Risk of severe illness from COVID-19 among Aboriginal and Torres Strait Islander adults: the construct of 'vulnerable populations' obscures the root causes of health inequities

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Abstract

Objective: To quantify the prevalence of known health-related risk factors for severe COVID-19 illness among Aboriginal and Torres Strait Islander adults, and their relationship with social determinants.

Methods: Weighted cross-sectional analysis of the 2018-19 National Aboriginal and Torres Strait Islander Health Survey; Odds Ratios for cumulative risk count category (0, 1, or ≥2 health-related risk factors) by social factors calculated using ordered logistic regression.

Results: Of the adult population, 42.9%(95%CI:40.6,45.2) had none of the examined health-related risk factors; 38.9%(36.6,41.1) had 1, and 18.2%(16.7,19.7) had ≥2. Adults experiencing relative advantage across social indicators had significantly lower cumulative risk counts, with 30-70% lower odds of being in a higher risk category.

Conclusions: Aboriginal and Torres Strait Islander peoples must continue to be recognised as a priority population in all stages of pandemic preparedness and response as they have disproportionate exposure to social factors associated with risk of severe COVID-19 illness. Indigeneity itself is not a 'risk' factor and must be viewed in the wider context of inequities that impact health

Implications for public health: Multi-sectoral responses are required to improve health during and after the COVID-19 pandemic that: enable self-determination; improve incomes, safety, food security and culturally-safe healthcare; and address discrimination and trauma.

Key words: COVID-19, risk Factors, social Determinants of Health, racism

The COVID-19 pandemic has again put a spotlight on health inequities across populations globally, including differential risk of COVID-19 exposure and transmission, consequences of infection, access to vaccines and consequences of response measures.[1-3] Inequities arise for many reasons, including, but not limited to, government leadership, socio-political agendas, economic rationale, existing health care systems and pandemic governance.

There is growing evidence of inequities in the prevalence of severe outcomes, including mortality, following severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2), the infective agent that causes COVID-19 (hereafter referred to as 'severe COVID-19 illness'). Observed inequities likely reflect the pre-existing unequal distribution of risk factors for severe COVID-19 illness within and across populations.[1-4] However, globally, exposition of these inequities in severe COVID-19 illness has spurred unsubstantiated hypotheses about biological differences in risk between groups.[3,5,6] Ascribing 'vulnerability' to race, ethnicity or Indigeneity – in the context of COVID-19 or beyond – is a form of systemic racism.[7,8] It has material consequences, including reproducing and exacerbating narratives of racial inferiority.[9] This can confirm and reinforce prejudices and stereotypes, and can lead to pathologising the population. It can also lead to internalised racism for the population, which can impair self-esteem and compound complex trauma.

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Submitted: June 2021; Revision requested: August 2021; Accepted: September 2021
Conflict: The authors have stated they have no conflicts of interest.

Aust NZ J Public Health. 2021; 45:658-63; doi: 10.1111/1753-6405.13172

The portrayal of communities as 'biologically destined to be sick'[9] and permanently 'disorganised'[10] and dependent[9] can be used to justify paternalistic policies and dismiss calls for self-determination. Further, it can lead to policy responses that ignore the root causes of inequities, creating missed opportunities for prevention and limiting the effectiveness of interventions.[5]

There is robust evidence that individual health-related factors including cardiovascular disease (CVD), cerebrovascular disease, diabetes, chronic obstructive pulmonary disease (COPD), chronic kidney disease, cancer, hypertension and smoking are associated with severe COVID-19 illness (commonly defined as intensive care unit admission, requiring mechanical ventilation, or death).[11] Having multiple comorbidities may compound risk of severe illness.[12] It is well established that these health-related factors are more common among groups experiencing social disadvantage and exclusion.[2,3,13] Additionally, older age is associated with severe COVID-19 illness,[11] as is male sex, although the latter may reflect sex differences in comorbidity risk profiles.[11]

