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Culturally appropriate assessment of Depression and Anxiety in older Torres Strait Islanders: Limitations and Recommendations

Running Head: Depression and anxiety in the Torres Strait

Sarah G. Russell, PhD[a,b,c,], Rachel Quigley, MPhil[a,b,c] , Fintan Thompson, MEpi[c], Betty Sagigi[d], Gavin Miller BMed[b], Dina LoGiudice, PhD[e], Kate Smith, PhD[f], Edward Strivens MBBS [a,b,c] & Nancy A. Pachana, PhD[g]

[a]*College of Medicine and Dentistry, James Cook University, Cairns, Australia.*
[b]*Queensland Health, Cairns and Hinterland Hospital and Health Service, Cairns, Australia*
[c] *Australian Institute of Tropical Health and Medicine, James Cook University, Cairns, Australia*
[d] *Queensland Health, Torres and Cape Hospital and Health Service, Thursday Island, Australia*
[e]*Faculty of Medicine, Dentistry, and Health Services, Royal Melbourne Hospital, University of Melbourne, Victoria, Australia*
[f]*University of Western Australia, Perth, Australia*
[g]*School of Psychology, University of Queensland, Brisbane, Australia*

ORCID ID
Sarah G. Russell https://orcid.org/0000-0003-2845-5990
Rachel Quigley https://orcid.org/0000-0002-9943-9384
Fintan Thompson https://orcid.org/0000-0002-0798-2671
Dina LoGiudice https://orcid.org/0000-0002-0391-3898
Kate Smith https://orcid.org/0000-0003-4077-1996
Nancy A. Pachana https://orcid.org/0000-0002-8927-4205
Edward Strivens https://orcid.org/0000-0002-7260-508X

Corresponding author
Dr Sarah Russell
Healthy Ageing Research Team
College of Medicine and Dentistry
Divison of Tropical Health and Medicine
James Cook University, Cairns Campus
Smithfield QLD 4878

Email: Sarah.Russell6@jcu.edu.au
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Research data are not available

Biographical Note
Sarah Russell
Dr Sarah Russell is an Associate Professor with the College of Medicine and Dentistry, James Cook University and a founding member of the Healthy Ageing Research Team (HART). Her research focuses on healthy ageing, with a particular focus on Aboriginal and Torres Strait Islander communities in FNQ. Sarah has been instrumental in attracting 8 continuous years of NHMRC grant funding of just under $3 million. She holds a Masters and PhD in Clinical Neuropsychology and combines her research work with a clinical role as a Neuropsychologist. Sarah also provides research supervision to postgraduate students and clinical supervision to psychologists and neuropsychologists

Rachel Quigley
Rachel Quigley is a physiotherapist working in the field gerontology for over 20 years. She has worked in the UK, Saudi Arabia, Bahrain and Australia. She holds a clinical role in Cairns Hospital, as the Older Persons Liaison Advanced Clinician and has completed a MPhil through Griffith University focusing on the experiences of carers of older adults as they navigate aged care and health care systems. Rachel also holds a senior research position with the Health Ageing Research Team (HART) at James Cook University, Queensland, Australia. This research role focuses on projects involved with dementia and ageing within Aboriginal and Torres Strait Islander populations in Far North Queensland as well as models of integrated care. She is

undertaking a PhD through JCU, developing a framework of healthy ageing for the Torres Strait.

Fintan Thompson

Fintan Thompson has qualifications in epidemiology and clinical neuropsychology. He works as a Data Analyst at James Cook University and a Clinical Neuropsychologist Registrar at the Cairns Hospital. He has previously worked in epidemiology for governments, academia and humanitarian organisations. As a clinical neuropsychologist, Fintan has worked in rehabilitation, geriatrics, psychiatry and paediatrics. This combination of epidemiology and clinical experience provides Fintan with an understanding of how injury and disease at the population level impacts people at the individual level. He is from Far North Queensland and has an interest Indigenous health, including how midlife risk and protective factors influence cognitive functioning in later life.

Betty Sagigi

Betty Sagigi is a Torres Strait Islander Indigenous Health Worker. She is the Aged Care Assessment Team Coordinator and Assessor for the Torres Strait and Northern Peninsula Area, working as part of Thursday Island's Primary Health Post-Acute Rehab and Aged Care Program within Torres and Cape Hospital & Health Services for the last 10 years. Prior to this role, she managed Commonwealth Funding Agreements for the Primary Health Care Indigenous Health Programs and managed initiatives under Queensland State Government Department of Aboriginal and Torres Strait Islander Policy. Betty has been an integral part of the Healthy Ageing Research Team and has worked on the Dementia Prevalence study from design, data collection and through to knowledge translation. She has ensured the screening tools for dementia are culturally appropriate, facilitated maximum community participation and ensured that community consultation and engagement is conducted in a culturally safe and appropriate way.

Gavin Miller

Dr Gavin Miller studied Medicine as University of Newcastle and is a Senior Medical Officer in Geriatric Medicine with Cairns and Hinterland Hospital and Health Service. He is an Investigator on the *Reducing risk in Aboriginal and Torres Strait Islander Communities* and *A Framework for Healthy Ageing in the Torres Strait*, with HART.

Edward Strivens

Dr Eddy Strivens is a practising clinician and national leader in geriatric medicine and dementia, working in Far North Queensland for over 20 years. He has held an academic appointment with James Cook University since the commencement of the Clinical School in Cairns and is currently an Adjunct Professor. His research interests are in Culturally Appropriate Assessment, Healthy Ageing, Integrated Care and Models of Service Delivery. He has worked extensively with Aboriginal and Torres Strait Islander Communities in Far North Queensland and has validated the use of culturally appropriate cognitive assessment tools in this population. He is practised in linking research with clinical outcomes in these communities.

