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Original article

Levels of frailty and frailty progression in older urban- and regional-living First Nations Australians

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ABSTRACT

Objectives: To explore the prevalence of frailty, association between frailty and mortality, and transitions between frailty states in urban- and regional-living First Nations Australians.
Study design: Secondary analysis of longitudinal data from the Koori Growing Old Well Study. First Nations Australians aged 60 years or more from five non-remote communities were recruited in 2010–2012 and followed up six years later (2016–2018). Data collected at both visits were used to derive a 38-item Frailty Index (FI). The FI (range 0–1.0) was classified as robust (<0.1), pre-frail (0.1- < 0.2), mildly (0.2- < 0.3), moderately (0.3- < 0.4) or severely frail (≥0.4).
Main outcome measures: Association between frailty and mortality, examined using logistic regression and transitions in frailty (the percentage of participants who changed frailty category) during follow-up.
Results: At baseline, 313 of 336 participants (93 %) had sufficient data to calculate a FI. Median FI score was 0.26 (interquartile range 0.21–0.39); 4.79 % were robust, 20.1 % pre-frail, 31.6 % mildly frail, 23.0 % moderately frail and 20.5 % severely frail. Higher baseline frailty was associated with mortality among severely frail participants (adjusted odds ratio 7.11, 95 % confidence interval 2.51–20.09) but not moderately or mildly frail participants. Of the 153 participants with a FI at both baseline and follow-up, their median FI score increased from 0.26 to 0.28.
Conclusions: Levels of frailty in this First Nations cohort are substantially higher than in similar-aged non-Indigenous populations. Screening for frailty before the age of 70 years may be warranted in First Nations Australians. Further research is urgently needed to determine the factors that are driving such high levels of frailty and propose solutions to prevent or manage frailty in this population.

1. Introduction

First Nations Australians account for 3.8 % of the Australian population [1]. First Nations Peoples and cultures are diverse, and comprise many nations [2]. First Nations Australians experience well-known health inequity and socioeconomic disadvantages; the legacy of colonisation, discrimination and structural racism still contributes to these inequalities [3]. While there have been increasing gains in some areas,

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this population still have worse health than their non-Indigenous counterparts, lower life expectancies and disproportionately higher levels of chronic disease [4].

First Nations Elders play a key role in the community, transferring traditional knowledge, and improving community wellbeing, caregiving, and cultural continuity [5]. With the proportion of older First Nations Australians projected to triple within the next three decades [6], providing culturally responsive social and healthcare services and ensuring their wellbeing is crucial.

Frailty is common in older adults and is associated with poor outcomes, including death [7,8]. It is characterised by increased vulnerability to stressors, resulting from age-related decreases in physiological reserve across multiple systems [9]. Frailty is dynamic [9] occurring on a continuum from robustness to severe frailty [10]. Individuals can transition between these states [9]. Importantly, frailty progression can be delayed and even reversed with intervention [11].

A meta-analysis of community-dwelling adults 50 + years from 62 countries found the overall prevalence of frailty ranged between 12 and 24 % [12]. However, there is a paucity of research on frailty in the Indigenous context. A recent scoping review of nine articles mapping frailty in Indigenous populations found a higher prevalence compared to their non-Indigenous counterparts. Further, frailty occurred in younger age groups, with remote-living First Nations Australians experiencing the highest prevalence of frailty [13]. First Nations people tend to view frailty and ageing more holistically [5,14] than Western views, which adds complexity to studying frailty in this group.

To our knowledge, no studies have investigated frailty within First Nations Australians beyond remote settings [13]. This is an important knowledge gap since >80 % of First Nations Australians reside in urban and regional settings [1] with New South Wales (NSW) home to the largest First Nations population [1]. Therefore, we aimed to quantify the prevalence of frailty, the association between frailty and all-cause mortality, and transitions between frailty states in older First Nations Australians from urban and regional NSW.

2. Methods

2.1. Population

This is a secondary analysis of the Koori Growing Old Well Study (KGOWS), a longitudinal study of ageing and cognitive health of First Nations Australians residing in five NSW communities (two urban and three regional areas) [15,16]. KGOWS used a systematic sampling frame, with 62 % ($n = 336$) of the First Nations population from the five communities recruited to the study. Full study protocol and recruitment methods have been described [15]. Participant eligibility criteria included: ≥60 years, self-identifying as Aboriginal and/or Torres Strait Islander, residence outside of a remote area for most of their lives and living in one of the five study sites for at least 6-months at the time of study enrolment. Exclusion criteria included: stroke in the past 12-weeks, current incarceration, unable to provide written consent and without a proxy to consent on their behalf. Data collection for Wave 1 (baseline) took place from 2010 to 2012 and Wave 2 (follow-up) from 2016 to 2018 at six years' follow-up. Both waves collected data on socio-demographic characteristics, socio-economic risk factors, general health, medical history, cognitive assessment, and activities of daily living by trained researchers using standard and culturally-adapted measures with participants (or their proxy if appropriate) [15,17]. Where no follow-up visit was completed, the study team attempted to ascertain participant status as either died (date of death was not recorded), withdrawn from participation or unable to be contacted.