Within Australia, Aboriginal and Torres Strait Islander peoples are more likely than non-Indigenous people to experience poor health,[14] including increased prevalence and earlier onset of many of the health-related risk factors for severe COVID-19 illness. The inequitable burden of poor health stems from settler colonialism and government policies, which dispossessed, disempowered and oppressed Aboriginal and Torres Strait Islander peoples.[14] Colonisation is an ongoing process, perpetuated and entrenched through systemic racism and discrimination.[14] It has controverted Aboriginal and Torres Strait Islander peoples' control over their lives and has led to long-term exclusion from conditions that support physical and mental health and wellbeing, including (but not limited to) access to adequate incomes, safe neighbourhoods, appropriate education, health services, optimal management of health conditions and food security.

Precise discourse, including contextualisation of 'risk', is vital to challenge the fallacy that Indigenous peoples (or any other group) are genetically or biologically predisposed to severe COVID-19 illness, and to identify areas for preventive action. The aim of this paper was to quantify the prevalence within the Aboriginal and Torres Strait Islander population of health-related factors known to be associated with severe COVID-19 illness, overall and by age and by sex, and to quantify the relationship between underlying contextual factors and the occurrence of these risk factors.

Methods

Study population

This study analyses data about adults ≥18 years of age from the 2018-19 National Aboriginal and Torres Strait Islander Health Survey (NATSIHS) conducted by the Australian Bureau of Statistics (ABS).[15] The survey included 6,423 Aboriginal and Torres Strait Islander adults; this sample was used to generate estimates weighted to a total population of 486,444 adults, representing 97.1% of the estimated national Aboriginal and Torres Strait Islander adult population at 30 June 2018 (N=500,988).[16]

Data

Outcome: risk of severe illness if COVID-19 is contracted

We first conducted a review of meta-analyses, published at 23 June 2020, to identify clinical risk factors with consistent evidence of association with severe COVID-19 illness.[11] The identified health-related risk factors were CVD, cerebrovascular disease, diabetes, COPD, chronic kidney disease, cancer, hypertension and smoking.

Outcome variables were defined based on the literature review, constrained by available ABS data; see Supplementary Table 1 for details. Each outcome was coded as a binary variable (no/yes), and summed to create a cumulative risk count, ranging from 0-8 factors associated with increased risk of severe COVID-19 illness. A categorical variable (0, 1, or ≥2) was created based on this cumulative risk count.

Older age (≥65 years) and male sex were not included in the risk count but were examined separately.

Exposures: contextual factors

Informed by group discussions to identify relevant domains, six exposures were selected *a priori* from the available variables in the dataset to represent a diversity of factors conceptualised to underlie risk profiles: household income, area-level disadvantage, barriers to accessing healthcare, food security, experiences of interpersonal discrimination and forced removal from family (an indicator of intergenerational trauma) (Supplementary Table 2).

Potential confounding factors

Because this analysis was exploratory in nature, aiming to illuminate general patterns of association, analyses were adjusted for basic demographic factors only: age group (18-44, 45-64, ≥65 years), sex and remoteness (urban/regional, remote/very remote), rather than for all potentially confounding factors.

Statistical methods

We quantified the prevalence of each individual health-related risk factor and the cumulative risk categories, overall and by age group and by sex.

The distribution across cumulative risk categories is presented by each contextual factor (exposure). We individually quantified the relation between each exposure and the cumulative risk category (0, 1, or ≥2), using ordered logistic regression to calculate Odds Ratios (OR) and 95% confidence intervals (CIs). Models were run unadjusted and then adjusted for age group, sex and remoteness; adjusted results are presented in the text. The Supplementary File details the approach for determining the modelling strategy and testing assumptions.

To understand the patterning of contextual factors and each component of cumulative risk, we individually quantified the relation between each exposure and each individual health-related risk factor (outcome), using binary logistic regression.

Confidential Unit Record Data Files, accessed through ABS DataLab,[15] were analysed using Stata version 16. Results were weighted to the total in-scope population, using replicate weights provided by the ABS, employing the delete-a-group jackknife replication method. All results were based on an underlying unweighted cell count ≥10.