Dina LoGiudice

Associate Professor Dina LoGiudice is a geriatrician at Royal Melbourne Hospital, visiting specialist at the Victorian Aboriginal Health Service and clinical researcher at the Royal Melbourne Hospital Department of Medicine, University of Melbourne. She has over 20 years' experience specialising in the area of dementia and is especially interested in the cross-cultural influences on this condition. Since 2003, Dina has been working with Aboriginal researchers and community members to address the significance of dementia and cognitive impairment particularly for those living in remote Australia, and working with communities to develop and evaluate models of care for people with dementia, their carers and families.

Kate Smith

Dr Kate Smith is the Research Lead and a Lecturer at the Centre for Aboriginal Medical and Dental Health, School of Medicine, University of Western Australia, on Nyoongar Country. She is an Occupational Therapist and has coordinated concurrent high impact Indigenous ageing well research since 2003, including the development and validation of the Kimberley Indigenous Cognitive Assessment; the development and trial of a model of community care for older Aboriginal Australians; the prevalence, incidence and protective factors for dementia in Aboriginal Australians; and the co-design of a quality of life package for older Aboriginal Australians (Good Spirit, Good Life assessment). She is currently leading the five year DAMPAA study, trialling and evaluating an Aboriginal health practitioner led dementia risk management program for Aboriginal Australians, and is co-director of the Good Spirit Good Life Centre for Research Excellence in Indigenous ageing and a chief investigator on the OnTrack Centre for Research Excellence in Indigenous Dementia.

She is a member of the Department of Health funded National Advisory Group for Aboriginal and Torres Strait Islander Aged Care (NAGATSIAC) and advocated for and

co-chaired the development of the NHMRC Aboriginal and Torres Strait Islander Roadmap for Dementia Research and Translation.

Nancy Pachana

Nancy A. Pachana is Professor of Clinical Geropsychology and Program Lead, Age Friendly University and Healthy Ageing Initiatives, at The University of Queensland. She has an international reputation in geriatric mental health, particularly late-life anxiety, assessment and interventions for persons living with dementia, and driving in later life. She has published over 300 peer-reviewed articles, book chapters and books in the field of ageing. Pachana was elected a Fellow of the Academy of Social Sciences in Australia in 2014. In 2019, she was awarded the M. Powell Lawton Award, the American Psychological Association's Society of Clinical Geropsychology Lifetime Achievement Award.

ABSTRACT

Objectives

The aim of the study was to assess the prevalence of anxiety and depression in older Aboriginal and Torres Strait Islander adults.

Methods

A modified version of the PHQ-9 and the Geriatric Anxiety Inventory (GAI) were administered as part of a wider dementia prevalence study conducted in the Torres Strait. Results were compared to diagnoses obtained on geriatric review to evaluate their applicability in the region.

Results

A total of 236 participants completed the KICA-dep and 184 completed the GAI short form. Of these, 10.6% were identified with depression and 15.8% with anxiety. Some participants found questions about suicide ideation and self-harm offensive and others had difficulty understanding concepts on the GAI. The KICA-dep performed poorly in comparison to diagnosis on geriatric clinical review, so results are unlikely to reflect the true prevalence of depression in the region.

Conclusions

Further research is required to explore the underlying dimensions of depression and anxiety and terminology used to express mood symptoms in the Torres Strait.

Clinical Implications

Current mental health screening tools are not appropriate for the Torres Strait and more work is required to determine how symptoms of depression and anxiety are expressed within Torres Strait communities.

Key words: First Nations, mental health, assessment tools, PHQ-9, KICA-dep, Geriatric Anxiety Inventory, Torres Strait

Introduction

Mental health issues of First Nations people, particularly older persons, are an emerging issue globally (Pachana, 2015). First Nations people number upwards of 302 million individuals worldwide (Hall & Patrinos, 2012). Significantly, however, epidemiological evidence suggests that health indicators for First Nations peoples fall behind those of non-Indigenous persons in those countries studied. Maternal and child health indicators are more frequently documented, whereas mental health indicators have not been given as much attention (Anderson et al., 2016). Studies that have examined later life mental health issues have revealed salient differences with older non-Indigenous persons, including earlier onset of dementia (e.g., in those 45 years and over) in Australian First Nations peoples (Radford et al., 2015; Russell et al., 2020; Smith et al., 2008), as well as increased experience of traumatic events (Beals et al., 2013), and racism (Temple et al., 2020). Consideration of strengths and protective factors for achieving good mental health is emerging. For example, Baiden and Fuller-Thomson examined complete mental health (CMH), as defined as the absence of depression or anxiety disorders, suicide ideation or substance misuse in the past 12 months together with life satisfaction and psychological and social wellbeing in Canadian First Nations peoples (Baiden & Fuller-Thomson, 2016), and found those aged 60 and older had 56% higher odds of CMH compared to those in their 20s.

Australia has two distinct First Nations populations: the mainland Aboriginal population and the peoples of the Torres Strait region, which lies between the tip of Queensland and New Guinea (Dudgeon et al., 2014). The Torres Strait region is divided into five islands clusters, as well as communities on the Northern Peninsula Area of Cape York, on the mainland of Australia. Aboriginal and Torres Strait Islander people comprise 3.3% of the Australian population (approximately 800,000 people), with a mean age of 22.9 years, based on 2016 census data (Australian Bureau of Statistics, 2019a). According to the 2016 census, approximately 9,000 people who identified as Torres Strait Islander and/or Aboriginal were estimated to be living in this region, with around 1,660 aged 45 and over (Australian Bureau of Statistics, 2019a).

The term social and emotional wellbeing has been used to describe the holistic view of health and wellbeing held by Aboriginal and Torres Strait Islander peoples (Gee et al., 2014). This concept differs from western models in that the individual is viewed as being intrinsically linked to family and community (Gee et al., 2014). Connections between body, mind, spirit, country, culture, and family and kinship play an interrelated

role in wellbeing and when any of these relationships are disrupted, poor health prevails (Gee et al., 2014). There are relatively few studies of the health and wellbeing specifically involving Torres Strait Islander people. However, increasingly researchers are tackling physical health and mental health issues and placing these concerns within an appropriate cultural context, one informed by Torres Strait Islanders themselves (Gee et al., 2014). The *Gayaa Dhuwi (Proud Spirit) Declaration* supports leadership by Aboriginal and Torres Strait Islander peoples within the mental health system, and an appropriate balance of clinical and culturally informed mental health system responses (Dudgeon et al., 2016). This is important because mental health issues in the Torres Strait are not insignificant. A third (30%) of respondents to the *Australian Aboriginal and Torres Strait Islander Health Survey* (AATSIHS) 18+ years of age reported high or very high psychological distress levels in the 4 weeks before the survey interview (Australian Bureau of Statistics, 2013).