2.2. Frailty assessment

Frailty was quantified using a Frailty Index (FI) an approach that has been validated in non-Indigenous populations, including a cohort of remote-living First Nations Australians [18]. A 38-item FI was constructed according to standard procedure [19]. Definitions for each variable making up the FI were developed based on available information in the KGOWS data. The FI incorporated health-related deficits across multiple domains [20] including conditions, symptoms, cognition, mood, medications, physical functioning, and psychosocial circumstances with variables assigned a score: either '1' if the deficit was present in the data or '0' if absent (Supplement 1). Polypharmacy was defined as present if using ≥5 regular medications [21], and impaired cognition was present if Mini-Mental State Examination (MMSE) score was <25 [22]. FI scores were calculated, at baseline and follow-up, by dividing the total number of deficits present (maximum 38) by 38, yielding a continuous variable between 0 (fittest) and 1 (frailest). For example, if a participant had 10 deficits their FI score would be 0.26. The FI requires a minimum of 30 items [19]. Participants with ≥20 % of variables missing were excluded. The FI was analysed both as a continuous and as a categorical variable, using categories of robust (fit) (FI < 0.10), pre-frail ('very' mild frailty) (0.10 to <0.20), mildly frail (0.20 to <0.30), moderately frail (0.30 to <0.40), or severely frail (≥0.40) [10,18].

2.3. Statistical analysis

We employed three analytical approaches. First, descriptive statistics were produced for participants with an FI score at baseline ($n = 313$) using frequency and percentages for categorical variables and mean ± SD standard deviation or median [interquartile range (IQR)] for continuous data. Comparisons between groups were made using the Chi-Squared test for categorical variables and *t*-test or non-parametric Wilcoxon test for continuous variables. Pearson correlation was used to examine the associations between frailty and age.

Second, lacking date-of-death data, logistic regression examined the relationship between baseline frailty and subsequent all-cause mortality on participants with an FI score at baseline and survival status was known at follow-up ($n = 279$). Models were run unadjusted and adjusted for age, sex, and education [23]. Frailty was examined as a continuous and as a categorical variable (severe, moderate, or mild frailty, and not-frail (combining pre-frailty and robust)). The area under receiver operator characteristic (AUROC) curves as expressed as a *C*-statistic were used to evaluate the performance of the FI; higher AUROC values indicate better discrimination. We performed sensitivity analyses to investigate the impact of missing follow-up status. First, those who were 'unable to be contacted' were assumed to be alive and the logistic regression model was refitted, then they were assumed to have died and the model refitted.

Third, transitions in frailty were examined for participants with an FI score both at baseline and follow-up thus allowing assessment of change in FI ($n = 153$). The change in frailty status between baseline and follow-up, calculated as the proportion of participants who moved from one frailty category to another.

We considered *P*-values <0.05 statistically significant. All analyses were conducted using SAS v9.4 (Cary NC, USA).

3. Results

Of the 336 participants interviewed at baseline, 23 were excluded due to insufficient data for an FI. Those excluded were likely to be significantly older ($P = 0.001$) with no sex difference ($P = 0.654$) however missing data precluded further formal comparison (Supplement 2). Of those included in the analysis, 153 participants had follow-up FI scores (Fig. 1). The mean follow-up time was 6.3 years (SD 1.1). By follow-up, 18.2 % had died, 10.9 % could not be contacted and 19.5 % were unable or refused to participate (Fig. 1). Of those for whom follow-up data were not available ($n = 152$), at baseline they were more likely to have cognitive impairment ($P = 0.009$), impaired mobility ($P = 0.013$) and polypharmacy ($P = 0.020$), however there were no