Ethics

The conduct of ABS surveys is approved under the Census and Statistics Act 1905. Ethics approval for the analysis of ABS data was granted by the Australian National University (Protocol: 2017/013).

This work actively involved Aboriginal and Torres Strait Islander (and non-Indigenous) health practitioners and researchers at all stages. The research question arose from, and the research was governed by, the COVID-19 Primary Healthcare Guidance Group, a joint initiative of the National Aboriginal Community Controlled Health Organisation, Royal Australian College of

General Practitioners, The Australian National University and the Lowitja Institute.

Results

Among Aboriginal and Torres Strait Islander adults in 2018/19, the prevalence of health-related risk factors ranged from 1.8% (95%CI:1.2,2.4) for cancer to 40.2% (37.9,42.5) for current daily smoking (Table 1). The prevalence of each condition was generally similar by sex and higher in older versus younger age groups, with the exception of daily smoking where prevalence was lowest in the older age group.

Of Aboriginal and Torres Strait Islander adults, 42.9% (40.6,45.2) had none of the health-related risk factors examined (Table 1); 38.9% (36.6,41.1) had one and 18.2% (16.7,19.7) had two or more. Half of those aged 18-44 years (52.5%; 49.4,55.7) had no risk factors, decreasing to 27.3% (23.4,31.2) of those aged 45-64 years, and 23.2% (18.1,28.3) of those aged ≥65 years. Risk distribution was similar by sex.

Adults who were advantaged across the social indicators examined, compared to the respective reference category, had significantly lower cumulative risk counts (Table 2), with 30-70% lower odds of being in a higher risk category.

The pattern of results was broadly consistent with a protective effect of exposures in relation to individual outcomes, although most adjusted associations had wide confidence intervals and there was not strong evidence of association (Supplementary Figure 1; Supplementary Table 3).

Discussion

While a substantial percentage of Aboriginal and Torres Strait Islander adults have no health-related risk factors for severe COVID-19 illness (42.9%, n=209,000 adults), 38.9% have a single risk factor, and 18.2% have two or more. In total, 59.0% (n=287,000) of Aboriginal and Torres Strait Islander adults have one or more of these health-related risk factors and/or were aged ≥65 years in 2018/19. This reinforces the need for the Aboriginal and Torres Strait Islander population to continue to be recognised as a priority population in all stages of the pandemic response. The analysis evidences that the risk profile within the Aboriginal and Torres Strait Islander population is linked to broader contextual factors. Those with access to fundamental determinants of health – income, living in an advantaged area, food security, no interpersonal discrimination, no forced separation from family, and access to healthcare – are at a significantly lower risk of severe COVID-19 illness. Disproportionate exclusion of Aboriginal and Torres Strait Islander peoples from these fundamental determinants reflects consequences of ongoing colonisation, systemic racism, and a longstanding failure to address underlying inequities.

Being Aboriginal and/or Torres Strait Islander is not a 'risk' factor for severe COVID-19 illness. It is a marker for disproportionate exposure to other factors which in turn confer risk. Accordingly, solutions to reduce health inequities – of which COVID-19 outcomes is the latest example – must address broader issues (including systemic racism) in order to be successful.[2-4,17] Multi-sectoral, equitable and inclusive responses are required to improve health during and after the COVID-19 pandemic, including those that: enable self-determination; improve access to incomes, neighbourhood safety, food security and culturally appropriate healthcare; and address discrimination and intergenerational trauma. In contrast, a focus on de-contextualised notions of 'risk' and 'vulnerability' would lead to solutions that ignore the long-standing structures that shape patterns of risk.[5,9]

