental education	Bachelor's degree or higher	32%	208,008
	Middle category	17%	111,680
	Completed Year 12 or lower	31%	204,662
	No information	20%	127,673
State	New South Wales	32%	211,216
	Victoria	26%	167,166
	Queensland	20%	129,149
	South Australia	7%	46,942
	Western Australia	10%	62,693
	Tasmania	3%	16,781
	Northern Territory	1%	3,986
	Australian Capital Territory	2%	14,090
Field of education	Natural and Physical Sciences	11%	72,611
	Information Technology	3%	20,028
	Engineering and Related Technologies	6%	40,360

Variable	Values	Per cent	n
	Architecture and Building	2%	15,590
	Agriculture, Environmental and Related Studies	2%	9,538
	Health	18%	120,003
	Education	10%	63,934
	Management and Commerce	16%	104,523
	Society and Culture	23%	152,539
	Creative Arts	8%	52,897
Cohort (Commencement year)	2012	24%	156,837
	2013	25%	163,441
	2014	26%	167,179
	2015	25%	164,566
Attendance mode	Internal	80%	519,503
	External	12%	75,491
	Multi-modal	9%	57,029
Attendance type	Full-time	85%	554,152
	Part-time	15%	97,871
Tertiary entrance score	1st quartile	15%	95,653
	2nd quartile	14%	89,912
	3rd quartile	14%	89,933
	4th quartile	14%	93,002
	No score	44%	283,523
Receiving employment income	Yes	73%	472,735
	No	27%	179,288
Receiving business income	Yes	2%	15,480
	No	98%	636,543
Not linked to PIT database	Yes	8%	49,081
	No	92%	602,942
	Total	100%	652,023

Notes: Data from customised MADIP dataset (2011-2016). PIT: Personal Income Tax.

Table 2.1. Results from logistic regression models predicting different poor mental health indicators using equity groups, complete set of model coefficients

Mental health indicator	Using services	Using medication	Using services or medication
Equity groups			
Indigenous	1.16***	1.21***	1.20***
With disability	4.85***	6.23***	5.51***
NESB	0.45***	0.33***	0.40***
RRR	0.86***	1.09***	0.96***
Low SES	0.86***	0.97*	0.91***
Controls			
Male	0.52***	0.58***	0.53***
Age (ref: 18 years of less)			
19 years	1.17***	1.33***	1.22***
20-24 years	1.63***	2.45***	1.85***
25-39 years	2.67***	5.08***	3.53***
40+ years	2.63***	6.86***	4.38***
Parental education (ref: no information)			
Bachelor's degree or higher	1.02	0.99	0.99
Middle category	0.93***	0.89***	0.91***
Completed Year 12 or lower	0.90***	0.92***	0.90***
State (ref: New South Wales)			
Victoria	0.98*	0.93***	0.96***
Queensland	1.02	1.23***	1.09***
South Australia	0.89***	0.93***	0.91***
Western Australia	0.83***	1.22***	0.96**
Tasmania	0.91***	1.02	0.97
Northern Territory	0.56***	0.62***	0.57***
Australian Capital Territory	0.84***	1.06	0.93**
Cohort (ref: 2012)			
2013	1.09***	1.91***	1.30***
2014	1.22***	2.21***	1.48***
2015	1.35***	2.34***	1.62***
Observations	652,023	652,023	652,023
Pseudo R^2	0.08	0.14	0.11

Notes: Data from customised MADIP dataset (2011-2016). SES: socioeconomic status. NESB: Non-English Speaking Background. RRR: regional, rural or remote. All coefficients reported in this table are exponentiated coefficients. Statistical significance: * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.