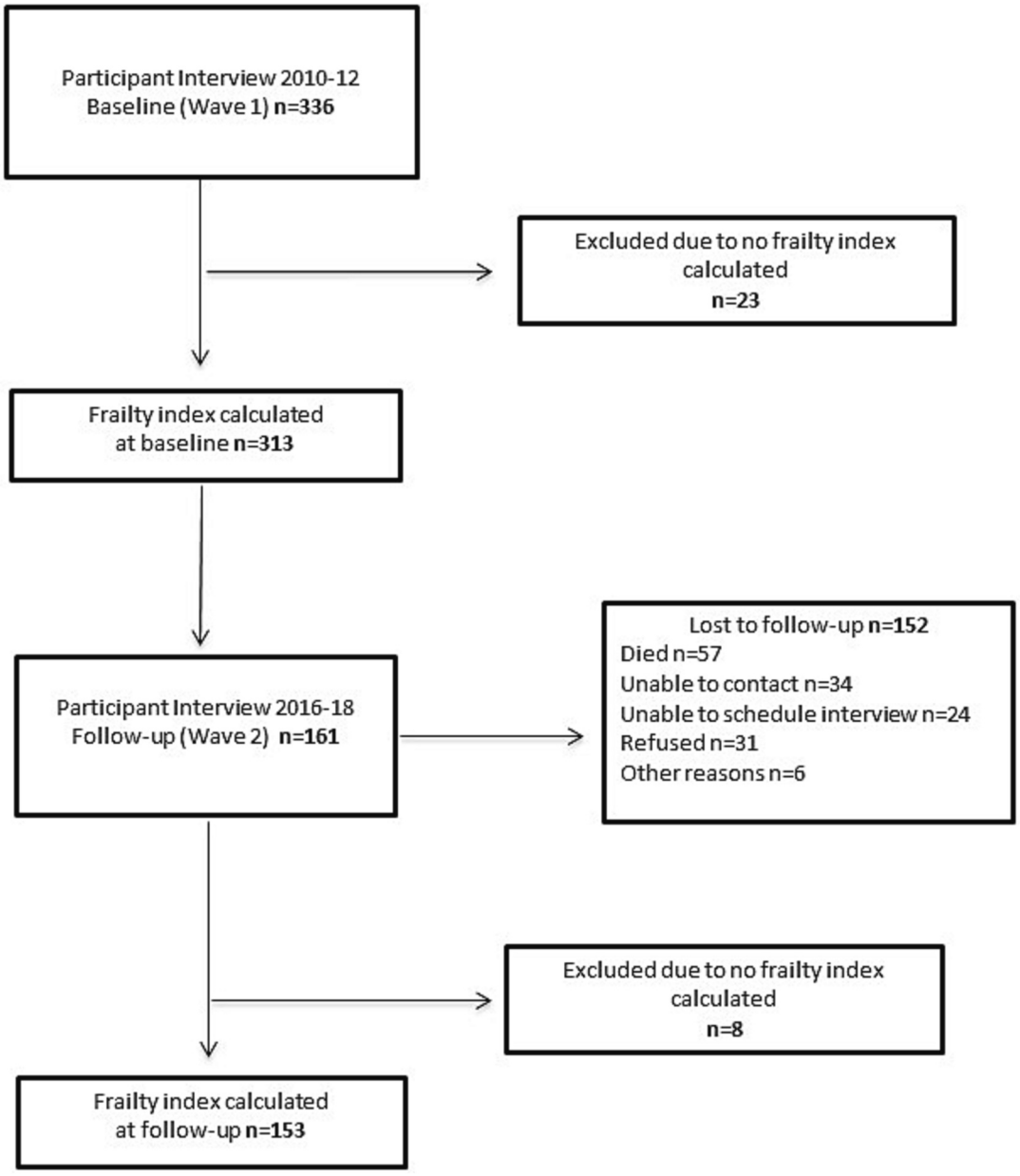

Fig. 1. Participant flow diagram.

differences for age, sex and geographical residence when compared to those where follow-up data was available ($n = 161$).

At baseline, the KGOWS study population had a mean age of 66.1 years (SD 5.8), and more than half (59.1 %) were female. Almost half were widowed or separated and around 60 % were living regionally with the other 40 % residing in an urban setting. The prevalence of comorbidities was high, with hypertension reported in 70.6 %, followed by diabetes 45.4 %. Just under one quarter reported having had at least one fall in the past 12 months. The majority (91.4 %) reported feeling connected to their Indigenous community. The characteristics of those who were retained at follow-up were broadly similar although slightly younger (mean baseline age of 65.7 years (SD 5.5)), and with a higher prevalence of several comorbidities (e.g., diabetes 54.2 %). Just under one quarter had cognitive impairment (Table 1).

3.1. Frailty prevalence at baseline

In the 313 participants with baseline scores, the FI showed a right skewed distribution, median = 0.26 (IQR 0.18) and a sub-maximal limit of 0.76 (Fig. 2). The mean age of males was 67.1 years (SD 6.1) and females 65.5 years (SD 5.5). Females had higher FI scores (median 0.29 (IQR 0.18)) than males (median 0.26 (IQR 0.17), $P = 0.036$). Supplement 3 shows the FI distribution at baseline by sex. The FI was weakly related to age ($r = 0.144$, $P = 0.01$).

