


Relationship of Aboriginal family wellbeing to social and cultural determinants, Central Australia: 'Waltja tjutangu nyakunytjaku'

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To cite: Wright A, Davis VN, Brinckley M-M, *et al.* Relationship of Aboriginal family wellbeing to social and cultural determinants, Central Australia: 'Waltja tjutangu nyakunytjaku'. *Fam Med Com Health* 2022;**10**:e001741. doi:10.1136/fmch-2022-001741

► Additional supplemental material is published online only. To view, please visit the journal online (<http://dx.doi.org/10.1136/fmch-2022-001741>).



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ABSTRACT

Objective The objective of this study was to apply a strength-based approach to examine the relation of cultural and social determinants to high family functioning for Aboriginal people in Central Australia.

Design Cross-sectional study involving a quantitative analysis of survey data. Prevalence rate ratios (PRs) and 95% CIs were calculated from binomial regressions, adjusted for gender and age. Qualitative data from workshops with Aboriginal leaders in Central Australia supported the interpretation of the research findings.

Participants The study involved 639 Aboriginal people in Central Australia who participated in the Mayi Kuwayu Study.

Result Overall, 57.9% (370/639) of participants reported high/very high family functioning, 16.9% (108/639) reported moderate and 13.3% (85/639) reported low. The adjusted prevalence of family functioning was similar across gender, age groups and household sizes. Family functioning was associated with lower family financial status (aPR=0.74, 95% CI=0.60 to 0.91) and receiving welfare (0.88, 0.77 to 1.00). Family functioning was greater with high community cohesion (2.72, 1.68 to 4.39), high individual agency in community (2.15, 1.63 to 2.85); having an Aboriginal language as a first language (1.20, 1.04 to 1.37); speaking your Aboriginal language a lot (1.37, 1.12 to 1.68); high exposure to cultural practice and knowledge (1.45, 1.28 to 1.65); and multigenerational or extended family households (1.19, 1.02 to 1.38).

Conclusion High family functioning is a strength in Central Australia and is intrinsically connected with culture. Healthcare providers and programmes that build on the foundations of culture and family are an important approach to improving wellbeing.

INTRODUCTION

Public health and primary healthcare developments increasingly recognise the importance of family in the health of individuals.¹ Interventions based on theoretical underpinnings in social epidemiology demonstrate that families are an asset for the development, maintenance and restoration of health.²⁻⁴ Families

WHAT IS ALREADY KNOWN ON THIS TOPIC

⇒ Previous research has found that family functioning is related to a number of social determinants including income, employment and education levels but there is little research on the associations between functioning of a family and cultural determinants, particularly among adults.

WHAT THIS STUDY ADDS

⇒ High family functioning is a strength among Aboriginal families in Central Australia and is intrinsically connected with culture and kin.
 ⇒ High family functioning was associated with high community cohesion; high individual agency in community, having an Aboriginal language as a first language; speaking your Aboriginal language; and high exposure to cultural practice.
 ⇒ Among the social determinants, family functioning was higher in multigenerational and extended family households, which is a novel finding within the social determinants.

HOW THIS STUDY MIGHT AFFECT RESEARCH, PRACTICE OR POLICY

⇒ Primary healthcare provision and programmes that build on the foundations of culture and family are important to improving wellbeing in this population.

also provide the social emotional support needed to foster children's development. A recent review of Aboriginal and Torres Strait Islander wellbeing concepts identified that family was considered the most important factor for overall wellbeing.^{5 6} McCalman *et al* found that family-centred primary healthcare interventions generated clinical health outcomes for Indigenous children, led to greater parent satisfaction with the service and wider community utilisation of healthcare services.⁷ Others have described that importance, prioritisation and value placed on attending to social relationships and

responsibilities and learning ‘respect’ as underpinning Aboriginal culture and knowledge.^{8,9}

International and Australian research demonstrates links between family functioning and social determinants, but there is little research on associations between functioning of a family and cultural determinants, particularly among adults. This is despite the clear conceptual linkages in family and culture. Family is the support structure and the basis to which people understand their social networks and relations, and the world. A quality within Aboriginal worldviews is the concept of family goes beyond immediate family, to those related by skin group names, kinship and social structures¹⁰ and are based on both biological and social networks. Extended family and grandparents (particularly grandmothers) often have critical roles in the caring for children.¹¹ In this context, it can be problematic to consider family as constituting only household members,¹² because households can contain multiple families and families can extend beyond the household. Recent evidence from a sample of Aboriginal adolescents in Victoria demonstrated higher wellness was associated with participants who grew up in their Aboriginal family and community, and conversely institutionally imposed family displacement was associated with lower odds of being well.¹³

The importance and value of family to Aboriginal people’s wellbeing is juxtaposed against a dominant deficit narrative of Aboriginal families and parents in the public arena. The most lurid of these was Leak’s obscene comic of an Aboriginal man holding a beer, unaware of his son’s name.¹⁴ The son was being held by a police officer who suggested that the father talk to his son about ‘personal responsibility’. The comic, called out as racist by Indigenous leaders across the country, was defended by the newspaper’s editor, “Leak’s confronting and insightful cartoons force people to examine the core issues...”.¹⁵ Aboriginal people are met with the narrative of dysfunctional families on a daily basis.^{16,17} These depictions and imagery can have implications for health service delivery, as they foster racial bias, reinforce stereotypes and promote prejudices which can influence clinician responses and overall care.^{18–20} At a 2018 launch of *In My Blood It Runs*, a movie depicting the life of Dujaan, a 10-year-old living at Ewyenper-Atwatye camp in Alice Springs (Northern Territory, Australia), Dujaan’s mother, Megan Hoosan, commented “I just want Australia to know that we love and care for our kids”.²¹ Her sentiment appeared to reflect an exhaustion with the deficit narrative and a resilience to speak back against it.

This paper aimed to apply a strength-based approach to explore the relationship of high family functioning to the cultural and social determinants for Aboriginal people in Central Australia. The analysis and interpretations involved the participation of Aboriginal organisations, their Aboriginal Directors and community researchers. The co-design and review process is consistent with Indigenous ethical research approaches and principles.²²

METHOD

Setting

This work was conducted in Central Australia, a site which self-nominated to participate based on established research partnerships, and importantly, a region of profound historical injustices and ongoing discrimination for Aboriginal language groups and people. The region of Central Australia is remote; it contains two main service towns (Alice Springs and Tennant Creek) and a number of remote Aboriginal communities. Most Aboriginal people live in (or maintain connections with) communities where they are surrounded by family. The locations of communities are closely aligned with ancestral country and support the ability to foster cultural knowledge transmission. However, remote communities often have serious deficits in physical and health infrastructure. They can also be physically remote from services (for example, high schools and hospitals) and infrastructure (for example, mobile phone towers).²³ The Aboriginal population in this region have considerable health and social disparities when compared with the Aboriginal population in other parts of Australia and with general Australian population.²⁴