Table 3.1. Results from logistic regression models predicting first-year attrition from field of education, an institution, and higher education using equity-group membership, complete set of model coefficients

Type of attrition	Field of education attrition	Institution attrition	Higher education attrition
Equity groups			
Indigenous	1.29***	1.36***	1.45***
With disability	0.99	0.99	0.87***
NESB	0.83***	0.82***	0.77***
RRR	1.05***	1.01	1.07***
Low SES	1.03***	1.04***	1.06***
Controls			
Male	1.07***	1.10***	1.19***
Age (ref: 18 years of less)			
19 years	0.91***	0.93***	0.94***
20-24 years	0.84***	0.93***	1.05***
25-39 years	0.67***	0.82***	1.04**
40+ years	0.69***	0.87***	1.15***
Parental education (ref: no information)			
Bachelor's degree or higher	1.03***	1.00	0.72***
Middle category	1.03**	1.00	0.81***
Completed Year 12 or lower	1.05***	1.04***	0.91***
State (ref: New South Wales)			
Victoria	0.94***	1.04***	1.15***
Queensland	1.43***	1.40***	1.51***
South Australia	1.23***	1.23***	1.43***
Western Australia	1.10***	1.09***	1.25***
Tasmania	1.83***	1.75***	2.06***
Northern Territory	1.22***	1.32***	1.39***
Australian Capital Territory	0.98	0.97	1.09**
Cohort (ref: 2012)			
2013	1.06***	1.08***	1.09***
2014	1.06***	1.06***	1.09***
2015	1.03***	1.05***	1.09***
Field of education (ref: Natural and Physical Sciences)			
Information Technology	0.80***	0.91***	1.13***
Engineering and Related Technologies	0.62***	0.72***	0.83***
Architecture and Building	0.89***	1.00	1.04
Agriculture, Environmental and Related Studies	0.91***	0.90***	1.08*
Health	0.69***	0.91***	1.05**
Education	0.72***	0.90***	1.12***
Management and Commerce	0.78***	0.94***	1.12***

Type of attrition	Field of education attrition	Institution attrition	Higher education attrition
Society and Culture	0.92***	1.07***	1.20***
Creative Arts	0.91***	1.09***	1.32***
Mode (ref: Internal)			
External	1.22***	1.34***	1.33***
Multi-modal	0.78***	0.78***	0.78***
Part-time attendance	2.25***	2.35***	2.55***
Tertiary entrance score (ref: no score)			
Quartile 1	1.34***	1.35***	1.32***
Quartile 2	1.04***	0.99	0.85***
Quartile 3	0.72***	0.67***	0.51***
Quartile 4	0.45***	0.40***	0.27***
Receiving employment income	1.16***	1.16***	1.20***
Receiving business income	1.02	1.03	1.03
Not linked to PIT database	0.88***	0.89***	0.94***
Observations	652,023	652,023	652,023
Pseudo R^2	0.04	0.06	0.10

Notes: Data from customised MADIP dataset (2011-2016). SES: socioeconomic status. NESB: Non-English Speaking Background. RRR: regional, rural or remote. All coefficients reported in this table are exponentiated coefficients. Statistical significance: * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.

Table 3.2. Results from logistic regression models predicting first-year attrition from field of education, an institution, and higher education using different poor mental health indicators, complete set of model coefficients

Type of attrition	Field of education attrition			Institution attrition			Higher education attrition		
Poor Mental Health Indicator	S	M	SM	S	M	SM	S	M	SM
Poor mental health	1.31***	1.32***	1.31***	1.34***	1.35***	1.35***	1.39***	1.39***	1.39***
Controls									
Male	1.08***	1.08***	1.09***	1.11***	1.11***	1.12***	1.21***	1.21***	1.22***
Age (ref: 18 yrs or less)									
19 years	0.90***	0.90***	0.90***	0.93***	0.93***	0.93***	0.93***	0.93***	0.93***
20-24 years	0.83***	0.82***	0.82***	0.91***	0.91***	0.90***	1.02	1.02	1.02
25-39 years	0.65***	0.64***	0.64***	0.78***	0.77***	0.77***	0.98	0.97	0.96*
40+ years	0.67***	0.65***	0.65***	0.83***	0.81***	0.80***	1.08***	1.05**	1.05**
Parental education (ref: no information)									
Bachelor's degree or higher	1.02*	1.02*	1.02*	0.99	0.99	0.99	0.71***	0.71***	0.71***
Middle category	1.03**	1.03**	1.03**	1.00	1.00	1.00	0.81***	0.81***	0.81***
Completed Year 12 or lower	1.06***	1.06***	1.06***	1.04***	1.04***	1.04***	0.92***	0.92***	0.92***