When the FI was examined categorically, 4.8 % (95 % CI 2.71–7.78) were classified as robust, 20.1 % (95 % CI 15.83–25.00) as pre-frail, 31.6 % (95 % CI 26.51–37.10) as living with mild frailty, 23.0 % (95 % CI 18.46–28.07) with moderate frailty and 20.5 % (95 % CI 16.12–25.35) with severe frailty. Table 2 shows the classification of frailty severity categories by age group and sex.

3.2. Association between frailty and mortality

Of 313 participants with baseline FI scores, survival status was known for 279 participants, of whom 57 had died. Examined categorically, those with severe frailty at baseline showed the greatest risk of

Table 1
Key demographic, clinical and cultural-social characteristics of cohort participants with baseline and follow-up FI scores.

	Baseline (Wave 1) n (%)[a] (n = 313)	Follow-up (Wave 2) n (%)[a] (n = 153)
Age (Wave 1) in years, mean (SD)	66.1 (5.8)	65.7 (5.5)
Female	185 (59.1)	92 (60.1)
Years of education, mean (SD)	9.3 (2.9)	9.5 (2.9)
Marital status		
Married/de facto	118 (37.7)	60 (39.2)
Widowed/separated	155 (49.5)	76 (49.7)
Never married	39 (12.5)	17 (11.1)
Geographical residence		
Urban	127 (40.5)	64 (41.8)
Regional	186 (59.5)	89 (58.2)
Speaks Indigenous language/ words	109 (34.8)	101 (66.0)
Feels connected to Indigenous community	286 (91.4)	142 (92.8)
Removed from family in childhood	30 (9.6)	15 (9.8)
Hypertension	221 (70.6)	110 (71.9)
Kidney problem	48 (15.3)	29 (19.0)
Diabetic	142 (45.4)	83 (54.2)
Stroke	71 (22.7)	22 (14.4)
Incontinent	61 (19.5)	38 (24.8)
Mobility impaired	83 (26.5)	34 (22.2)
Cognitive impairment	47 (15.0)	36 (23.5)
One or more fall in last 12 months	75 (24.0)	52 (34.0)
Polypharmacy[b]	158 (50.5)	77 (50.3)
Assistance with 2+ I/ADLs	92 (29.4)	48 (31.4)

SD = standard deviation.
[a] Data are expressed as no. (%) unless otherwise indicated.
[b] Polypharmacy ≥5 medications.

death compared to those not-frail, which remained after adjustment. The FI showed good predictive discrimination with a *C*-statistic of 0.74.

The pattern was similar when frailty was examined as a continuous variable. For each increment of 0.01 on the FI, the adjusted odds of mortality increased by 7 % (aOR 1.07, 95 % CI 1.04–1.09, *C*-statistic 0.75) (Table 3).

3.3. Sensitivity analysis

Sensitivity analyses showed similar results i.e., the association between FI severity score and mortality remained. However, the strength of the association when resetting unknown survival status ($n = 34$) to 'died' was diminished with the *C*-statistic to 0.65 (Supplement 4).

3.4. Frailty transitions

Of the 153 participants with FI scores at both waves, the median FI score at baseline was 0.26 (IQR 0.16–0.34) and 0.28 (IQR 0.18–0.37) at follow-up (mean change in FI 0.02 (SD 0.09)).

Over the 6-year period of follow-up, substantial numbers of participants progressed from pre-frail to any other level of frailty. Those already classified with moderate or severe frailty at baseline mostly remained the same or moved to a more severe level of frailty. Only a small number of participants transitioned to a better state. No participant who had moderate or severe frailty recovered to a robust state (Fig. 3). Further details on baseline frailty classification and follow-up status are in Supplement 5.

4. Discussion

To our knowledge, this is the first study to investigate frailty in urban- and regional-living First Nations Australians. Results demonstrated a very high prevalence of baseline frailty: three quarters (75.1 %) classified as frail (31.6 % mild, 23.0 % moderate and 20.5 % severe) and a further 20.1 % as pre-frail. We also found higher prevalence in females than males (78.9 % vs 69.5 %). This is consistent with previous research in other populations [12,21].

The prevalence of frailty here (75 %) was much higher than the prevalence of physical frailty reported in non-Indigenous community-dwelling Australians 65 + years (mean age 78 years) at 21 % [24]. The mean age of our cohort at baseline was 66 years, therefore it is likely that if prevalence were compared for equivalent age and sex there could be even greater discrepancy. The only other study in a First Nations Australian population was in 363 remote-living First Nations adults 45 + years in Western Australia, using a FI with the same threshold as our study (≥0.20), reporting frailty in 65.3 %, increasing to 83.3 % in those aged 80 + years [18]. The prevalence of frailty in our study is also comparable to that of adults 50 + years in sub-Saharan Africa, with 60 % as frail using a FI with a similar threshold (>0.21) [25].