Older First Nations people play a vital role in the health and wellbeing of communities. But the health and wellbeing of older First Nations people have only recently been examined in depth. High rates of chronic conditions such as hypertension, diabetes, and renal failure are found in both Aboriginal and Torres Strait Islander older people (Leonard et al., 2002) and this, together with head injury and other sociodemographic factors (Arkles et al., 2010), contributes to relatively high rates of dementia within these communities (Radford et al., 2015; Russell et al., 2020; Smith et al., 2008). Yet data on specific mental health concerns such as depression and anxiety, and research on measurement tools designed for this population, are still lacking, particularly for the Torres Strait Islander population.

An important step in measuring mental health among First Nations people is the use of culturally safe and appropriate instruments. Several tools have been developed and validated for measuring depression in older Aboriginal and Torres Strait Islander people. The PHQ-9 (Kroenke et al., 2001) is a frequently utilized screening tool for depression severity that is widely used in primary care. This nine-item tool assesses the presence and severity of symptoms of depression experienced in the past week according to DSM-IV criteria (American Psychiatric Association, 2000). Based on a four-point scale ranging from “never” (0) to “nearly every day” (3), scores of 10 or above are associated with 88% sensitivity and 88% specificity for major depression. Adaptations of the PHQ-9 have been used to assess depression in specific Aboriginal and Torres Strait Islander populations. When modified for use in a cohort of Aboriginal participants with ischaemic heart disease (Esler et al., 2008), an additional question

about anger was included based on previous work that found this was an important symptom of depression in Aboriginal and Torres Strait communities (Esler et al., 2007) and a cut score of 8/9 was used. The modified PHQ-9 (Esler et al., 2007) was adapted for older Aboriginal Australians living in the Kimberley region of Western Australia aged 45 and over (Almeida et al., 2014). The authors retained the question about anger and split the question about suicide ideation into two items, resulting in an 11-item tool. Using this tool, known as the KICA-dep, 22.4% of the sample of older Kimberley Aboriginal adults (N=250) obtained a score of ≥8, which was associated with 78% sensitivity and 82% specificity for the diagnosis of a depressive disorder (determined by a comprehensive face to face psychiatry review, then reviewed by a geriatrician, both blinded to KICA-dep scores) (Almeida et al., 2014). The point prevalence of depression, as determined by psychiatric review, was 7.7%, which the authors note was similar to rates found in older adults (60 and over) in the wider community (Pirkis et al., 2009), but rates of *major* depression were double within the older Aboriginal sample. Anger was the most frequently endorsed item, highlighting the salience of this symptom within the sample. Within demographic and clinical risk factors, only the presence of heart disease was significantly associated with depression, although high rates of chronic diseases such as diabetes and kidney disease were present. In a study of 500 Aboriginal men accessing primary care for depression (The Getting it Right Collaborative Group., 2019), a cut score of 10 on the adapted PHQ-9 had adequate sensitivity and sensitivity for depression when validated against the MINI International Neuropsychiatric Interview (Sheehan et al., 1998). Sleep disturbance was the most frequently endorsed symptom (38%), self-harm and suicide ideation items were endorsed by 16% of participants, and when surveyed post-administration, 91% of participants agreed that they felt comfortable answering the a-PHQ-9 questions. The PHQ-9 has also been translated into Torres Strait Kriol and used to screen for depression among people with diabetes living in the Torres Strait (Taylor et al., 2017). In this study, rates of depression in people with diabetes (12.2%) were lower than other studies using the PHQ-9 within the wider population of people with diabetes in Australia (22.6%) (Reddy et al., 2010). Explanations for lower rates of depression included diabetes being normalised in the Torres Strait given its high prevalence in the region; the protective social environment where people have maintained strong connections to family, land and sea; or the dietary benefits of having an abundance of fresh seafood in the region (Taylor et al., 2017).

Anxiety is less frequently measured than depression, including among First Nations people and particularly Torres Strait Islander people. The Geriatric Anxiety Inventory

(GAI) is used across five continents and in a range of clinical and research settings (Pachana & Byrne, 2012). It was designed and validated specifically on older adults to serve as a brief self-report measure of anxiety symptoms (Pachana et al., 2007). The GAI internal reliability, and sensitivity and specificity to clinical diagnoses of anxiety disorders range, respectively, from α = 0.92-0.99, 0.69-0.88, and 0.66-0.100 across studies globally (Gerolimatos et al., 2013; Johnco et al., 2015; Kneebone et al., 2016; Marquez-Gonzalez et al., 2012; Ribeiro et al., 2011; Yan et al., 2014). The original 20-item form is complemented by a 5-item short form (GAI SF), using the most sensitive items from the original scale. Using scores of three and over to identify generalised anxiety, this short form has equivalent sensitivity, specificity, and other psychometric properties to the original (Byrne & Pachana, 2011), though the original scale has superior performance overall (Johnco et al., 2015). The validity of items in the short and long form have been validated across 10 countries internationally (Molde et al., 2020). There have to date been no validation studies undertaken with the GAI in First Nations people.

The translation of the GAI into various languages has necessitated flexibility. Several of the items on the long form, but not the short form, are idiomatic, e.g., ‘I feel as though I have butterflies in my stomach’. These items are usually not translated verbatim, but into an equivalent expression in the non-English language, such as “I feel as though I have ants in my chest (Spanish translation) (Pachana & Byrne, 2012). Both item response analyses have suggested that, despite such idiomatic expression, the individual items are roughly equal in validity (Molde et al., 2020). However, it was unclear how such items would be received among older Torres Strait Islanders. There is no common language used across the Torres Strait, from amongst the several Indigenous languages used in the region, and because English is widely spoken, the decision in the current study was to give the inventory in English.