Further, Central Australia is marked with historical and recent intervention by the state, including the 10-year effort to ‘mainstream and normalise’ remote Aboriginal communities, under policies such as Northern Territory Emergency Response and the National Partnership on Remote Service Delivery. These policies were premised on government priorities to reduce social inequities across education, income levels, employment and health, but have been largely ineffective in achieving greater parity.^{25,26} Government policy decision and funding priorities dominates the service delivery environment, at the same time Aboriginal people’s capacity regionally and locally to be self-determined is supported by the Aboriginal Land Rights Act Northern Territory and the large Aboriginal community controlled sector. Notably though, Aboriginal governed agencies are outside of the tiers of government decision-making and Aboriginal people’s struggle for a legitimate voice in the state’s decision-making systems remains ongoing.²⁷

Despite challenges to self-determination and service delivery in this setting, several influential projects have arisen from Aboriginal research partnerships. In particular, this current study was influenced by 2008 conceptual work of senior Aboriginal women from a partner organisation, Waltja, in Central Australia that explained the foundations to family. This work documents four principles: *Tjukurpa*, *Ngura*, *Kanyini*, *Waltja* (defined table 1) for growing up children and identifies relationships and responsibilities between people, animals, land and spirituality.²⁸ With guidance from Waltja, we used this conceptual frame in the analysis of cultural determinants.

Table 1 Anangu cultural domains principles and key terminology applied to raising children²⁸ and the exposure variables used in the analysis

Anangu term	English interpretation	Exposure variables used in the analysis
<i>Kanyini</i>	Sense of belonging, holding all of the connections together, keep everything together. Kanyini has been described as vital to keep and maintain rules, stories and ceremonies associated with the three other principles described below.	<ul style="list-style-type: none"> ▶ Community cohesion ▶ Individual agency
<i>Tjurkurpa</i>	Dreaming (Dreaming is the word used by Aboriginal people to explain how life came to be; it is the stories and beliefs behind creation), basis of Aboriginal Law and custom, knowledge and ways of relating.	<ul style="list-style-type: none"> ▶ Cultural practice ▶ First language ▶ Time spent speaking own Aboriginal language
<i>Ngura</i>	The home, the land, the country (country is term used by Aboriginal people to describe the lands, waterways, seas to which they are connected to and includes all living things), this place and community, connection to country (this term encapsulates the link between land and all aspects of Aboriginal and Torres Strait Islander people's existence—spirituality, culture, language, family, law and identity). The relationship between people and place.	<ul style="list-style-type: none"> ▶ Lives on country ▶ Time across your life spent on country ▶ Know tribe/mob's (mob is a group of Aboriginal people associated with a particular place and language group) country
<i>Waltja</i>	Family, extended family, kinship (kinship describes a person's responsibilities towards other people, the land and living environment) relationships. It extends to include those with whom one is familiar, has stayed with, and has been fed by and cared for, or grown up with. It can refer to anyone with whom a significant relationship has been shared, and includes people and animals.	<ul style="list-style-type: none"> ▶ Other family speaks language ▶ Knows skin name (skin name is a name given to an Aboriginal person at birth based on the combined skin names of their parents, or given by their community) ▶ Knows your mob.

*English interpretation has been provided for the key domains. It is important to note that the concepts can be conceptually challenging and difficult to define within a Western cultural framework.

The Mayi Kuwayu Study

Mayi Kuwayu

Mayi Kuwayu, the National Study of Aboriginal and Torres Strait Islander Wellbeing is a longitudinal cohort study of Aboriginal and Torres Strait Islander adults aged 16 years and over.²⁹ Participants were recruited through a multimode approach including mail-out survey (using the Medicare Enrolment Database), in-community, online and social media, over-the-phone and word of mouth. Questionnaires were self-completed on paper or online, or completed with assistance from community researchers. The Mayi Kuwayu Study has over 20 Aboriginal and Torres Strait Islander partner communities around Australia.

Community oversight and review

Community partnerships were key in determining the research question being answered here and interpreting the findings. Waltja and Tangentyere had initially been involved in Mayi Kuwayu Study community-based survey recruitment and were keen for the Study results to generate meaningful findings for communities in Central Australia. At initial meetings with Waltja and Tangentyere, Aboriginal directors were asked to identify research areas of interest and it was at these first meetings that a project on family and culture was identified, including the suggested use of the conceptual frame described above. Following the analysis, we undertook workshops

with community participants and governance groups to discuss preliminary results. This involved structured discussions on the results with Waltja Board of Directors (August 2020, May 2021) and with the Tangentyere Research Hub staff (November 2020, May–June 2021). The research team used these discussions to inform the interpretations of results and in describing the research implications. Quotes and observations from these stakeholder discussions are incorporated in the Results and Discussion sections of the paper to contextualise findings.

Study population and inclusion criteria

The region of Central Australia was selected for this study in negotiation with community partners. Quantitative data in this analysis were from the Mayi Kuwayu Study baseline survey (Data Release 4.0) and are based on self-reported responses to the questionnaire. Participants were included in the analysis if they lived in the Central Australian region (n=639/9691) as defined by participant's postcode (online supplemental table 1). Additionally, qualitative data from workshops with Aboriginal leaders in key partner organisations, many of whom had also completed the baseline survey, are included in this paper.

Outcome variable

The Mayi Kuwayu Study family functioning measure is a validated, modified scale of family functioning from

the Western Australian Aboriginal Children Health Survey.^{30 31} The measure has recently been validated by Mayi Kuwayu research team, including the development of quartile cut-points applied in this paper.³⁰ Participants responded to nine items regarding their family, “In my family: We get on together and cope in hard times; We celebrate special days and events; We talk with each other about the things that matter; We are always there for each other; We manage money well; We have common interests; People are accepted for who they are; We have good support from mob); We have family knowledge and traditions that we pass on our children”. The response options are as follows: ‘not at all’ (coded as 1), ‘a little bit’ (2), ‘a fair bit’ (3), ‘a lot’ (4), ‘unsure’ (recoded as missing). For participants who responded unsure or missing to one item, an imputed value (the mean of their other eight family functioning items) replaced the missing or unsure. Total family functioning score was derived by summing responses for the nine items, and categories are based on quartile cut-points established in the work by the Mayi Kuwayu research team to validate the measure³⁰ and in line with the original family functioning scale.³¹

The categories are low (9 to ≤ 24), medium (>24 to ≤ 29), high (>29 to ≤ 33) and very high (>33 to 36). Categories were collapsed to a binary outcome for the regression analysis: low/medium (9 to ≤ 29) and high/very high (>29 to 36). These categories were determined based on findings from the validation study of the family functioning measure.³⁰

Exposure variables and covariates

We examined the relationship between family functioning and a range of cultural and social indicators identified in the literature as conceptually related family wellbeing and functioning.^{28 32 33} Cultural measures were specifically linked to *Anangu* terms developed by Waltja in previous conceptual research (table 1).²⁸ The cultural measures include community cohesion, individual agency, exposure to cultural practice, first language, time spent speaking your Aboriginal language, lives on country, time across your life spend on country, know tribe’s country, knows skin name and knows your mob.