As has been well established in other populations [8,26], higher FI values were related to an increased risk of mortality. A fifth of those classified as frail at baseline were reported deceased at follow-up whereas no person classified as robust at the start of the study was known to have died by follow-up (further details of frailty status are in Supplement 5). After adjustment, frailty remained significantly associated with mortality, with the strongest association found in those classified with severe frailty. While frailty progression is not surprising, the strong association with mortality is of concern and warrants in-depth investigation for potentially modifiable risk factors not measured in this study.

Associations between frailty and mortality have been reported in other Indigenous study populations. A New Zealand study in Maori participants 65 + years found each increase in FI of 0.1 increased the risk of death (HR = 2.53; 95 % CI 1.63–3.95) after adjusting for age and sex [27]. Hyde et al.'s study of remote-living First Nations Australians also found frailty to be associated with all-cause mortality (HR = 1.9; 95 % CI 1.2–3.0) at follow-up. This study also found the prevalence of frailty to be higher in females, and males were two and a half times more likely to die by follow-up than females of the same age and frailty severity [18]. In our study, we found similar results with a 2-fold increased likelihood of death among males (Table 3) at follow-up, while females had a higher prevalence of frailty. These findings are consistent with the literature and conceptualised as a sex-frailty paradox i.e., females appear to tolerate frailty better than males [28].

The high prevalence of frailty found in our study may be associated with the prevalence of comorbidities, as in other Indigenous populations. For example, First Nations Australians have a dementia prevalence three to five times higher than non-Indigenous Australians [29]. Around 80 % of the mortality gap between First Nations and non-Indigenous Australians aged 35–74 years is due to chronic disease, notably cardiovascular disease and diabetes [30].

Social disparities across the lifecourse and systemic factors may also explain the burden of frailty in this population, which had lower education and one in ten experienced removal from family in childhood. For example, childhood and adulthood socioeconomic disadvantage have been found to contribute to age-related physiological decline [31] and childhood adversity has been found to be positively associated with frailty in adulthood [32]. The effects of past policies, colonisation and dispossession have contributed to this group experiencing poorer access to health services, overcrowded housing, lower education, and the worst socioeconomic disadvantage in Australia [3,4]. It is well-established that lower socioeconomic position is strongly linked with frailty [21].

4.1. Limitations

No frailty instrument has been validated for Indigenous populations, therefore measures and perspectives of frailty that are important to this population and their health may not have been captured. Nonetheless as a starting point to determine the frailty profile of urban and regional-