The aim of the study was to assess the prevalence of anxiety and depression in Aboriginal and Torres Strait Islander adults aged 45 and over living in the Torres Strait and determine how the instruments used to measure anxiety and depression performed.

The study was co-designed and conducted in partnership with the Post-Acute, Rehabilitation and Aged Care Service on Thursday Island, which is the administrative centre of the Torres Strait. Ethics approval was obtained from Queensland Health

(HREC/13/QCH/129-878) and James Cook University (H5495) Human Research Ethics Committees.

Methods

Data were collected as part of a wider dementia prevalence study conducted in the Torres Strait and Northern Peninsula Area between May 2015 and February 2018. Prevalence data and detailed methodology of the wider study have been reported elsewhere (Russell et al., 2020).

The KICA-dep and the Geriatric Anxiety Inventory were administered as part of a wider health assessment using the Kimberley Indigenous Cognitive Assessment (KICA) tool (LoGiudice et al., 2006). The KICA tool collects demographic and clinical information (social, medical, smoking/alcohol history), assesses cognition (KICA-cog) and functional status, and obtains an informant report. Screening tools for falls risk, pain, and continence were also embedded in the questionnaire. These included (1) The Elderly Falls Test, a 5-item questionnaire assessing falls risk in community-dwelling adults based on the number of falls and near falls in the past year, gait, and walking speed, where scores of 2 and above are consistent with high falls risk (Cwikel et al., 1998); (2) The Brief Pain Inventory (BPI) short form, assessing the presence and severity of pain and its functional impact, where higher scores indicate greater severity and functional impact (Cleeland, 1991); and (3) The Modified ICIQ Continence Questionnaire (ICIQ), a 4-item questionnaire assessing symptoms and impact of urinary incontinence, with scores of 2 and above identifying those needing referral (Avery et al., 2004). The KICA tool was administered by members of the research team who were also mental health or older persons' clinicians. The tool took 45 minutes to complete, which included 30 minutes with the participant and 15 minutes with a carer. The depression and anxiety tools were administered at the end of the assessment to allow time to develop rapport and for participants to feel comfortable with the clinician. As neither tool had previously been trialled by the team in the Torres Strait, both tools were retained in their original formats. Both tools were administered verbally with a team member (BS) providing cultural support and repeating specific questions in language (Creole) if a participant was having trouble understanding the original question in English. Some participants were observed to fatigue whilst completing the long form of the GAI and several questions using terminology such as "butterflies in the stomach" frequently needed further explanation. Due to concerns about participant fatigue and whether the underlying symptoms targeted by the questions were recognised and fully understood by participants, a decision was made during data

collection to switch to the GAI SF. Participants also underwent a comprehensive clinical assessment by a geriatrician, blinded to the results of the KICA-cog and where appropriate were given diagnoses of dementia using criteria from the Diagnostic and Statistical Manual for Mental Disorders, 4th Edition (DSM IV-TR) (American Psychiatric Association, 2000). Dementia diagnoses were subsequently reviewed by a panel comprising geriatricians and an older persons' psychiatrist to obtain consensus diagnoses. For the current study, a diagnosis of depression was obtained from information documented in clinical letters written by the geriatricians.

Participants

Participants included Aboriginal and Torres Strait Islander residents living in the Torres Strait and Northern Peninsula Area aged 45 years and over. There were no other specific inclusion or exclusion criteria as the aim of the wider dementia prevalence study was to assess as many residents as possible. Participants were recruited using a range of strategies, including community lists from primary health centres, community meetings and events attended by the research team, flyers placed on community noticeboards, council newsletters, social media, and word of mouth. Residents of the residential aged care facility located on Thursday Island also participated in the study.

Data Analysis

Descriptive and inferential analyses were undertaken using SPSS Statistics for Windows, Version 26 (SPSS Inc., Chicago, Ill, USA) and STATA 14 (College Station, TX: StataCorp LLC). The dependent variables for this study were scores on the KICA-dep and GAI SF. These variables were significantly positively skewed. The KICA-dep and GAI SF scores remained skewed after transformation (i.e., cubic, square, square root, and log), so these variables were retained in their original forms and summarised using medians (Mdn) and interquartile ranges (IQR). Independent demographic and clinical variables were examined for normality with age and number of vascular risk factors the only normally distributed variables. Education was dichotomised into primary school and high school or above due to low numbers of cases at some levels of education.

Univariate associations between the dependent and independent variables were tested using Spearman's Rank Coefficient and Mann-Whitney Tests (i.e., Wilcoxon rank-sum test) for continuous and categorical independent variables respectively (Supplementary Table 1). Associations between independent variables were also examined to identify potential confounding variables (results not tabled). In these analyses, age was

associated with the dependent variables and a selection of independent variables. To account for the potential confounding effect of age, univariate analyses were re-examined using linear regression analyses adjusted for age. The residuals from these analyses were plotted to assess their normality. Non-parametric regression analyses using quantile regression were undertaken for comparison, to account for the non-normal distribution of regression residuals. These analyses are presented in Supplementary Table 1, and a sub-set is described in text.

To assess the accuracy of the KICA-dep at identifying depression, total continuous scores on this scale were dichotomised at the cut-off threshold of 7/8 (noncase/case) as recommended for the KICA-dep, and 8/9, consistent with other studies. These dichotomised variables were compared with assessments of mood noted by geriatricians in their clinical assessments. Sensitivity and specificity were calculated, and alternative cut-off thresholds were examined via receiver operating characteristic (ROC) curves and area under the curve (AUC) analysis. To examine the association between individual items on the KICA-dep and a diagnosis of depression by geriatricians, responses to items on the KICA-dep were dichotomised into Never (0) and Sometimes/A lot/All the time (1-3). These dichotomised variables were tabulated by depression status. Due to small cell sizes, the distributions were assessed with Fisher's exact test. An alpha level of 5% was set and all tests were two-tailed.