The social measures were household composition, household size, crowded housing, number of children in the house, family financial status, employed, welfare recipient and highest level of education. Age group (16–35, 36–55, ≥ 56) and gender (male, female) were treated as covariates. Specific details on variables are reported in online supplemental table 2.

Statistical analysis

Scores for family functioning items (percentage and number) are presented. Total family functioning scores and their distribution across categories and demographic factors are presented.

We used binomial regression to calculate prevalence rate ratios (PRs) and 95% CIs for each exposure in relation to the binary family functioning categories. Models

were restricted to participants with data on the outcome of interest. Models are presented unadjusted, and then adjusted for age group and gender, as these factors were identified a priori as potential confounders of the relationship between the outcome of family functioning and cultural and social factors. PR was selected as the measure of association in the statistical analysis over OR because the outcome family functioning was common.

We tested the sensitivity to models using both family functioning score with no imputation and the imputed score for one missing or unsure item. Results were not materially different after changing the method of calculating the family functioning measure (online supplemental table 3). Cells with <5 observations were confidentialised, with the exception of cells for the missing category (which pose no risk of identification). An alpha level of 0.05 was the threshold for statistical significance. Data were analysed in Stata V.16.

Ethics

This study was approved by the Central Australian Human Research Ethics Committee (19-3315) and the Australian National University Human Research Ethics Committee (2019/19). Participation in the Mayi Kuwayu Study is voluntary and all participants provided consent. Participants involved in follow-up workshop provided written consent and all written outputs were provided to partner organisations for review and approval prior to submitting for publication. The Mayi Kuwayu Study is Aboriginal and Torres Strait Islander led and governed, and conducted with ethics approvals from jurisdictional Human Research Ethics Committees and relevant Aboriginal and Torres Strait Islander organisations. Data access to Mayi Kuwayu data was approved by a data governance committee.

RESULTS

Responses to family functioning items and sample characteristics

The highest proportion of responses were to the following statements: ‘We are always there for each other’ (72.1% reported ‘A lot’), ‘We have family knowledge and traditions that we pass on to our children’ (65.4% report ‘A lot’), ‘We have good support from mob’ (62.6% reported ‘A lot’) and ‘People are accepted for who they are’ (62.0% reported ‘A lot’) (table 2). Of all 639 participants, 515 had full answers to the family functioning items and an additional 48 participants had only one unsure or missing (total sample with family functioning score=563), 76 participants were missing (11.9%). The majority (57.9%, $n=370$) of participants had either high (26.1%, $n=167$) or very high (31.8%, $n=203$) family functioning, and 13.3% ($n=85$) recorded a low family functioning score.

The sample with full responses to family functioning measure was characterised by more women than men (table 3) but there was no observable gender difference in the proportion of participants in each family functioning category (table 4). There were similar proportions by age

Table 2 Responses to family functioning individual items and overall, Central Australian participants

In my family...	Not at all % (n)	A little bit % (n)	A fair bit % (n)	A lot % (n)	Unsure % (n)	Missing % (n)
We get on together and cope in the hard times	6.7% (43)	11.7% (75)	22.7% (145)	52.4% (335)	1.4% (9)	5.0% (32)
We celebrate special days/events	6.9% (44)	12.4% (79)	18.8% (120)	55.4% (354)	1.6% (10)	5.0% (32)
We talk with each other about the things that matter	3.8% (24)	8.8% (56)	21.0% (134)	60.4% (386)	0.9% (6)	5.2% (33)
We are always there for each other	2.3% (15)	7.5% (48)	12.1% (77)	72.1% (461)	0.8% (5)	5.2% (33)
We manage money well	10.5% (67)	23.6% (151)	23.2% (148)	33.6% (215)	3.6% (23)	5.5% (35)
We have common interests	8.0% (51)	5.2% (33)	26.1% (167)	39.3% (251)	4.1% (26)	6.3% (40)
People are accepted for who they are	3.6% (23)	9.5% (61)	16.9% (108)	62.0% (396)	2.7% (17)	5.3% (34)
We have good support from mob	3.0% (19)	11.4% (73)	15.5% (99)	62.6% (400)	2.5% (16)	5.0% (32)
We have family knowledge and traditions that we pass on to our children	4.4% (28)	8.0% (51)	13.8% (88)	65.4% (418)	3.1% (20)	5.3% (34)
Categories of family functioning measures	n	%				
Low	85	13.3				
Moderate	108	16.9				
High	167	26.1				
Very high	203	31.8				
Missing	76	11.9				
Total	639	100.0				

group and household size categories. The sample was also characterised by large sized households with a mean number of 6.9 people per household and mean number of 2.6 children, 25.2% of participants (n=142) reported having 7–9 people living in the house and 36.1% (n=203) had at least 3 children. Most households were classified as a multigenerational (33.6%, n=189) or extended family household (25.8%, n=145). A total of 14.6% of households were nuclear family (n=82) and only 2.1% (n=12) were single person households.

The large household sizes and high proportion of extended family or multigenerational households were confirmed by Waltja Directors, as one Director responded:

We have big families and we live with lots of people... We all live together and that's what keeps those family connections so strong. It's a part of culture living together, being together and always being there for each other.

Arrangements can change between families and households with people moving between houses and shifting roles in family, particularly in relation to caring for kids. This was summarised by one Waltja Director who shared:

There is a fluidity around Aboriginal families. There are a lot of extended family members involved in the care of the children—that's how it works. It's mainly grandmothers who do a lot of active caring for kids,

but it can also be sisters, uncles, and aunties.... These are often informal arrangements, just discussed day by day but it's important to recognise all the people involved as[in] growing up and raising the kids.

Relationship between family functioning and social factors

High family functioning was associated with financial situation and household composition. Higher family functioning was associated with high family financial status compared with lower family financial status (aPR 0.74, 95% CI 0.60 to 0.91) and not being on welfare compared with being on welfare (0.88, 0.77 to 1.00) (table 4). High family functioning was also positively associated with living in an extended or multigenerational family (1.19, 1.02 to 1.38) compared with nuclear family household. We did not observe a significant statistical relationship between high family functioning and larger household size, greater number of children in house, less family or community worries, being employed or considering your house to be overcrowded.