Type of attrition	Field of education attrition			Institution attrition			Higher education attrition		
Poor Mental Health Indicator	**S**	**M**	**SM**	**S**	**M**	**SM**	**S**	**M**	**SM**
State (ref: New South Wales)									
Victoria	0.94***	0.94***	0.94***	1.04***	1.04***	1.04***	1.14***	1.14***	1.14***
Queensland	1.45***	1.44***	1.45***	1.41***	1.41***	1.41***	1.54***	1.53***	1.53***
South Australia	1.24***	1.23***	1.23***	1.23***	1.23***	1.23***	1.44***	1.43***	1.43***
Western Australia	1.11***	1.10***	1.10***	1.09***	1.08***	1.09***	1.25***	1.24***	1.24***
Tasmania	1.95***	1.93***	1.94***	1.81***	1.80***	1.81***	2.24***	2.22***	2.23***
Northern Territory	1.30***	1.30***	1.31***	1.38***	1.37***	1.38***	1.52***	1.51***	1.53***
Australian Capital Territory	0.97	0.97	0.97	0.96	0.96	0.96	1.07**	1.06*	1.07*
Cohort (ref: 2012)									
2013	1.05***	1.05***	1.05***	1.07***	1.06***	1.07***	1.08***	1.07***	1.08***
2014	1.05***	1.04***	1.04***	1.06***	1.05***	1.05***	1.08***	1.07***	1.07***
2015	1.02*	1.01	1.01	1.04***	1.03**	1.03***	1.08***	1.07***	1.07***
Field of education (ref: Natural and Physical Sciences)									
Information Technology	0.80***	0.80***	0.80***	0.91***	0.91***	0.91***	1.12***	1.12***	1.12***
Engineering and Related Technologies	0.63***	0.62***	0.63***	0.72***	0.72***	0.72***	0.84***	0.83***	0.84***
Architecture and Building	0.89***	0.89***	0.89***	1.01	1.01	1.01	1.05	1.05	1.05
Agriculture, Environmental and Related Studies	0.93**	0.93**	0.93**	0.92**	0.92**	0.92**	1.11**	1.11**	1.11**
Health	0.70***	0.70***	0.70***	0.91***	0.91***	0.91***	1.06***	1.06***	1.06***
Education	0.73***	0.73***	0.73***	0.91***	0.91***	0.91***	1.15***	1.15***	1.16***
Management and Commerce	0.78***	0.78***	0.78***	0.94***	0.94***	0.95***	1.13***	1.12***	1.13***
Society and Culture	0.92***	0.92***	0.92***	1.07***	1.07***	1.06***	1.20***	1.20***	1.20***
Creative Arts	0.91***	0.91***	0.91***	1.09***	1.10***	1.09***	1.33***	1.34***	1.33***
Mode (ref: Internal)									
External	1.26***	1.25***	1.26***	1.39***	1.38***	1.38***	1.40***	1.39***	1.39***
Multi-modal	0.79***	0.79***	0.79***	0.79***	0.79***	0.79***	0.80***	0.80***	0.80***
Part-time attendance	2.24***	2.24***	2.24***	2.33***	2.34***	2.33***	2.52***	2.53***	2.52***
Tertiary entrance score (ref: no score)									
Quartile 1	1.34***	1.34***	1.34***	1.35***	1.35***	1.35***	1.32***	1.32***	1.32***
Quartile 2	1.04***	1.04***	1.04***	0.99	0.99	0.99	0.85***	0.85***	0.85***
Quartile 3	0.72***	0.72***	0.72***	0.67***	0.67***	0.67***	0.50***	0.50***	0.50***
Quartile 4	0.45***	0.45***	0.45***	0.40***	0.40***	0.40***	0.26***	0.26***	0.26***