Results

Participants

A total of 276 Torres Strait residents were recruited from all populated communities in the Torres Strait and Northern Peninsula Area. Two participants were excluded from the final analysis due to insufficient clinical information to make a dementia diagnosis. Of the remaining 274 participants, 88% were of Torres Strait Islander descent, 4% of Aboriginal descent, and 8% of Aboriginal and Torres Strait Islander descent. The mean age of the sample was 65.1 (*SD*10.8, range 45-93), and 34.3% were male. All had some formal education, and 95% of participants spoke English. Using DSM IV-TR criteria, 39 (14.2%) participants were diagnosed with dementia, and 60 (21.9%) were diagnosed with Cognitive Impairment, No Dementia, which is a risk factor for dementia.

KICA-dep

A total of 236 participants completed the KICA-dep. There were missing data for 13.9% of the sample. There were no significant differences in age, gender, or education

(dichotomised) between those who completed the KICA-dep and those who did not (*p*>0.05).

The median KICA-dep score obtained in the sample was 1 (IQR 0-4), with scores ranging from 0-20. Over a third of participants (34.7%) obtained a score of 0. Twenty-five participants (10.6%) were identified with depression using a cut score of 7/8 (noncase/case), and 17 (7.2%) were identified with depression using a cut score of 8/9.

Univariate associations between demographic and clinical variables and KICA-dep scores

There was a significant negative relationship between age and KICA-dep scores (*rho= -0.15, p=0.023*) (Supplementary Table 1). KICA-dep scores were slightly higher in females (*Mdn=2, IQR 0-4*) compared to males (*Mdn=1, IQR=0-3, p=0.061*), and there was no difference across years of education (*p*=0.747). There was a significant positive correlation between KICA-dep and GAI SF scores (*rho=0.57, p*=<0.001). Current drinkers had significantly higher scores on the KICA-dep (*Mdn*=3, *IQR=1-5*) than non-drinkers (*Mdn*=1, *IQR=0-3, p*=0.001). There were significant associations between depression and a history of head injury (*Yes Mdn=2, IQR=1-7* vs. *No Mdn* =1*, IQR=0-3*, *p*=0.003) and chronic kidney disease (*Yes Mdn*=1*, IQR=0-2* vs. *No Mdn*=2, *IQR=0-4, p*=0.006). No significant association was found between depression and diabetes (*p*=0.465), depression and heart disease (*p*=0.322), or depression and other chronic diseases assessed in the current study (e.g., hypertension, cerebrovascular disease, and dyslipidaemia) (Supplementary Table 1). There were significant positive correlations between KICA-dep scores and scores on the Elderly Falls Test (*rho=0.17, p = 0.012*), pain scale (*rho=0.38, p*=<0.001), and incontinence scale (*rho=0.21, p*=0.001). There were no significant associations between mood score and cognitive status (*p>0*.05).

Multivariate associations between demographic and clinical variables and KICA-dep scores

Age was associated with several independent variables that were significant in univariate analyses (results not tabled). Specifically, age was lower among people who reported being current drinkers (*p*=0.002) and higher among those with chronic kidney disease (*p*=0.001). Age was also positively associated with scores on the Elderly Falls Test (*p*<0.001) and negatively associated with pain scale scores (*p*=0.056). After adjusting for age in multivariate linear regression analyses (Supplementary Table 1), KICA-dep scores remained significantly higher among people who were current

drinkers (β=1.15, *p*=0.020), or had a history of head injury (β=1.98, *p*=0.001) and were positively associated with scores on the Elderly Falls Test (β=0.41, *p*=0.001) and pain scale (β=0.28, *p*<0.001). While residuals for these analyses were not normally distributed, quantile regressions produced the same trends. Chronic kidney disease was significant after adjusting for age in a linear regression analysis, and non-significant in a quantile regression.

Correspondence between KICA-dep scores and geriatric clinical diagnosis

Among the 274 participants in the dementia prevalence study, a subset of 246 had their mental state assessed by a geriatrician. Of these, 184 (74.8%) were assessed as euthymic, 16 (6.5%) were diagnosed with depression, and 25 (10.2%) were noted to have low mood. There were 32 participants who had a geriatrician assessment and no KICA-dep (i.e., 13% missing data) and 22 who had a KICA-dep but no geriatrician assessment (i.e., 9% missing data). The total number of participants with complete information on both the KICA-dep and Geriatrician assessment was 214.

In the subset of 214 participants with both KICA-Dep and geriatrician review, 11 had depression based on the geriatrician assessment (sensitivity 45.5%) (Supplementary Table 2). The same cut-off performed well at ruling out depression (specificity 91.6%). Findings were similar for a cut-point of 8/9 on the KICA-dep. ROC analyses (Supplementary Figure 1) suggested lower cut-offs, such as 3/4, would produce higher levels of sensitivity and specificity for the KICA-dep in its current form.

Cultural appropriateness of the KICA-dep for use in the Torres Strait

The distribution of responses for each question of the KICA-dep is shown in Table 1. Anger was the most frequently endorsed item (n=76), followed by feelings of low mood (n=73) and loss of energy (n=65). Thoughts of self-harm (n=5) and suicide ideation (n=15) were the least frequently endorsed items in the questionnaire. These two items were not received well by many participants, who at times took offence at being asked these questions.

[INSERT TABLE 1 HERE]

Geriatric Anxiety Inventory Short Form

Given the decision to switch from the GAI to GAI SF during data collection, data from the long form collected from 124 participants were converted to a GAI SF score. These cases were added to the additional 60 GAI SF cases subsequently obtained, resulting in 184 participants who had GAI SF information and 90 participants (i.e., 32.8%) with no GAI SF information. Twenty-five percent of those with missing data were participants who declined the KICA survey tool but had a medical assessment. Other common reasons for not completing the GAI were time constraints, fatigue, and declining to answer more questions about their psychological state after already answering the KICA-dep.