From the early stages of the pandemic, Aboriginal and Torres Strait Islander leaders and Australian governments recognised the potential for catastrophic impact within Aboriginal and Torres Strait Islander communities. This led to targeted responses that have contributed to the low rates of COVID-19 illness among Aboriginal and Torres Strait Islander people.[18] While aiming to support Aboriginal and Torres Strait Islander communities, however, some responses may have been interpreted as inferring the inherent 'vulnerability' of Aboriginal and Torres Strait Islander peoples to COVID-19 on the basis of their Indigeneity. For example, initial Australian Health Protection Principal Committee (AHPPC) advice applied different age cut-offs to define 'vulnerability' (risk for severe COVID-19 illness) among Aboriginal and Torres Strait Islander people (50 years of age) versus non-Indigenous people (65 years of age) with the same profile of chronic conditions.[19] The lack of context underpinning the differential definition of 'vulnerability' between the populations risked misinterpretation as an indicator of differential susceptibility due to Indigeneity. Moving away from this framing, updated AHPPC advice identifies elevated risk of severe COVID-19 illness among all persons with specified chronic conditions, regardless of age and Indigenous status, and identifies Aboriginal and Torres Strait Islander peoples as *a priority population* in COVID-19 responses.[20] Further, preliminary advice from the Australian Technical Advisory Group on Immunisation identified Aboriginal and Torres Strait Islander peoples of all ages as a potential priority group for COVID-19 vaccination.[21] The high prevalence of risk factors for severe COVID-19 illness is one of the justifications for prioritisation of this group.

A contextualised response to the COVID-19 pandemic has been provided through governments and the AHPPC listening to and working in partnership with Aboriginal and Torres Strait Islander peoples, and implementing learnings from the 2009 influenza pandemic.[18] Led by First Nations leaders utilising principles of shared decision-making and working collectively with communities, the Aboriginal and Torres Strait Islander health sector responded rapidly and effectively to the COVID-19 pandemic.[18,22,23] This leadership has contributed to a significantly and substantially lower infection rate for Aboriginal and Torres Strait Islander peoples across all age groups, compared to the rest of the population, with an overall standardised rate ratio of 0.2.[24] This exemplifies the effectiveness of Aboriginal and Torres Strait Islander self-determination, and the strength – far from 'vulnerability' – of the Aboriginal and Torres Strait Islander community and health sector. Community control, community connectedness, valuing of Elders and the strength of connection to culture and country have likely contributed to the positive outcomes observed. It is critical that Aboriginal and Torres Strait Islander leaders continue to be involved in planning and decision making around emergency responses at the community to policy level, including in the identification of priority populations, and the policy actions taken to support them.

These health-related risk factors are generally more common among older adults, with around three-quarters of those aged ≥45 years reporting at least one risk factor. However, risk also occurs at younger ages,

Table 1: Percentage (95%CI) and number of Aboriginal and Torres Strait Islander adults with each health-related risk factor and in each cumulative risk category, overall and by age group and by sex.