Type of attrition	Field of education attrition			Institution attrition			Higher education attrition		
Poor Mental Health Indicator	**S**	**M**	**SM**	**S**	**M**	**SM**	**S**	**M**	**SM**
Receiving employment income	1.18***	1.18***	1.18***	1.18***	1.18***	1.18***	1.23***	1.24***	1.24***
Receiving business income	1.02	1.03	1.03	1.03	1.04*	1.04	1.04	1.05*	1.04*
Not linked to PIT database	0.88***	0.88***	0.89***	0.89***	0.89***	0.89***	0.94**	0.94**	0.95**
Observations	652,023	652,023	652,023	652,023	652,023	652,023	652,023	652,023	652,023
Pseudo R^2	0.05	0.05	0.05	0.06	0.06	0.06	0.10	0.10	0.10

Notes: Data from customised MADIP dataset (2011-2016). S: mental health-related services. M: mental health-related medication. SM: mental health-related services or medication. PIT: Personal Tax Income. All coefficients reported in this table are exponentiated coefficients. Statistical significance: * p < 0.05, ** p < 0.01, *** p < 0.001.

Table 3.3. Results from logistic regression models predicting first-year attrition from field of education, an institution, and higher education using different poor mental health indicators and equity-group membership, complete set of model coefficients

Type of attrition	Field of education attrition			Institution attrition			Higher education attrition		
Poor Mental Health Indicator	**S**	**M**	**SM**	**S**	**M**	**SM**	**S**	**M**	**SM**
Poor mental health	1.32***	1.32***	1.31***	1.35***	1.36***	1.35***	1.41***	1.42***	1.42***
Equity groups									
Indigenous	1.28***	1.28***	1.28***	1.35***	1.35***	1.35***	1.45***	1.45***	1.44***
With disability	0.94***	0.93***	0.92***	0.92***	0.92***	0.90***	0.80***	0.80***	0.78***
NESB	0.84***	0.84***	0.85***	0.84***	0.84***	0.85***	0.79***	0.79***	0.80***
RRR	1.05***	1.05***	1.05***	1.02*	1.01	1.02	1.08***	1.07***	1.07***
Low SES	1.03***	1.03***	1.03***	1.05***	1.04***	1.05***	1.06***	1.06***	1.06***
Controls									
Male	1.08***	1.08***	1.09***	1.11***	1.11***	1.12***	1.22***	1.21***	1.22***
Age (ref: 18 years or less)									
19 years	0.90***	0.90***	0.90***	0.93***	0.93***	0.93***	0.93***	0.93***	0.93***
20-24 years	0.83***	0.83***	0.83***	0.92***	0.91***	0.91***	1.04**	1.03*	1.03*
25-39 years	0.66***	0.65***	0.65***	0.79***	0.79***	0.78***	1.01	1.00	0.99
40+ years	0.68***	0.66***	0.66***	0.84***	0.82***	0.82***	1.12***	1.08***	1.08***
Parental education (ref: no information)									
Bachelor's degree or higher	1.03***	1.03***	1.03***	1.00	1.00	1.00	0.72***	0.72***	0.72***
Middle category	1.03**	1.03**	1.03**	1.00	1.00	1.01	0.81***	0.81***	0.81***
Completed Year 12 or lower	1.06***	1.06***	1.06***	1.04***	1.04***	1.04***	0.92***	0.91***	0.92***