There were no significant differences in gender between participants who completed the GAI SF and those who did not (p=0.177). Participants with a GAI score were significantly younger (p=0.045) and significantly more likely to have high school education than those without GAI information (p=0.010).

The median score on the GAI SF was 0 (IQR 0-2), with scores ranging between 0 and 5, and 113 (61.4%) of participants scored 0. Using the cut score of 2/3 described in the original GAI-SF validation article (Byrne & Pachana, 2011), 29 (15.8%) participants were identified with anxiety.

Associations between demographic and clinical variables and GAI SF

There was a significant negative relationship between age and scores on the GAI SF (*rho= -0.163, p=0.027*) but not education (p=0.111) (results not tabled). Scores on the GAI SF were slightly higher among females (*Mdn=0, IQR=0-2*) compared to males (*Mdn=0, IQR=0-1, p=0.075*). Prior head injury was the only clinical variable significantly associated with anxiety (*Yes Mdn=1, IQR=0-3 vs. No Mdn=0, IQR=0-1, p=0.006*). There were significant positive correlations between GAI-SF scores and scores on the incontinence scale (rho=0.251, p<0.001) but not the Elderly Falls Test (*rho=0.062, p=0.429*). Scores on the GAI SF were associated with pain scale scores during univariate analyses (*rho=0.284, p*=<0.001). Because age was associated with both pain and GAI SF scores, the association between GAI SF and pain was retested in age adjusted analyses. In these linear and quantile age adjusted regression analyses, GAI SF scores remained significantly associated with pain scale scores (p<0.001) (results not tabled). All analyses were replicated with the GAI long form data and the results were comparable to the GAI SF.

Correspondence between GAI SF scores and clinical diagnosis

Of the 246 participants who underwent clinical review of their mental state by a geriatrician, 10 (4.1%) participants were diagnosed with anxiety or mixed depression/anxiety. Of these, seven had completed the GAI SF, but only three had a score of 3, which would have identified them through screening. Another three participants obtained a score of 2, and one participant scored 0. The cells sizes were considered too small to conduct analyses of sensitivity and specificity. These analyses were replicated for the GAI long form, and the cell sizes were also too small for valid diagnostic analyses.

Cultural appropriateness of the GAI and GAI SF for use in the Torres Strait

Many participants had difficulty understanding the concepts presented in some items of the longer GAI, such as “butterflies in the stomach” and “knot in my stomach” and words such as “trivial” were often unfamiliar and needed further explanation. In comparison, the GAI SF was well received by participants given its brevity and simplicity. The only question that caused some confusion was “I think of myself as a worrier”, which was sometimes interpreted as “I think of myself as a warrior”. This was often endorsed in the positive, requiring further clarification, much to the amusement of participants and the clinician involved. The distribution of responses for each question of the GAI SF is show in Table 2. The most frequently endorsed response was “I worry a lot of the time”, with 23.9% of respondents giving a positive response on this item. Given the small numbers involved, no further statistical analyses were conducted.

[INSERT TABLE 2 HERE]

Discussion

The aim of the study was to assess the prevalence of anxiety and depression in Aboriginal and Torres Strait Islander adults aged 45 and over living in the Torres Strait and determine how the instruments used to measure anxiety and depression performed. Overall, the correlations between the KICA-dep, GAI-SF and sociodemographic and clinical variables obtained in the study were generally in the expected directions.

Using the KICA-dep, 10.6% of participants had scores of 8 or higher, indicating the likely presence of depression compared to 6.5% of a slightly smaller subsample being diagnosed with depression on clinical geriatric review. Associations with alcohol use (McHugh & Weiss, 2019) and head injury (Jorge & Robinson, 2003) in the study are

consistent with trends seen in the wider population. Despite high rates of chronic disease within the sample and known association with depression in the wider population (Herrera et al., 2021), there was no clear association between chronic disease and depression. There was no association with heart disease, as seen in the Kimberley study (Almeida et al., 2014). However, the absence of association with diabetes was consistent with Taylor et al.'s diabetes study in the Torres Strait (Taylor et al., 2017). Whilst the authors argued this may be due to the normalisation of diabetes in the region, the preservation of strong social connections to family, land and sea, and the dietary benefits of fresh seafood, an alternative explanation is that the tools used were not appropriate for use in the Torres Strait. A KICA-dep cut-point of 7/8 in our study was ineffective at identifying people with depression, as identified by geriatric assessment, and the revised cut-point of 3/4 required for the KICA-dep in its current form is not clinically useful. Given such poor performance of the tool in our study, it is likely that the underlying dimensions of depression and how they are expressed in the Torres Strait are not adequately captured in the current version of the KICA-dep. However, we acknowledge a limitation in this study is that the depression diagnoses of participants were gained from a retrospective review of geriatrician letters, rather than a face-to face psychiatric review using diagnostic criteria, as per the initial KICA-dep validation. This may have impacted on the revised cut-point and validity results.

High endorsement of anger as a symptom of depression in the study was consistent with previous studies in Aboriginal people with ischaemic heart disease (Esler et al., 2008) and older adults in the Kimberley study (Almeida et al., 2014). This shows that symptoms of how depression and anxiety are expressed may differ from mainstream communities and need to be investigated within different cultural groups. The strong negative response to suicide and self-harm questions shows these items are not only culturally inappropriate but also perceived as offensive. As rates of suicide are significantly higher in First Nations communities (Dudgeon et al., 2016), this is a sensitive topic, and participants may not have felt culturally safe to discuss this topic in this research setting. Additionally, there is a strong Christian faith in the Torres Strait, which may also impact on willingness to discuss topics such as suicide openly. Our results show that including screening items for suicide in a general depression tool such as the PHQ-9 may not be culturally appropriate in the Torres Strait.

Significant associations with pain, incontinence, and falls risk and depression were consistent with the wider literature (Dugan et al., 2000; Iaboni & Flint, 2013; Onder et al., 2005) and highlighted the impact on mood from common problems of ageing.