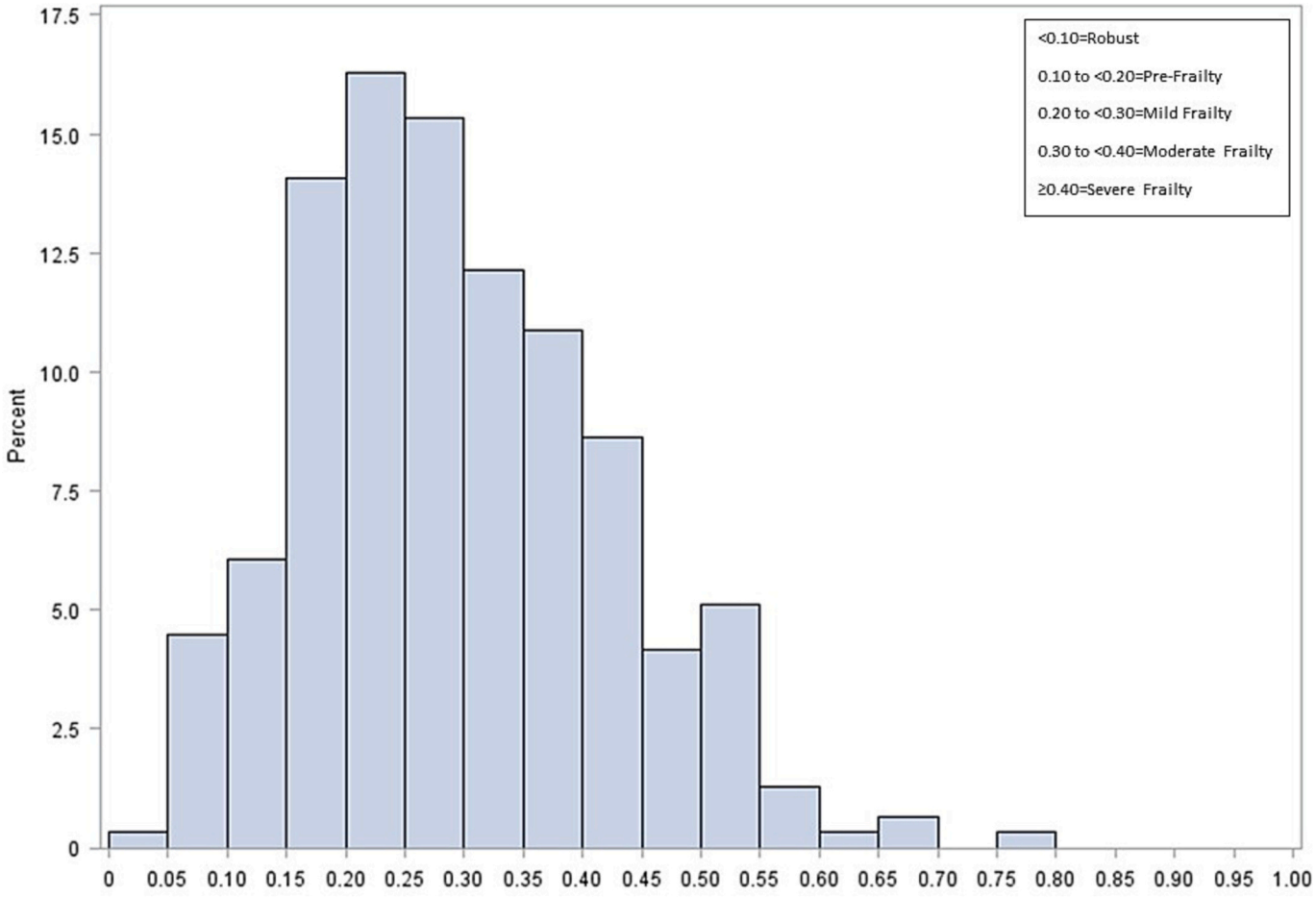

Fig. 2. Distribution of Frailty Index scores at baseline (n = 313).

Table 2
Prevalence of frailty by age group and sex at baseline (N = 313).

	Robust n (%)	Pre-frailty n (%)	Mild frailty n (%)	Moderate frailty n (%)	Severe frailty n (%)	Total
All	15 (4.8)	63 (20.1)	99 (31.6)	72 (23.0)	64 (20.5)	313
Sex						
Female	9 (4.9)	30 (16.2)	61 (32.9)	40 (21.6)	45 (24.3)	185
Male	6 (4.7)	33 (25.8)	38 (29.7)	32 (25.0)	19 (14.8)	128
Age groups, years						
60–64	10 (6.7)	35 (23.5)	45 (30.2)	33 (22.2)	26 (17.5)	149
65–69	3 (3.4)	17 (19.3)	33 (37.5)	19 (21.6)	16 (18.2)	88
70–74	0 (0.0)	7 (15.9)	13 (29.6)	11 (25.0)	13 (29.6)	44
≥75	2 (6.3)	4 (12.5)	8 (25.0)	9 (28.1)	9 (28.1)	32

living First Nations Australians we applied one of the most well-known definitions of frailty i.e., the frailty index, which has been previously used to characterise frailty in other Indigenous populations [27,33]. Furthermore, we used the same threshold (≥0.2) to define frailty as has been used in a study of remote-living First Nations Australians to facilitate relevant comparisons [18]. Another limitation is that we did not have data on time to death, and this is something that should be explored in further research on this topic. It needs to be acknowledged that the participation rate for the KGOWS study was 62 % [15] and this could potentially introduce bias. Of those participants who did not participate in the KGOWS, the authors report no significant differences in age, sex and geographical distribution compared to those who participated in KGOWS [15]. Bias may also be present in the participant group who were available at follow-up and the impact of frailty may be underestimated as those who were uncontactable in the present study at follow-up were older and had higher baseline frailty. Lastly, as there is great diversity among First Nations Australians [2], generalisability is limited to people from our study sites. However, given that the only other known study of First Nations Australians from a remote site found similar results, this may suggest that a very high burden of frailty in First Nations Australians could exist across all levels of remoteness and geographical regions.