Type of attrition	Field of education attrition			Institution attrition			Higher education attrition		
Poor Mental Health Indicator	**S**	**M**	**SM**	**S**	**M**	**SM**	**S**	**M**	**SM**
State (ref: New South Wales)									
Victoria	0.94***	0.94***	0.94***	1.04***	1.04***	1.04***	1.15***	1.15***	1.15***
Queensland	1.43***	1.42***	1.43***	1.40***	1.39***	1.39***	1.50***	1.50***	1.50***
South Australia	1.23***	1.23***	1.23***	1.23***	1.23***	1.23***	1.44***	1.43***	1.44***
Western Australia	1.11***	1.10***	1.10***	1.09***	1.08***	1.09***	1.25***	1.24***	1.25***
Tasmania	1.84***	1.84***	1.84***	1.75***	1.75***	1.75***	2.07***	2.06***	2.07***
Northern Territory	1.24***	1.24***	1.24***	1.34***	1.34***	1.34***	1.41***	1.41***	1.42***
Australian Capital Territory	0.98	0.98	0.98	0.97	0.97	0.97	1.10***	1.09**	1.09***
Cohort (ref: 2012)									
2013	1.06***	1.05***	1.05***	1.07***	1.06***	1.07***	1.08***	1.07***	1.08***
2014	1.05***	1.04***	1.05***	1.06***	1.05***	1.05***	1.08***	1.07***	1.07***
2015	1.02**	1.02	1.02	1.04***	1.03***	1.03***	1.08***	1.07***	1.07***
Field of education (ref: Natural and Physical Sciences)									
Information Technology	0.80***	0.80***	0.80***	0.92***	0.91***	0.92***	1.13***	1.13***	1.13***
Engineering and Related Technologies	0.63***	0.63***	0.63***	0.72***	0.72***	0.72***	0.84***	0.84***	0.84***
Architecture and Building	0.89***	0.89***	0.89***	1.01	1.01	1.01	1.05	1.05	1.05
Agriculture, Environmental and Related Studies	0.91***	0.91***	0.91***	0.91***	0.91***	0.91***	1.08*	1.08*	1.08*
Health	0.69***	0.69***	0.69***	0.91***	0.91***	0.91***	1.05***	1.05**	1.05**
Education	0.72***	0.72***	0.72***	0.90***	0.90***	0.90***	1.13***	1.13***	1.13***
Management and Commerce	0.79***	0.79***	0.79***	0.95***	0.94***	0.95***	1.13***	1.12***	1.13***
Society and Culture	0.91***	0.92***	0.91***	1.06***	1.06***	1.06***	1.19***	1.19***	1.19***
Creative Arts	0.90***	0.91***	0.90***	1.08***	1.09***	1.08***	1.32***	1.32***	1.32***
Mode (ref: Internal)									
External	1.23***	1.22***	1.23***	1.35***	1.35***	1.35***	1.34***	1.33***	1.34***
Multi-modal	0.78***	0.78***	0.78***	0.78***	0.78***	0.78***	0.78***	0.78***	0.78***
Part-time attendance	2.24***	2.25***	2.24***	2.34***	2.34***	2.33***	2.54***	2.54***	2.54***
Tertiary entrance score (ref: no score)									
Quartile 1	1.34***	1.34***	1.34***	1.35***	1.35***	1.35***	1.32***	1.32***	1.32***
Quartile 2	1.04***	1.04***	1.04***	0.99	0.99	0.99	0.85***	0.86***	0.86***
Quartile 3	0.72***	0.73***	0.73***	0.67***	0.67***	0.67***	0.51***	0.51***	0.51***
Quartile 4	0.46***	0.46***	0.46***	0.40***	0.40***	0.40***	0.27***	0.27***	0.27***

Type of attrition	Field of education attrition			Institution attrition			Higher education attrition		
Poor Mental Health Indicator	**S**	**M**	**SM**	**S**	**M**	**SM**	**S**	**M**	**SM**
Receiving employment income	1.16***	1.16***	1.17***	1.16***	1.16***	1.17***	1.21***	1.21***	1.21***
Receiving business income	1.02	1.03	1.03	1.03	1.04*	1.04	1.04	1.04*	1.04
Not linked to PIT database	0.89***	0.89***	0.89***	0.89***	0.89***	0.90***	0.95**	0.95**	0.95**
Observations	652,023	652,023	652,023	652,023	652,023	652,023	652,023	652,023	652,023
Pseudo R^2	0.05	0.05	0.05	0.06	0.06	0.06	0.10	0.10	0.10

Notes: Data from customised MADIP dataset (2011-2016). S: mental health-related services. M: mental health-related medication. SM: mental health-related services or medication. SES: socioeconomic status. NESB: Non-English Speaking Background. RRR: regional, rural or remote. PIT: Personal Tax Income. All coefficients reported in this table are exponentiated coefficients. Statistical significance: * p < 0.05, ** p < 0.01, *** p < 0.001.