Results highlight the need to screen not just for depression but also ask about other problems of ageing, as these are amenable to intervention without treatment and increase the burden of excess disability, and impact quality of life and wellbeing.
The absence of associations between depression and cognitive impairment or dementia differs from the significant relationship observed within the wider community (Leung et al., 2021). Again, this may reflect the limitations of the tool in its current form and highlights the need for accurate mental health screening tools. Given that late-life depression can be a risk factor for dementia or presents as a comorbidity in dementia, clinicians need to have confidence that the tools they are using can differentiate between depression and dementia to ensure an accurate diagnosis. Further research is required to investigate how depression and anxiety present in older Aboriginal and Torres Strait adults with cognitive impairment and dementia.

With the GAI SF, a cut score of 2/3 identified 15.8% of participants with anxiety. This was significantly higher than the 2.8% seen in older adults in the population (Gonçalves et al., 2011) but lower than those identified with anxiety (4.1%) on geriatric clinical review. The GAI SF was better received and better understood than the long form but whilst acceptable for large epidemiological studies, may be too brief for clinical settings. The lack of associations between anxiety and clinical indicators other than with head injury, pain, and incontinence, may reflect limitations of using the test without cultural adaptation for the Torres Strait. Again, the absence of formal psychiatric diagnoses for anxiety is an acknowledged limitation in this study.

Due to concerns identified during the study about the cultural appropriateness of the tools in their current form, it is unlikely that the results obtained are an accurate representation of rates of depression and anxiety in the Torres Strait. Results highlight the need to consider the broader, holistic view of social and emotional wellbeing held by Torres Strait peoples.
Another limitation of our study was the amount of missing data. This was of relevance when identifying associations between anxiety and clinical variables, as those who completed the GAI SF were significantly younger than those who did not. As the GAI SF was administered at the end of the session, this may reflect a clinical decision to stop the assessment for older clients due to fatigue. However, this bias towards younger people may have resulted in a failure to identify other associations. Similarly, the ‘diagnostic’ analyses of the KICA-dep are limited by the large proportion of missing data. Specifically, only 214 of the 274 participants had both KICA-dep scores and a geriatric assessment.

Based on the findings of the current study, further work is underway by the research team in the Torres Strait to develop and validate culturally appropriate mental health screening tools for use in primary care and clinical practice. How symptoms of anxiety and depression are experienced and expressed in the Torres Strait will be explored within the holistic model of social and emotional wellbeing that considers the interconnectedness between the individual, family, and community. Any tools developed as part of the planned study will be validated against a psychiatric assessment.

Clinical Implications

- Mainstream mental health tools may not be sufficient to measure the dimensions of depression and anxiety in the Torres Strait.
- More work is required to determine how language is used to describe symptoms of depression and anxiety and investigate how mental health symptoms are expressed within different First Nations communities.

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Table 1: Distribution of responses from participants who completed the KICA-dep (n=236)

QUESTION: **In the last week, have you:**	**Never** **(0)** **n (%)**	**Sometimes** **(1)** **n (%)**	**A lot** **(2)** **n (%)**	**All the time (3)** **n (%)**
1. Felt down, sad, no good?	163 (69.1%)	64 (27.1%)	7 (3%)	2 (0.8%)
2. Felt like not doing things you usually like doing?	184 (78%)	41 (17.4%)	9 (3.8%)	2 (0.8%)
3. Had trouble getting to sleep, staying asleep, or sleeping too much?	177 (75%)	47 (19.9%)	6 (2.5%)	6 (2.5%)
4. Felt more tired or slack, like you've had no energy?	171 (72.5%)	54 (22.9%)	10 (4.2%)	1 (0.4%)
5. Been eating too much or eating only a little bit?	183 (77.5%)	41 (17.4%)	9 (3.8%)	3 (1.3%)
6. Felt bad about yourself, or felt shamed that you had let yourself or family down?	197 (83.5%)	34 (14.4%)	4 (1.7%)	1 (0.4%)
7. Had trouble paying attention or concentrating on things?	195 (82.6%)	37 (15.7%)	3 (1.3%)	1 (0.4%)
8. Been told that you are speaking or moving too slowly or fast?	211 (89.4%)	21 (8.9%)	3 (1.3%)	1 (0.4%)
9. Had thoughts that you would be better off dead?	221 (93.6%)	12 (5.1%)	2 (0.8%)	1 (0.4%)
10. Thoughts of hurting yourself?	231 (97.9%)	4 (1.7%)	1 (0.4%)	0 (0%)
11. Felt wild (angry)?	160 (67.8%)	66 (28%)	8 (3.4%)	2 (0.8%)

Table 2: Distribution of responses from participants who completed the GAI SF (n=184)

Question:	**Disagree (0) n/%**	**Agree (1) n/%**
1. I worry a lot of the time	140 (76.1%)	44 (23.9%)
2. Little things bother me a lot	147 (79.9%)	37 (20.1%)
3. I think of myself as a worrier	150 (81.5%)	34 (18.5%)
4. I often feel nervous	163 (88.6%)	21 (11.4%)
5. My own thoughts often make me nervous	150 (81.5%)	34 (18.5%)

Instructions: Please answer the items according to how you've felt in the last week. Tick Agree if you mostly agree that the item describes you. Tick disagree if you mostly disagree that the item describes you

Supplementary Table 1 – Distribution of the Kimberley Indigenous Cognitive Assessment of Depression (KICA-dep) scale, by study variables, among 236 Torres Strait Islander and Aboriginal residents of the Torres Strait and Northern Peninsula Area of North Queensland, Australia (2015-2018)