Relationships between family functioning and cultural factors

There were positive associations between family functioning and a number of cultural domains. Family functioning was associated with a strong sense of belonging (*Kanyini*) represented by higher levels of community cohesion (aPR 2.72, 95% CI 1.68 to 4.39) and higher

Table 3 Sample characteristics of Central Australian participants and by categories of family functioning categories

	Total sample, n (%)	Low/moderate family functioning, n (%)	High/very high family functioning, n (%)
Total	N=563	N=193	N=370
Age group			
16–34 years	212 (37.7)	70 (36.3)	142 (38.4)
35–54 years	223 (39.6)	79 (40.9)	144 (38.9)
55+ years	111 (19.7)	35 (18.1)	76 (20.5)
Missing	17 (3.0)	9 (4.7)	8 (2.2)
Gender			
Men	210 (37.3)	67 (34.7)	143 (38.6)
Women	336 (59.7)	116 (60.1)	220 (59.9)
Missing	17 (3.0)	10 (5.2)	7 (1.9)
Family financial status			
Some or a lot of savings	105 (18.7)	30 (15.5)	75 (20.3)
Just enough money	225 (40.0)	66 (34.2)	159 (43.0)
Run out of money or spend more than we get	123 (21.8)	58 (30.1)	65 (17.6)
Missing/unsure	110 (19.5)	39 (20.1)	71 (19.2)
Household size			
	Mean=6.9		
1–3 people	81 (14.4)	29 (14.9)	52 (14.1)
4–6 people	176 (31.3)	58 (30.1)	118 (31.9)
7–9 people	142 (25.2)	46 (23.8)	96 (25.9)
10+	90 (16.0)	36 (18.7)	54 (14.6)
Missing	74 (13.1)	24 (12.4)	50 (13.6)
Number of children in the house			
	Mean=2.6		
No children	77 (13.7)	27 (14.0)	50 (13.5)
1–2 child/ren	210 (37.3)	72 (37.3)	138 (37.3)
≥3 children	203 (36.1)	71 (36.8)	132 (35.7)
Missing	73 (13.0)	23 (11.9)	50 (13.5)
Household composition			
Nuclear family	82 (14.6)	31 (16.1)	51 (13.8)
Multigenerational	189 (33.6)	52 (26.9)	137 (37.0)
Extended family	145 (25.8)	45 (23.3)	100 (27.0)
Single parent	24 (4.3)	10 (5.2)	14 (3.8)
Lives with parents	14 (2.5)	≤5 (≤2.6)	≤10 (≤2.7)
Group-share house	9 (1.6)	≤5 (≤2.6)	≤10 (≤2.7)
Partner only	46 (8.2)	24 (12.4)	22 (6.0)
Single	12 (2.1)	≤5 (≤2.6)	≤10 (≤2.7)
Missing	42 (7.5)	20 (10.3)	22 (6.0)
Missing family functioning measure (n=76) not included in the analysis.			

individual agency (2.15, 1.63 to 2.85), with a dose response found in these relationships (table 5). Additionally, within the *Anangu* domain of *Tjukurpa*, higher family functioning was associated with exposure to cultural practice and knowledge (1.45, 1.28 to 1.65), speaking your Aboriginal language as your first language (1.20, 1.04 to 1.37) and speaking your Aboriginal language a lot (1.37,

1.12 to 1.68). These findings were discussed with the Directors:

I feel we are living and doing this culture work in our family programs at Waltja. We start our work with young people in the bush. We take them on country and sit them down. We give them space, and we teach

Table 4 Associations between high family functioning and social determinants among Mayi Kuwayu participants, Central Australia

	High/very high family functioning, n/N (%)	PR (95% CI)	P value	Adjusted PR (95% CI)	P value
Age group					
16–34 years	142/212 (67.0)	1 (ref)		1 (ref)	
35–45 years	144/223 (64.6)	0.96 (0.84 to 1.10)	0.597	0.95 (0.82 to 1.09)	0.473
≥55 years	76/111 (68.5)	1.02 (0.87 to 1.20)	0.785	1.04 (0.89 to 1.22)	0.596
Gender					
Men	143/210 (68.1)	1 (ref)		1 (ref)	
Women	220/336 (65.5)	0.96 (0.85 to 1.09)	0.525	0.97 (0.86 to 1.10)	0.629
Household composition					
Nuclear/partner only	82/142 (57.8)	1 (ref)		1 (ref)	
Multigenerational or extended families	237/334 (71.0)	1.23 (1.05 to 1.44)	0.010	1.19 (1.02 to 1.38)	0.028
Other	29/45 (64.4)	1.12 (0.86 to 1.45)	0.406	1.05 (0.81 to 1.36)	0.734
Family financial status					
Some or a lot of savings	75/105 (71.4)	1 (ref)		1 (ref)	
Just enough money	159/225 (70.7)	1.00 (0.85 to 1.15)	0.887	0.99 (0.86 to 1.14)	0.893
Run out of money or spend more than we get	65/123 (52.9)	0.74 (0.60 to 0.91)	0.004	0.74 (0.60 to 0.91)	0.004
Household size					
1–3 people	52/81 (64.2)	1 (ref)		1 (ref)	
4–6 people	118/176 (67.1)	1.04 (0.86 to 1.27)	0.659	1.07 (0.88 to 1.31)	0.477
7–9 people	96/142 (67.1)	1.05 (0.86 to 1.28)	0.610	1.06 (0.87 to 1.31)	0.525
≥10 people	54/90 (60.0)	0.93 (0.74 to 1.18)	0.572	1.00 (0.79 to 1.27)	0.982
Number of children in the house					
No children	50/77 (64.9)	1 (ref)		1 (ref)	
1–2 children	138/210 (65.7)	1.01 (0.84 to 1.22)	0.903	1.05 (0.86 to 1.27)	0.629
≥3 children	132/203 (65.0)	1.00 (0.83 to 1.21)	0.989	1.04 (0.85 to 1.26)	0.729
House overcrowded					
Not at all/not relevant	203/300 (67.7)	1 (ref)		1 (ref)	
A little bit	70/105 (66.7)	0.99 (0.84 to 1.15)	0.852	0.97 (0.83 to 1.14)	0.706
A fair bit	26/41 (63.4)	0.94 (0.73 to 1.20)	0.604	0.95 (0.75 to 1.22)	0.691
A lot	44/71 (62.0)	0.91 (0.75 to 1.11)	0.386	0.88 (0.72 to 1.08)	0.229
Community worries					
No	44/65 (67.7)	1 (ref)		1 (ref)	
Few	178/267 (66.7)	0.98 (0.82 to 1.19)	0.874	1.01 (0.84 to 1.23)	0.893
More	73/104 (70.2)	1.04 (0.84 to 1.28)	0.734	1.08 (0.84 to 1.23)	0.834
Family worries					
No	49/80 (61.3)	1 (ref)		1 (ref)	
Few	120/171 (70.2)	1.15 (0.94 to 1.40)	0.182	1.20 (0.97 to 1.47)	0.086
More	163/243 (67.1)	1.10 (0.90 to 1.33)	0.362	1.12 (0.91 to 1.37)	0.274
Employed					
Not employed	155/225 (68.9)	1 (ref)		1 (ref)	
Employed	191/291 (65.6)	0.96 (0.84 to 1.08)	0.433	0.97 (0.86 to 1.10)	0.622
Highest level of education					
Year 10 or below	242/373 (64.9)	1 (ref)		1 (ref)	

Continued

Table 4 Continued

	High/very high family functioning, n/N (%)	PR (95% CI)	P value	Adjusted PR (95% CI)	P value
Year 11–12 or Certificate	103/148 (69.6)	1.07 (0.95 to 1.22)	0.290	1.08 (0.96 to 1.24)	0.220
University	12/21 (57.1)	0.88 (0.61 to 1.29)	0.524	0.87 (0.60 to 1.27)	0.486
Welfare recipient					
No	182/260 (70.0)	1 (ref)		1 (ref)	
Yes	165/268 (61.6)	0.88 (0.78 to 1.00)	0.042	0.88 (0.77 to 1.00)	0.047

Data exclude 76 missing family functioning score and missing by individual variable. All variables adjusted for age and gender. Age adjusted only for gender. Gender adjusted only for age. ref, reference group .

them culture by being on country. But it's always hard to get this recognised by our funders. We can get a program to address alcohol easily, but what we need is a healing pathway back to our culture, back to the community and back to our elders teaching.