Table 3.4. Results from logistic regression models predicting first-year attrition from field of education, an institution, and higher education using different poor mental health indicators, equity-group membership, and their interaction, complete set of model coefficients

Type of attrition	Field of education attrition			Institution attrition			Higher education attrition		
Poor mental health indicator	**S**	**M**	**SM**	**S**	**M**	**SM**	**S**	**M**	**SM**
Poor mental health	1.30***	1.30***	1.29***	1.34***	1.34***	1.33***	1.42***	1.41***	1.41***
Equity groups									
Indigenous	1.30***	1.28***	1.30***	1.37***	1.35***	1.37***	1.47***	1.46***	1.48***
With disability	0.95***	0.95**	0.93***	0.93***	0.94***	0.92***	0.81***	0.81***	0.78***
NESB	0.83***	0.84***	0.84***	0.83***	0.83***	0.83***	0.78***	0.78***	0.79***
RRR	1.05***	1.04***	1.04***	1.01	1.01	1.00	1.08***	1.07***	1.07***
Low SES	1.03***	1.03**	1.03**	1.05***	1.04***	1.04***	1.07***	1.06***	1.06***
Interactions									
Poor mental health × Indigenous	0.93	1.01	0.93	0.92	0.98	0.92	0.92	0.95	0.90*
Poor mental health × With disability	0.97	0.93**	0.97	0.97	0.93**	0.96	0.97	0.96	0.99
Poor mental health × NESB	1.16**	1.18**	1.18***	1.15**	1.19**	1.17***	1.11	1.21**	1.14**
Poor mental health × RRR	1.04	1.05*	1.06**	1.04	1.07**	1.07***	1.01	1.02	1.03
Poor mental health × Low SES	0.99	1.04	1.02	0.98	1.04	1.02	0.99	1.01	1.01
Controls									
Male	1.08***	1.08***	1.09***	1.11***	1.11***	1.12***	1.22***	1.21***	1.22***
Age (ref: 18 years or less)									
19 years	0.90***	0.90***	0.90***	0.93***	0.93***	0.93***	0.93***	0.93***	0.93***
20-24 years	0.83***	0.83***	0.83***	0.92***	0.91***	0.91***	1.04**	1.03*	1.03*