4.2. Implications

Clinical practice guidelines recommend that all adults 70 + years be routinely screened for frailty using a validated instrument [7]. Yet the very high levels of frailty at the start of our study and the high proportion of people who transitioned towards a worsening frailty by follow-up might suggest a large burden of frailty before the age of 60. While not available in our dataset, the prevalence of frailty in urban- and regional-living younger First Nations Australians would also be worth examining as previous studies in other Indigenous populations report a high prevalence of frailty as early as 45 years [13,18]. These findings suggest that identification of frailty and those at-risk of frailty may need to be undertaken earlier than current recommendations. This is important as frailty has been found to be preventable and reversible especially

Table 3
Unadjusted and adjusted associations between baseline frailty and all-cause mortality at follow-up ($n = 279$).

	Odds ratio	95 % CI	p-Value	*C* statistic[a]
Frailty Index categorical				
Unadjusted				
Frailty classification				
Not-frail[b]	Reference			
Mild frailty	2.34	0.86–6.33	0.094	
Moderate frailty	2.56	0.90–7.29	0.078	
Severe frailty	7.01	2.61–18.83	<0.001	
				0.67
Adjusted[c]				
Age at baseline	1.07	1.02–1.12	0.008	
Male	1.97	1.03–3.79	0.041	
Years of education	0.97	0.86–1.09	0.619	
Frailty classification				
Not-frail[b]	Reference	–	–	
Mild frailty	2.32	0.84–6.47	0.106	
Moderate frailty	2.40	0.82–7.02	0.111	
Severe frailty	7.11	2.51–20.09	<0.001	
				0.74
Frailty Index continuous				
Unadjusted	1.06	1.04–1.09	<0.001	0.70
Adjusted[c]				
Age at baseline	1.07	1.01–1.12	0.012	
Male	2.19	1.12–4.28	0.022	
Years of education	0.98	0.87–1.10	0.682	
Frailty score continuous	1.07	1.04–1.09	<0.001	
				0.75

[a] *C* statistic represents the area under the receiver operating curve.
[b] Not-frail combines those who were classified as either robust or pre-frail.
[c] Adjusted for all variables presented in the table.

at its early stages with targeted intervention [11,34]. Timely identification allows for tailored person-centred care interventions to support people living with frailty, improving quality of life, reducing the likelihood of progression of frailty, building resilience [34], and potentially increasing life expectancy. However, Indigenous perspectives of frailty, and strategies to combat frailty in this population are lacking [13]. This is important, as when compared to biomedical definitions of health, First Nations Australians tend to view health and ageing as encompassing physical, social, emotional, land, cultural, spiritual and ecological wellbeing of the person and the whole community [2,5]. It is therefore critical to involve First Nations Peoples in the design of culturally-appropriate holistic frailty prevention and management strategies.

The need for strategies addressing modifiable risk factors that go beyond individual interventions to combat frailty and which target the social and environmental factors that influence health have been put forward by others [35]. A modifiable risk factor of particular relevance to Indigenous Peoples is racism. Prevalence of racism has been reported as high as 97 % in First Nations Australians, increasing the risk of poor outcomes and being a barrier to accessing mainstream healthcare services [36]. A recent study of 2232 African American cancer survivors found a large clinically meaningful association between experiencing more discrimination events and higher FI scores [37]. These findings suggest that racism and discrimination are likely to impact frailty and further research is needed into the links between key determinants of First Nations health and frailty within an Australian context.

Lastly, culture as a determinant of health for Indigenous Peoples promotes a strength-based perspective, with strong cultural identity and continuity, connection to Country and community in which Indigenous knowledge is maintained linked to positive health outcomes [38]. Indeed, recent research from Canada has found cultural connection and identity to be strongly associated with emotional and spiritual wellness among First Nations living with frailty [33]. A strength-based approach to combat frailty which is aligned with Indigenous perspectives of frailty and co-designed with the community are likely to be more acceptable to First Nations Australians.