We did not observe a significant statistical relationship between high family functioning and living on your country; spending time on country; knowing your skin name; having cultural responsibilities for country; other family speaking language; knowing your mob; and knowing your mob's country. One Waltja Director observed:

I think it's [the research is] sort of boxing things up: culture, land, language, as individual things you see. This Kanyini, Ngura, Waltja and Tjukurpa, they are all connected. For one to flourish, you need to have the other parts. I think this is a good story, but I am thinking about the connections, how one thing is related to another and what it means, Anangu way.

DISCUSSION

The overwhelming majority of Central Australian participants reported high family functioning, with no observed differences in family functioning by age, gender or household size. The importance of respect and caring in the family is attested by the high proportion of participants who responded 'A lot' across the positive individual family functioning items and the overall high proportion with high/very high family functioning. High family functioning was associated with cultural factors such as knowing and speaking your Aboriginal language, higher community cohesion, high cultural practice and higher individual agency. Consistent with prior evidence, the findings indicate that culture and family are recognised strengths of Aboriginal communities^{5 34–38} contrary to the deficit framing of family in the media. These results in part are driven by a very unique 'social structure of Indigenous communities' and systems of connectedness and kinship which define relations between individuals, families and communities.⁵ Wilson provides an important summary of this signalling "...the relational way of being

is at the heart of what it means to be Indigenous" (Wilson, p80).³⁹

Waltja's framework (*Tjukurpa, Kanyi, Walta and Ngura*) for working with family and children suggest that these relationships are not simply about people, but encompass relationships with land, spirituality and Indigenous knowledge.⁴⁰ While we did not find an association between connection to country measures and family functioning, feedback from Waltja Directors suggest that people's connection with country is a critical backbone in supporting other cultural factors, including learning kinship responsibilities and understanding Aboriginal law (*Tjukurpa*). A lack of statistical significance does not mean no association; the small sample may mean that some associations were not detectable. Given the exploratory nature of this study, the comments from Aboriginal collaborators are particularly pertinent as they suggest there are complex and potential multidirectional relationships between and among the cultural determinants and family functioning, warranting further longitudinal investigation among the Mayi Kuwayu Study cohort. The findings warrant further exploration with the national level data to explore differences and similarities based on remoteness geography.

Of the social factors considered in this paper, household composition, family financial status and receiving welfare were associated with high family functioning. A potential novel finding of this study is that living in a multigenerational or extended family household was associated with higher family functioning compared with living in nuclear household. As identified by Waltja Directors, there is potentially an underlining link back to culture because households containing multigenerational or extended family may be in a better position to facilitate cultural knowledge transfer and teaching and use of Aboriginal language than less diverse households. This warrants further research and investigation, including better understanding why we observed an association in household composition and family functioning, but did not find this in relation to household size or perceived overcrowding. Given that reducing overcrowding and household sizes is pursued by primary healthcare experts as a response to high infections rates of common

Table 5 Associations between high family functioning and cultural determinants among Mayi Kuwayu participants, Central Australia

	High/very high family functioning, n/N (%)	PR (95% CI)	P value	Adjusted PR (95% CI)	P value
Kanyini					
Community cohesion					
Low	14/46 (28.3)	1 (ref)		1 (ref)	
Moderate	72/123 (58.5)	2.10 (1.30 to 3.40)	0.003	2.09 (1.27 to 3.44)	0.004
High	212/268 (79.1)	2.80 (1.76 to 4.45)	<0.001	2.72 (1.68 to 4.39)	<0.001
Individual agency in the community					
Low	32/82 (39.0)	1 (ref)		1 (ref)	
Moderate	80/125 (64.0)	1.64 (1.21 to 2.22)	<0.001	1.66 (1.23 to 2.25)	<0.001
High	174/213 (81.7)	2.09 (1.59 to 2.76)	<0.001	2.15 (1.63 to 2.85)	<0.001
Tjukurpa					
Exposure to cultural practice and knowledge					
Low-moderate	132/236 (55.9)	1 (ref)		1 (ref)	
High	194/243 (79.8)	1.43 (1.25 to 1.63)	<0.001	1.45 (1.28 to 1.65)	<0.001
None	8/14 (57.1)	1.03 (0.64 to 1.64)	0.903	0.94 (0.56 to 1.58)	0.807
First language					
English or other	108/184 (58.7)	1 (ref)		1 (ref)	
An Aboriginal language	241/334 (72.2)	1.23 (1.07 to 1.41)	0.003	1.20 (1.04 to 1.37)	0.011
Speaks language					
No	48/84 (57.1)	1 (ref)		1 (ref)	
A little bit	80/136 (58.8)	1.03 (0.82 to 1.30)	0.807	1.07 (0.84 to 1.36)	0.597
A fair bit	26/49 (53.1)	0.93 (0.67 to 1.28)	0.652	1.04 (0.76 to 1.43)	0.788
A lot	194/257 (75.5)	1.32 (1.08 to 1.61)	0.006	1.37 (1.12 to 1.68)	0.003
Cultural responsibilities for country					
No	97/161 (60.3)	1 (ref)		1 (ref)	
Yes	273/402 (67.9)	1.13 (0.98 to 1.30)	0.099	1.14 (1.00 to 1.32)	0.072
Ngura					
Currently lives on country					
No	161/256 (62.9)	1 (ref)		1 (ref)	
Yes	182/263 (69.2)	1.10 (0.97 to 1.25)	0.130	1.07 (0.95 to 1.23)	0.233
Time in life spent living on country					
None	52/81 (64.2)	1 (ref)		1 (ref)	
A little bit–a fair bit	88/155 (56.7)	0.88 (0.71 to 1.09)	0.258	0.94 (0.76 to 1.17)	0.604
A lot/all my life	199/283 (70.3)	1.10 (0.92 to 1.31)	0.320	1.14 (0.94 to 1.37)	0.175
Knows tribe's mob's country					
Unsure	37/50 (72.6)	1 (ref)		1 (ref)	
Reported	309/476 (64.9)	0.93 (0.76 to 1.14)	0.492	0.90 (0.75 to 1.08)	0.268
Waltja					
Other family speaks language					
No/unsure	21/53 (60.4)	1 (ref)		1 (ref)	
Yes, other family speak language	321/483 (66.5)	1.10 (0.88 to 1.38)	0.407	1.16 (0.92 to 1.47)	0.208
Knows skin name					
No/do not have one	40/60 (66.7)	1 (ref)		1(ref)	
Yes	270/409 (66.0)	0.99 (0.82 to 1.20)	0.920	1.02 (0.84 to 1.24)	0.810

Continued

Table 5 Continued

	High/very high family functioning, n/N (%)	PR (95% CI)	P value	Adjusted PR (95% CI)	P value
Knows their mob					
Unsure	37/51 (72.6)	1 (ref)		1 (ref)	
Reported	309/476 (64.9)	0.89 (0.74 to 1.07)	0.229	0.90 (0.75 to 1.08)	0.268

Data exclude 76 missing a family functioning score and missing by individual variable. All variables adjusted for age and gender. ref, reference group.

preventable disease (for example trachoma, rheumatic fever, otitis media and most recently COVID-19),^{41–43} there is a need to better understand and address tensions that arise between Aboriginal preferences in living among large family groups, and the guidance provided in clinical primary and public healthcare.⁴⁴ The nexus between housing and primary healthcare delivery needs to consider the importance of family, environmental health and the factors that contribute to wellbeing. This includes understanding the mechanisms that culture and family may have in reducing health inequities.