Type of attrition	Field of education attrition			Institution attrition			Higher education attrition		
Poor mental health indicator	**S**	**M**	**SM**	**S**	**M**	**SM**	**S**	**M**	**SM**
25-39 years	0.66***	0.65***	0.65***	0.79***	0.79***	0.78***	1.01	1.00	0.99
40+ years	0.68***	0.66***	0.66***	0.84***	0.82***	0.82***	1.12***	1.08***	1.08***
Parental education (ref: no information)									
Bachelor's degree or higher	1.03***	1.03***	1.03***	1.00	1.00	1.00	0.72***	0.72***	0.72***
Middle category	1.03**	1.03**	1.03**	1.00	1.00	1.01	0.81***	0.81***	0.81***
Completed Year 12 or lower	1.06***	1.06***	1.06***	1.04***	1.04***	1.04***	0.92***	0.91***	0.92***
State (ref: New South Wales)									
Victoria	0.94***	0.94***	0.94***	1.04***	1.04***	1.04***	1.15***	1.15***	1.15***
Queensland	1.43***	1.42***	1.43***	1.40***	1.39***	1.39***	1.50***	1.50***	1.50***
South Australia	1.23***	1.23***	1.23***	1.23***	1.23***	1.23***	1.44***	1.43***	1.44***
Western Australia	1.11***	1.10***	1.10***	1.09***	1.08***	1.09***	1.25***	1.24***	1.25***
Tasmania	1.84***	1.84***	1.84***	1.76***	1.75***	1.75***	2.07***	2.06***	2.07***
Northern Territory	1.24***	1.24***	1.25***	1.34***	1.34***	1.35***	1.41***	1.41***	1.42***
Australian Capital Territory	0.98	0.98	0.98	0.97	0.97	0.97	1.10***	1.09**	1.09***
Cohort (ref: 2012)									
2013	1.06***	1.05***	1.05***	1.07***	1.06***	1.07***	1.08***	1.07***	1.08***
2014	1.05***	1.04***	1.05***	1.06***	1.05***	1.05***	1.08***	1.07***	1.07***
2015	1.02**	1.02	1.02	1.04***	1.03***	1.03***	1.08***	1.07***	1.07***
Field of education (ref: Natural and Physical Sciences)									
Information Technology	0.80***	0.80***	0.80***	0.92***	0.91***	0.92***	1.13***	1.13***	1.13***
Engineering and Related Technologies	0.63***	0.63***	0.63***	0.72***	0.72***	0.72***	0.84***	0.84***	0.84***
Architecture and Building	0.89***	0.89***	0.89***	1.01	1.01	1.01	1.05	1.05	1.05
Agriculture, Environmental and Related Studies	0.91***	0.91***	0.91***	0.91***	0.91***	0.91***	1.08*	1.08*	1.08*
Health	0.69***	0.69***	0.69***	0.91***	0.91***	0.91***	1.05***	1.05**	1.05**
Education	0.72***	0.72***	0.72***	0.90***	0.90***	0.90***	1.13***	1.13***	1.13***
Management and Commerce	0.79***	0.78***	0.79***	0.95***	0.94***	0.95***	1.13***	1.12***	1.13***
Society and Culture	0.91***	0.92***	0.91***	1.06***	1.06***	1.06***	1.19***	1.19***	1.19***
Creative Arts	0.90***	0.91***	0.90***	1.08***	1.09***	1.08***	1.32***	1.32***	1.32***
Mode (ref: Internal)									
External	1.23***	1.22***	1.23***	1.35***	1.34***	1.35***	1.34***	1.33***	1.34***

Type of attrition	Field of education attrition			Institution attrition			Higher education attrition		
Poor mental health indicator	S	M	SM	S	M	SM	S	M	SM
Multi-modal	0.78***	0.78***	0.78***	0.78***	0.78***	0.78***	0.78***	0.78***	0.78***
Part-time attendance	2.24***	2.25***	2.24***	2.34***	2.34***	2.34***	2.54***	2.54***	2.54***
Tertiary entrance score (ref: no score)									
Quartile 1	1.34***	1.34***	1.34***	1.35***	1.35***	1.35***	1.32***	1.32***	1.32***
Quartile 2	1.04***	1.04***	1.04***	0.99	0.99	0.99	0.85***	0.86***	0.86***
Quartile 3	0.72***	0.72***	0.73***	0.67***	0.67***	0.67***	0.51***	0.51***	0.51***
Quartile 4	0.46***	0.46***	0.46***	0.40***	0.40***	0.40***	0.27***	0.27***	0.27***
Receiving employment income	1.16***	1.16***	1.17***	1.16***	1.16***	1.17***	1.21***	1.21***	1.21***
Receiving business income	1.02	1.03	1.03	1.03	1.04*	1.04	1.04	1.04	1.04
Not linked to PIT database	0.89***	0.89***	0.89***	0.89***	0.89***	0.90***	0.95**	0.95**	0.95**
Observations	652,023	652,023	652,023	652,023	652,023	652,023	652,023	652,023	652,023
Pseudo R^2	0.05	0.05	0.05	0.06	0.06	0.06	0.10	0.10	0.10

Notes: Data from customised MADIP dataset (2011-2016). S: mental health-related services. M: mental health-related medication. SM: mental health-related services or medication. SES: socioeconomic status. NESB: Non-English Speaking Background. RRR: regional, rural or remote. PIT: Personal Tax Income. All coefficients reported in this table are exponentiated coefficients. Statistical significance: * p < 0.05, ** p < 0.01, *** p < 0.001.