		KICA-Dep			Regression[c]		Quantile Regression[d]	
Study variable	**N**	**Median (IQR)[a]**	**Rho / z-score**	**P**	**β**	**P**	**β**	**P**
Demographics								
Age[b]	236		-0.15	0.023				
Gender								
Male	83	1 (0-3)	-1.87	0.061	0.69	0.131	0.62	0.152
Female	153	2 (0-4)						
Education								
Primary	76	1 (0-4)	-0.32	0.747	-0.54	0.292	-0.08	0.884
Highschool+	155	1 (0-3)						
Self-reported history								
Currently drinks alcohol	65	3 (1-5)	-3.18	0.001	1.15	0.020	2.00	0.000
Head Injury	42	2 (1-7)	-3.00	0.003	1.98	0.001	1.29	0.029
Medical History								
Chronic Kidney Disease	45	1 (0-2)	2.73	0.006	-1.25	0.027	-0.75	0.135
Diabetes	148	1 (0-3.5)	0.73	0.465	-0.50	0.276	-0.11	0.803
Heart Disease	39	1 (0-4)	-0.99	0.322	0.73	0.221	-0.04	0.958
Hypertension	153	1 (0-3)	1.19	0.234	-0.43	0.355	0.12	0.822
Dyslipidaemia	98	1 (0-3)	1.63	0.103	-0.71	0.114	-0.32	0.464
Cerebrovascular Disease	10	2 (0-9)	-1.06	0.288	2.15	0.048	0.48	0.687
Test scores[b]								
EFST total	215		0.17	0.012	0.41	0.001	0.39	0.003
BPI total	231		0.38	0.000	0.28	0.000	0.23	0.000
ICIQ total	234		0.21	0.001	0.32	0.005	0.37	0.006
SFGAI	181		0.57	0.000	1.63	0.005	1.38	0.000
Cognition								
Normal	162	1 (0-4)	2.03	0.363	ref		ref	
CIND	52	1 (0-3)			-0.52	0.361	-0.11	0.837
Dementia	22	2 (0-4)			0.28	0.736	1.03	0.192

Notes:

a. Categorical study variable, described with medians and Interquartile Range (IQR) and tested with Wilcoxon rank sum tests.

b. Continuous study variable, described and tested with Spearman's rank correlation coefficient.

c. Linear regression analyses, adjusted for age.

d. Quantile regression analyses, adjusted for age.

CIND=Cognitive Impairment Not Dementia, BPI = Brief pain inventory, EFST = Elderly Fall Screening Test, ICIQ = incontinence questionnaire, SFGAI = Geriatric Anxiety Inventory - Short Form, Highschool+=Any year of high school completed, or tertiary education.

Supplementary Table 2 – Comparison of the Kimberley Indigenous Cognitive Assessment of Depression (KICA-dep) scale at two cut-off thresholds (noncase/case) and assessment by a Geriatrician, for 214 Torres Strait Islander and Aboriginal residents of the Torres Strait and Northern Peninsula Area of North Queensland, Australia (2015-2018)

KICA-Dep cut-offs (non-case/case)	Geriatrician Assessment			Test Diagnostics			
	No	Yes	Total	Sensitivity	Specificity	PPV	NPV
KICA-Dep (7/8)							
No	186	6	192	45.5%	91.6%	22.7%	96.9%
Yes	17	5	22	*(5/11)*	*(186/203)*	*(5/22)*	*(186/192)*
Total	203	11	214				
KICA-Dep (8/9)							
No	191	8	199	27.3%	94.1%	20.0%	96.0%
Yes	12	3	15	*(3/11)*	*(191/203)*	*(3/15)*	*(191/199)*
Total	203	11	214				

Supplementary Table 3 – Responses on individual items of the Kimberley Indigenous Cognitive Assessment of Depression (KICA-dep) scale, by depression status based on assessment by a geriatrician, with Fisher's exact test for significance for 214 Torres Strait Islander and Aboriginal residents of the Torres Strait and Northern Peninsula Area of North Queensland, Australia (2015-2018)

QUESTION: In the last week, have you:	**RESPONSE: Never (0), Sometimes - All the time (1-3)**	**No Depression (n=203)**		**Depression (n=11)**		**Exact**	**P**
		n	**(%)**	**n**	**(%)**		
1. Felt down, sad, no good?	0	144	(70.9)	4	(36.4)	5.85	0.038
	1-3	59	(29.1)	7	(63.6)		
2. Felt like not doing things you usually like doing?	0	160	(78.8)	8	(72.7)	0.23	0.706
	1-3	43	(21.2)	3	(27.3)		
3. Had trouble getting to sleep, staying asleep, or sleeping too much?	0	155	(76.4)	5	(45.5)	5.28	0.032
	1-3	48	(23.6)	6	(54.5)		
4. Felt more tired or slack, like you've had no energy?	0	149	(73.4)	6	(54.5)	1.86	0.180
	1-3	54	(26.6)	5	(45.5)		
5. Been eating too much or eating only a little bit?	0	162	(79.8)	7	(63.6)	1.64	0.249
	1-3	41	(20.2)	4	(36.4)		
6. Felt bad about yourself, or felt shamed that you had let yourself or family down?	0	174	(85.7)	7	(63.6)	3.90	0.070
	1-3	29	(14.3)	4	(36.4)		
7. Had trouble paying attention or concentrating on things?	0	173	(85.2)	7	(63.6)	3.64	0.077
	1-3	30	(14.8)	4	(36.4)		
*8. Been told that you are speaking or moving too slowly or fast?	0	180	(88.7)	10	(90.9)		
	1-3	23	(11.3)	1	(9.1)		
9. Had thoughts that you would be better off dead?	0	192	(94.6)	9	(81.8)	2.98	0.137
	1-3	11	(5.4)	2	(18.2)		
*10. Thoughts of hurting yourself?	0	199	(98.0)	11	(100.0)		
	1-3	4	(2.0)	0	(0.0)		
11. Felt wild (angry)?	0	141	(69.5)	7	(63.6)	0.17	0.741
	1-3	62	(30.5)	4	(36.4)		

Note: *Fischer's Exact test result suppressed due to small cell size.

Supplementary Figure 1 – Receiver Operating Characteristic (ROC) curve diagnostic assessment of the Kimberley Indigenous Cognitive Assessment of Depression (KICA-dep) scale with assessment of depression by a Geriatrician (n=11), for 214 Torres Strait Islander and Aboriginal residents of the Torres Strait and Northern Peninsula Area of North Queensland, Australia (2015-2018)