Consistent with other research, lower family functioning was associated with receiving welfare and lower family financial status.^{45 46} Low income results in considerable stress on families⁴⁷ and could be compounded in the context of Central Australia by poorer social housing and infrastructure conditions.⁴⁴ Further, the levels of socioeconomic disadvantage experienced by Aboriginal families may mean the scale of benefit from increased household incomes are considerable in this context compared with urban locations.²⁴ Importantly, our findings are consistent with others who have argued that supporting Aboriginal families requires more than just improvements in social conditions⁴⁸ and is deeply connected with cultural determinants.

This study is the first quantifiable evidence from Central Australia demonstrating important associations between high family functioning and aspects of culture. The strength associated with Aboriginal families and culture provides an alternative narrative to the deficit public discourse. Working in partnership with Aboriginal leaders in this research has led to a deeper and more nuanced consideration of the findings that highlight complexities in how social and cultural determinants relate to family functioning. It seems important that future analysis give consideration to the interconnections between various factors of culture rather than simply their independent associations with family functioning. Further, the observed associations do not imply causality, and several aspects warrant further investigation to determine causal pathways. A limitation of the study is the non-random sampling strategy used by Mayi Kuwayu and the potential clustering of individual respondents in the same household or community, which was not accounted for in the analysis. This may mean the prevalence is overestimated as survey respondents are more likely to have

positively responded to questions about their family relations. Despite this, there is considerable diversity of the participants in the sample and it is one of the largest recorded samples for a study of the Aboriginal population in Central Australia. The sample size was sufficient to allow adjustment for age and gender across the associations explored, demonstrating no material changes in the findings. It is likely that similar findings may be found for other regions of Australia and potentially other Indigenous and First Nations groups globally; given the novel findings presented, further analyses at the national level are warranted.

Overall, being responsive to families and the community is a fundamental principle of primary healthcare as it was originally conceived.⁴⁹ As such, there is a need to think more broadly about how primary health can extend beyond clinical services and what investments could support this. This paper suggests working with families and with culture can support wellbeing outcomes. This finding reinforces what others have described as the critical need for Aboriginal-led services. Applying this principle to comprehensive primary healthcare requires services to establish a deeper connection with the Aboriginal culture, family and community which may already be occurring in some Aboriginal Community Controlled Health Services despite a lack of investment. Future research working with the Aboriginal Community Controlled Health Services is needed to identify case studies that demonstrate these ways of working. Integration of the family and community into healthcare services may be part of the transformative change needed to better serve Aboriginal and Torres Strait Islander people across the healthcare sector. The wellbeing benefits associated with cultural and social outcomes for Aboriginal and Torres Strait Islander peoples are enough to warrant strong government commitment and investment. Such investment should include rigorous research and evaluation to optimise the impacts on people.

CONCLUSION

This study found high family functioning among Aboriginal people in Central Australia, despite the impact of considerable health and social inequalities. Given the enormous power of state decision-making over Aboriginal lives, the family is a unit which bonds individuals and

collectively provides a source of empowerment. Family functioning is interconnected with a number of cultural and social determinants. Building on foundations of culture and family is likely to be an important approach to improving wellbeing in this region and could be better used in the delivery of primary healthcare services for Indigenous peoples.

Acknowledgements The authors acknowledge all Aboriginal and Torres Strait Islander peoples and their continuing connection to culture, land and seas. This work was primarily undertaken on Arrente Country and we acknowledge the Traditional Owners of this Country, who have remained strong custodians of their land despite the impacts of colonisation and associated trauma. We are grateful to the participants of Mayi Kuwayu from Central Australia and Directors and Researchers involved in the workshops and feedback session. We extend our thanks to Waltja Tjutangu Aboriginal Corporation, Tangentyere Council and the Mayi Kuwayu Data Governance Committee who provided guidance, engaged with the content of the study and approved outputs prior to submission for publication.

Contributors The authors contributed to study in the following manner: study design (RL, AW, VND); analysis (AW, M-MB); drafting manuscript (AW); interpretation (AW, VND); statistical review (JT, EB); revision to manuscript (all authors).

Funding The Mayi Kuwayu Study was supported by the National Health and Medical Research Council of Australia (ref: 1122273). AW is supported by an Australian Government Research Training Program Scholarship and an ANU Dean's Award Scholarship. RL and EB are supported by the National Health and Medical Research Council of Australia (reference numbers 1088366 and 1136128, respectively).

Competing interests None declared.

Patient consent for publication Consent obtained directly from patient(s)

Ethics approval This study involves human participants and was approved by Australian National University Human Research Ethics Committee (Ref Number: 2016/767), Central Australian Human Research Ethics Committee (Ref Number: 19-3315). Participants gave informed consent to participate in the study before taking part.

Provenance and peer review Not commissioned; externally peer reviewed.

Data availability statement Data may be obtained from a third party and are not publicly available. The Mayi Kuwayu dataset is governed by senior Aboriginal people based on principles of Indigenous data sovereignty. Requests on data access can be made to the Mayi Kuwayu Data Governance group.

Author note 'Waltja tjutangu nyakunyjtaku': Luritja language meaning 'to be surrounded by family'.

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Supplementary Table 1. Postcodes used to determine geographic locations

Geographic location	Postcodes
Central Australia*	0870, 0871, 0872, 0861, 0862, 0852, 4825, 5723, 6765, 6770, 6753, 6430, 6433, 6431
Non-Central Australia	All remaining participants, including those with missing postcode.

*Central Australia is often colloquially termed as the southern part of the Northern Territory (NT). In this paper, Central Australia includes not only the southern part of the NT, but is a larger geographic zone that overlaps state and territory boundary of South Australia, Western Australian and NT. It also extends to the Barkly region, and includes Lajamanu and Dagaragu communities, encompassing the service area of the Central Land Council. This wider region of Central Australia ensures that related and closely associated (through for example, kinship and language groups) Aboriginal and Torres Strait Islander groups are included in our analysis.