Table 3.5. Predicted field of education, an institution, and higher education first-year attrition rates for models predicting different poor mental health indicators, by mental health indicators

Type of attrition	Field of education attrition	Institution attrition	Higher education attrition
Not using mental health services	25.0%	20.0%	14.5%
Using mental health services	30.2%	24.8%	18.9%
Not using mental health medication	25.1%	20.0%	14.6%
Using mental health medication	30.3%	25.0%	19.0%
Not using mental health services or medication	24.8%	19.8%	14.3%
Using mental health services or medication	29.9%	24.7%	18.7%

Notes: Data from customised MADIP dataset (2011-2016). Predicted probabilities based on the model results presented in Appendix Table 3.3.

Table 3.6. Predicted field of education, an institution, and higher education first-year attrition rates for models predicting different poor mental health indicators, by equity-group membership

Type of attrition	Field of education attrition			Institution attrition			Higher education attrition		
Poor Mental Health Indicator	S	M	SM	S	M	SM	S	M	SM
Indigenous	30.1%	30.0%	30.0%	25.3%	25.3%	25.2%	19.6%	19.6%	19.6%
Not Indigenous	25.4%	25.4%	25.4%	20.3%	20.3%	20.3%	14.8%	14.8%	14.8%
Low SES	26.0%	25.9%	26.0%	21.1%	21.0%	21.1%	15.6%	15.6%	15.6%
Not Low SES	25.4%	25.4%	25.4%	20.4%	20.4%	20.4%	14.9%	14.9%	14.9%
NESB	22.7%	22.7%	22.8%	18.1%	18.1%	18.2%	12.6%	12.6%	12.7%
Not NESB	25.7%	25.7%	25.7%	20.7%	20.6%	20.6%	15.2%	15.2%	15.2%
RRR	25.2%	25.3%	25.3%	20.4%	20.4%	20.4%	14.7%	14.8%	14.7%
Not RRR	26.2%	26.1%	26.2%	20.7%	20.6%	20.6%	15.6%	15.6%	15.6%
With disability	24.4%	24.3%	24.1%	19.3%	19.2%	19.0%	12.7%	12.6%	12.5%
Not with disability	25.6%	25.6%	25.6%	20.5%	20.5%	20.6%	15.1%	15.1%	15.2%

Notes: Data from customised MADIP dataset (2011-2016). S: mental health-related services. M: mental health-related medication. SM: mental health-related services or medication. SES: socioeconomic status. NESB: Non-English Speaking Background. RRR: regional, rural or remote. Predicted probabilities based on the model results presented in Appendix II Table 3.3.

Table 3.7. Predicted field of education, an institution, and higher education first-year attrition rates, by mental health indicators and NESB status

Poor mental health indicator	Nesb status	Field of education	Institution	Higher education
Not using mental health services	NESB	22.1%	17.5%	12.1%
Not using mental health services	ESB	25.2%	20.2%	14.7%
Using mental health services	NESB	29.7%	24.2%	17.2%
Using mental health services	ESB	30.4%	25.0%	19.1%
Not using mental health medication	NESB	22.2%	17.6%	12.1%
Not using mental health medication	ESB	25.3%	20.2%	14.8%
Using mental health medication	NESB	30.3%	25.2%	18.5%
Using mental health medication	ESB	30.5%	25.3%	19.2%
Not using mental health services or medication	NESB	22.0%	17.3%	12.0%
Not using mental health services or medication	ESB	25.0%	20.0%	14.5%
Using mental health services or medication	NESB	29.9%	24.5%	17.5%
Using mental health services or medication	ESB	30.1%	24.8%	18.9%

Notes: Data from customised MADIP dataset (2011-2016). NESB: Non-English Speaking Background. ESB: English Speaking Background. Predicted probabilities based on the model results presented in Appendix II Table 3.4.