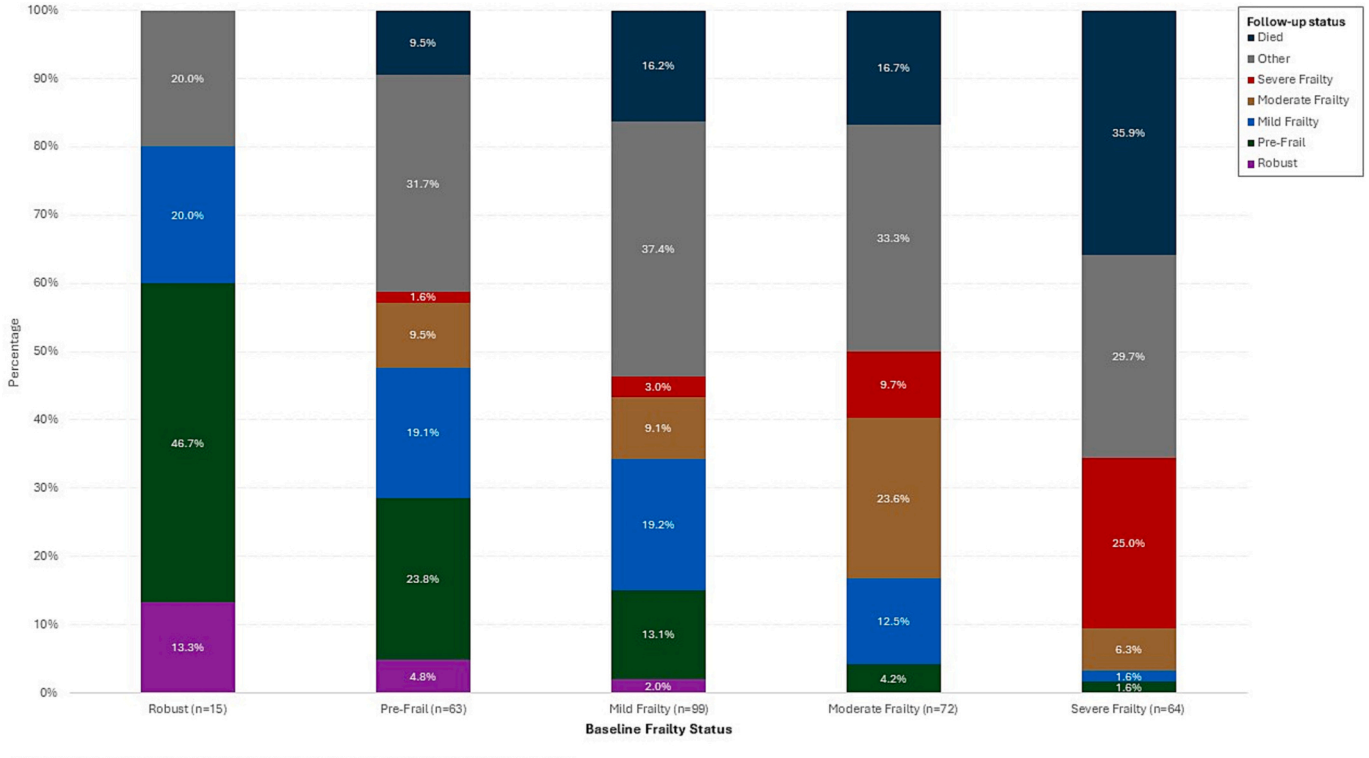

Fig. 3. Transitions in frailty between baseline and follow-up status.

5. Conclusion

Our results show older urban- and regional-living First Nations Australians experience very high levels of frailty. There is an urgent need for future research to determine the factors that are driving such high levels of frailty in this population. Furthermore, investment into ways to identify frailty earlier and strategies to combat frailty in the community that are aligned with a First Nations worldview is needed.

Contributors

Ebony T. Lewis contributed to study conception and design, data analysis and interpretation, drafting the article and revising the article critically for important intellectual content.

Kaarin J. Anstey contributed to study supervision, data interpretation, and revising the article critically for important intellectual content.

Kylie Radford contributed to the acquisition of data, study design, and revising the article critically for important intellectual content.

Nicole Mealing contributed to study design, data analysis and interpretation, and revising the article critically for important intellectual content.

Magnolia Cardona contributed to study design, and revising the article critically for important intellectual content.

Adrienne Withall contributed to study design, and revising the article critically for important intellectual content.

Kenneth Rockwood contributed to study conception and design, study supervision, data interpretation, and revising the article critically for important intellectual content.

Ruth Peters contributed to study conception and design, study supervision, data interpretation, and revising the article critically for important intellectual content.

All authors saw and approved the final version of the submitted manuscript and no other person made a substantial contribution to the paper.

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Ethical approval

Ethics approval was obtained from the Aboriginal Health and Medical Research Council (AHMRC; 615/07), the University of New South Wales Human Research Ethics Committee (HREC 08003), NSW Population & Health Services Research Ethics Committee (AU RED Ref: HREC/09/CIPHS/65). All participants provided written informed consent or, when unable to provide written consent in the case of reduced capacity, gave verbal assent and proxy written informed consent was obtained. The study complies with the principles of the Declaration of Helsinki.

Provenance and peer review

This article was not commissioned and was externally peer reviewed.

Research data (data sharing and collaboration)

There are no linked research data sets for this paper. The participants of this study did not give written consent for their data to be shared publicly, so due to the sensitive nature of the research supporting data is not available.

Declaration of competing interest

The authors declare that they have no competing interest.

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Appendix A. Supplementary data

Supplementary data to this article can be found online at https://doi.org/10.1016/j.maturitas.2024.107962.

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