Supplementary Table 2: Variables used in the analysis

Covariates	
Gender	Derived from the question “What is your gender” Coded as (1) male, (2) female, (3) other, (.) missing. There were no persons identifying as “other” gender in Central Australian sample. The variable sex was used for all adjusted analyses: (1) male (2) female, (.) missing.
Age group	Age in years is calculated based on “date of entry” (i.e. date of completion of the survey) minus “date of birth”, rounded to one decimal place. Age group as a continuous variable is named age . Implausible values are recoded to “.” in the continuous variable. Age was re-categorised in age_cat into broader age categories: 16-34 years, 35-54 years, ≥ 55 years, to avoid small/zero cells.
Family financial status	Family financial status was derived from the question, “Which words best describe your family’s money situation?”. Responses included “we have a lot of savings” “we have some savings” “we have just enough to get us to the next payday” “we run out of money before payday” or “we are spending more than we get” “unsure”. These was recoded to: “run out of money or spend more than we get”(2), “just enough money”(1), “some or a lot of savings”(0).” Unsure will be included in missing.
Cultural determinants – Framed from work Waltja and used in Priest et al. (2008). 4 areas Kanyini (belonging, nurturing), Tjurkpa (law, dreaming), Ngura (country), Waltja (family and kin)	
Kanyini	
Community cohesion	Community cohesion was assessed using 7-item question asking: “In the Aboriginal and Torres Strait Islander community, where I live now...” with responses reflecting community-level cohesion: “there are people with cultural knowledge (bosses or elders) that I can go to or yarn with, there are places for people to meet; there are leaders; we cope with problems; we work together; Local Aboriginal/Torres Strait Islander people make community decisions; we respect the decisions made by our local community leaders”. Responses are “not at all” (1), “a little bit” (2), “a fair bit” (3), “a lot (4)”, “unsure (5)”. These were recoded to “not at all” (0), “a little bit” (1), “a fair bit” (2), “a lot (3)”, “unsure (missing = .)”. The total score was calculated by summing responses to all 7-items (range: 0 to 21) and was only created for participants with complete data across the items. The distribution of the sample was assessed to define low-medium and high categories. The categories were defined after assessing the centre of the data (histogram), mean =16, median = 17. This was then categorised into three categories: low (0-10), medium community cohesion (11-16) and high community cohesion (17-21).
Individual agency in the community	The question asked “in the community I live now:” and responses reflecting individual-level agency: “I can get involved in community discussions, I trust the leaders, I feel listened to, I feel respected. I feel like a role model, I feel like a leader, I feel like I belong.” Responses are “not at all” (1), “a little bit” (2), “a fair bit” (3), “a lot (4)”, “unsure (5)”. These were recoded to “not at all” (0), “a little bit” (1), “a fair bit” (2), “a lot (3)”, “unsure (missing = .)”.

	<p>The total score is calculated by summing responses to all 7 items (range: 0 to 21) and was only created for participants with complete data across the items. The distribution of the sample was assessed to define low-medium and high categories. The categories were defined after assessing the centre of the data (histogram), mean =14, median = 17.</p> <p>This was then categorised into three categories: low (0-10), medium community cohesion (11-16) and high community cohesion (17-21).</p>
Tjukurpa	
Cultural knowledge and practice exposure(Q25)	<p>To create the cultural practice, we draw on aacul25_1 to aacul25_10. This instrument was categorised based on early Mayi Kuwayu analysis (Lovett et al. 2019) as the following</p> <ul style="list-style-type: none"> • None (score of 0) • Low (scores 1-10) • Moderate (scores 11 to 20) • High (scores 21 to 30) <p>Recoded to: Low Moderate (0), High (1) None (2) – due to the small number who responded none to all items.</p>
Language (individual)	<p>This uses answers to the question “What is your first language?” and recoded as</p> <ol style="list-style-type: none"> 1. As First language – Aboriginal and Torres Strait Islander Language 2. Other or English
Use language	<p>Question 20 asks do you speak any Aboriginal/Torres Strait Islander words/languages? Responses are No (1), Yes, a little bit (2), Yes, a fair bit (3), Yes a lot (4).</p> <p>Variable was recoded as is No (0) a little bit (1), a fair bit (2) a lot (3).</p>
Cultural responsibilities for country	<p>Derived from the question “Do you have special cultural responsibilities for country?”</p> <p>Multiple option: Yes, mother’s side; Yes father’s side; Yes other country; No</p> <p>Responses was recoded as 1 if they selected any of the yes options (yes, mothers side, yes fathers side, yes other country) or 0 if respondent chose no option. If the participant had selected any of the “yes” options as well as selecting “no”, they are recoded to “no” only.</p>
Ngura	
Lives on country	<p>Derived from the question “do you currently live on your country”. Response options are no (0), yes (1), unsure (2.) These were recoded as: No (0) Yes (1) Unsure (missing).</p>
Time spent living on country	<p>Derived from the question “How much of your life have you spent living on your country?”, Responses include None, a little bit, a fair bit, a lot or all my life, unsure</p> <p>Responses recoded to: No (0), A little bit-a fair bit (1), A lot or all my life (2) Unsure (missing)</p>
Knows tribes (mob’s) country	<p>Q7. Where is your mob’s country/island?</p> <p>Responses were text answer or Unsure</p> <p>Responses coded as: Unsure or missing text answer (0), Responded (1)</p>
Waltja	
Other family speaks language	<p>Q 22. If other family speak language derived from the question, “Who else in our family speaks (spoke) Aboriginal/Torres Strait Islander words or language. Multiple responses including: my partner/spouse, my children, my grandchildren, my parents, my grandparents, my sibling(s), my cousin(s), my aunty(ies) or Uncle(s), other family.</p> <p>Responses were recoded to categories:</p>

	Responses was recoded as 1 if responded selected any of the any option for family (my partner/spouse, my children, my grandchildren, my parents, my grandparents, my sibling(s), my cousin(s), my aunty(ies) or Uncle(s), other family or 0 if respondent chose unsure. Missing was coded as missing.
Skin name (6)	Derived from the question "Do you know your skin name?" Responses are No (1), Yes (2), Unsure (3), Don't have one (4) Responses were collapsed and recode as: Yes (1), No/ Don't have one (0), Unsure (missing)
Knows their mob	Derived from the question "Who are your tribe(s) or mob(s)?" Response options are: free-text answer (coded as "knows mob" = 1) and "Unsure" response (coded as "unsure of mob" = 0) We used the variable amob which has been cleaned by the Mayi Kuwayu Data Management Team in the following way: Participants who wrote a variation of "unsure" (e.g. "don't know", "unknown", "not sure" etc.) are recoded as "unsure of mob". People who did not respond to the free-text and who did not respond to the "unsure" check box are recoded to missing. Responses coded as: Unsure of mob (0), Knows mob (1), Missing (.)
Social determinants	
Household size	The question of household size was derived from Q33. How many people live with you? (number). We cross checked this question with "How many children live with you?" In cases, where the total number of children was greater than the total number of people, we added the totals together. To get the total household size, we added 1 to the total, so as to count the participant (+1). We checked for any anomalies in the data (1 participant recorded 99 people and 99 children). This is likely to be an error, we recoded this as missing. We assessed the spread and centre of the data, mean and SD. We recoded household size as: 1-3 4-6 7-9 ≥10
Number of children	The question of number of children in household, was derived from "How many children live with you?" We assessed the spread of responses – mean and median, histogram. Average was 2.5 children in household that responded. Responses recategorised into: 0"no children" 1 "1-2 child/ren" 2">= 3 children" Missing (.)
Household composition	Household type was derived from the question Q35. Who lives with you? Single response option included Single response: no-one (1,0) Multiple response options include: my partner or spouse, my children, my grandchildren, someone else's children, my parents, my grandparents, my siblings, my cousins, my aunty and uncles. Recode to household type: • Single (coded = 1)

	<ul style="list-style-type: none"> • No-one AND responded “0” Q33 How many people live with you?” 0 • No-one AND did not respond to Q33 • Multigenerational (coded = 2) <ul style="list-style-type: none"> • Those who selected lives with grandparent and/or grandchildren • Living with parents and living with my children or spouse • Lives with parents and someone else’s kids • Lives with aunty/uncle and living with someone else’s kids • Extended (coded = 3) <ul style="list-style-type: none"> • Lives with siblings, cousins, aunties/uncles, other family (in-laws), someone else’s children • Nuclear (coded = 4) <ul style="list-style-type: none"> • Only those who selected partner and children • Friends or visitors (coded = 5) <ul style="list-style-type: none"> • If selected “other friends or visitors” • Partner only (coded=6) <ul style="list-style-type: none"> • Only those who selected partner and no other response • Single parent household (coded = 7) <ul style="list-style-type: none"> • Only those who selected lives with children or someone else’s children • Lives with parents (coded = 8) <ul style="list-style-type: none"> ◦ If selected “My parents” and has not selected “My children” <p>These categories were used in the descriptive analysis, and collapsed further in the models to:</p> <p>1 "Nuclear/Partner only" 2 "Multigenerational and extended families" 3 "Other"</p> <p>Other includes single, single parent, other friends or visitors</p>
Employment	Participants were categorised as employed if they reported working or studying part or full-time, and categorised as not employed if they were not working (including being retired, on a pension or carer). Participants are categorised as missing if they have “not selected” for all ababo41* items.
Education	Highest attained education qualification was categorised into three groups: Year 10 or below (no school, primary school and intermediate certificate); Year 12 or trade or certificate (higher school, diploma/certificate, trade); and, university qualifications.
Welfare recipient	Derived from “Do you receive welfare payments?” No (0), yes (1), unsure (2). Unsure coded as missing (2=.)
Worries in the family (Q101)	<p>The question asked “in the last year, has anyone in your close family: been badly hurt or sick, passed away, lost a job, had problems at work, had an alcohol or drug problem, experienced violence, had stuff stolen, been arrested or been in youth detention or prison, had a relationship break up, had children taken away”. Response yes, no, not relevant. Recoded “not relevant” as no.</p> <p>A total score for “Worries in the family” was created by summing the total responses to this question. No/Not relevant (0), Yes (1). Totals were only created for participants who responded to all questions.</p> <p>Recategorised into 3 categories No worries (0) Few worries (1-3). More worries (4-10).</p>
Worries in the community (Q102)	<p>The question asked “Are any of these a problem where you live – drinking too much grog; tobacco smoking; drugs; sniffing; racism; gambling; family violence; people fighting or not getting along; humbugging;” Options included not at all (1), a little bit (2), a fair bit (3), a lot (4).</p> <p>Composite variable will be created that adds together the answers. (0 – not at all, unsure. 1 (a little), (a fair bit) (a lot).</p>

	<p>A total score for “Worries in the community” was created by summing the total responses to the question. Totals were only created for participants who responded to all questions. We reviewed the distribution of the data. 3 categories were created No worries (0) Few worries (1-17). More worries (18-27).</p>
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Supplementary Table 3. Sensitivity of family functioning and cultural determinant associations to different approaches in calculating the family functioning measure (FFM)

	FFM with imputed values		FFM with no imputation aPR	
<i>Kanyini</i>				
Community cohesion	aPR (95% CI)	p value	aPR (95% CI)	p value
Low	1 (ref)		1 (ref)	
Moderate	2.07 (1.28-3.36)	0.003	2.01 (1.22-3.30)	0.006
High	2.80 (1.76-4.45)		2.65 (1.64-4.29)	<0.001
Individual agency in the community				
Low	1 (ref)		1 (ref)	
Moderate	1.69 (1.25-2.30)	0.001	1.76 (1.27-2.44)	0.001
High	2.16 (1.63-2.87)	<0.001	2.28 (1.68-3.09)	<0.001
<i>Tjukurpa</i>				
Exposure to cultural practice and knowledge				
Low-Moderate	1 (ref)		1 (ref)	
High	1.44 (1.26-1.64)	<0.001	1.48 (1.29-1.70)	<0.001
None	1.03 (0.64-1.64)	0.903	0.90 (0.50-1.60)	0.711
First language				
English or other	1 (ref)		1 (ref)	
An Aboriginal language	1.22 (1.07-1.41)	0.004	1.18 (1.02-1.36)	0.024
Speaks language				
No	1 (ref)		1 (ref)	
A little bit	1.03 (0.82-1.30)	0.807	1.08 (0.84-1.39)	0.525
A fair bit	0.93 (0.67-1.28)	0.652	1.01 (0.72-1.41)	0.970
A lot	1.31 (1.08-1.60)	0.007	1.37 (1.10-1.70)	0.004
<i>Ngura</i>				
Cultural responsibilities for Country				
No	1 (ref)		1 (ref)	
Yes	1.12 (0.97-1.30)	0.111	1.22 (1.03-1.43)	0.015
Currently lives on country				
No	1 (ref)		1 (ref)	
Yes	1.11 (0.98-1.25)	0.109	1.06 (0.94-1.21)	0.342
Time in life spent living on Country				
None	1 (ref)		1 (ref)	
A little bit - a fair bit	0.87 (0.71-1.08)	0.219	0.95 (0.75-1.19)	0.638
A lot/All my life	1.10 (0.92-1.31)	0.320	1.14 (0.93-1.40)	0.193
Knows tribe's (mob's) country				
Unsure	1 (ref)		1 (ref)	
Reported	1.11 (0.89-1.38)	0.351	1.05 (0.84-1.32)	0.676
<i>Waljta</i>				
Other family speaks language				
No	1 (ref)		1 (ref)	

Yes, other family speak language	1.10 (0.87-1.38)	0.432	1.20 (0.93-1.53)	0.162
Knows skin name				
No/don't have one	1 (ref)		1 (ref)	
Yes	0.99 (0.81-1.20)	0.890	1.08 (0.87-1.34)	0.484
Knows their mob				
Unsure	1 (ref)		1 (ref)	
Know mob	0.89 (0.74-1.07)	0.216	0.87 (0.72-1.04)	0.127