	Overall			Age (years)									Sex					
				18-44			≥65			≥65			Male			Female		
	%	(95%CI)	[n]	%	(95%CI)	[n]	%	(95%CI)	[n]	%	(95%CI)	[n]	%	(95%CI)	[n]	%	(95%CI)	[n]
Hypertension	14.3	(12.7,15.9)	[70,000]	4.6	(3.2,5.9)	[14,000]	27.9	(24.0,31.8)	[39,000]	42.1	(35.3,48.9)	[17,000]	14.8	(12.4,17.2)	[35,000]	13.8	(11.9,15.7)	[35,000]
CVD	7.6	(6.5,8.7)	[37,000]	1.6	(0.9,2.3)	[5,000]	15.8	(12.6,18.9)	[22,000]	25.3	(19.9,30.7)	[10,000]	8.4	(6.5,10.3)	[20,000]	6.8	(5.6,8.1)	[17,000]
Cerebrovascular disease	2.0	(1.4,2.6)	[10,000]	0.7	(0.1,1.2)	[2,000]	3.2	(1.9,4.4)	[4,000]	8.3	(4.1,12.5)	[3,000]	2.0	(1.0,2.9)	[5,000]	2.0	(1.2,2.9)	[5,000]
Diabetes	12.1	(10.9,13.2)	[59,000]	3.5	(2.6,4.4)	[11,000]	24.2	(21.3,27.0)	[34,000]	36.2	(30.4,42.1)	[14,000]	12.1	(10.3,13.9)	[28,000]	12.0	(10.5,13.6)	[30,000]
COPD	4.7	(3.8,5.6)	[23,000]	1.7	(1.0,2.5)	[5,000]	9.8	(7.4,12.3)	[14,000]	9.8	(6.3,13.4)	[4,000]	2.9	(2.1,3.8)	[7,000]	6.4	(4.8,8.0)	[16,000]
Chronic kidney disease	2.9	(2.2,3.6)	[14,000]	1.2	(0.4,2.0)	[4,000]	4.6	(3.3,6.0)	[6,000]	9.4	(5.7,13.2)	[4,000]	2.3	(1.5,3.0)	[5,000]	3.4	(2.2,4.7)	[9,000]
Cancer	1.8	(1.2,2.4)	[9,000]	0.5	(0.0,1.0)	[1,000]	3.5	(1.7,5.3)	[5,000]	5.8	(3.1,8.4)	[2,000]	1.8	(0.8,2.7)	[4,000]	1.8	(1.1,2.4)	[5,000]
Current daily smoking	40.2	(37.9,42.5)	[196,000]	41.8	(38.7,44.9)	[129,000]	42.4	(38.3,46.6)	[59,000]	20.1	(15.1,25.1)	[8,000]	41.9	(38.1,45.7)	[98,000]	38.6	(35.8,41.4)	[98,000]
Cumulative risk category																		
0 risk factors	42.9	(40.6,45.2)	[209,000]	52.5	(49.4,55.7)	[161,000]	27.3	(23.4,31.2)	[38,000]	23.2	(18.1,28.3)	[9,000]	42.5	(38.9,46.1)	[99,000]	43.3	(40.6,46.0)	[110,000]
1 risk factor	38.9	(36.6,41.1)	[189,000]	41.4	(38.4,44.5)	[127,000]	36.1	(32.1,40.2)	[50,000]	28.6	(23.2,34.0)	[11,000]	39.3	(36.0,42.6)	[92,000]	38.5	(35.6,41.4)	[97,000]
≥2 risk factors	18.2	(16.7,19.7)	[89,000]	6.0	(4.8,7.3)	[19,000]	36.6	(32.7,40.5)	[51,000]	48.1	(43.0,53.2)	[19,000]	18.2	(15.8,20.6)	[42,000]	18.2	(16.2,20.2)	[46,000]

Note:
Absolute numbers of Aboriginal and Torres Strait Islander adults with each outcome are rounded to the nearest thousand.

with almost half of 18-44-year-olds reporting at least one risk factor (most commonly, daily smoking). Further, while male sex was identified as a potential risk factor for severe COVID-19 illness, the health-related risk factors examined were at least as common among females as males.[11] Therefore, Aboriginal and Torres Strait Islander people of all ages and genders need to be considered and prioritised accordingly in COVID-19 responses, as has occurred in preliminary advice on vaccine prioritisation.[21]

While this analysis is focused on Aboriginal and Torres Strait Islander peoples, findings are relevant to other populations experiencing health and social inequities. Care must always be taken to ensure that race, ethnicity, and/or cultural identity is not used as an indicator of inherent 'vulnerability'. These variables are indicators of structural inequities and racism, and represent social – not biological – constructs. Elevated risk observed within any population must be considered, and described, in the context of wider inequities in the conditions that support or diminish health, including systemic racism.[1,4,9,13]

Limitations

This manuscript focuses on risk of severe COVID-19 illness and the framework is intended to support contextualisation of other manifestations of inequity in the COVID-19 pandemic. It was outside of the scope of the manuscript to explore factors that increase the risk of exposure to COVID-19, access to prevention and mitigation measures, other consequences of COVID-19, or the reinforcing nature of these inequities.

The health-related outcomes explored in this analysis were based on a review of meta-analyses published up to 23 June 2020. The evidence on risks for severe COVID-19 illness is continually evolving. Policy guidance at a specific time point may not completely align with the risk factors examined here. For example, Australian guidance at the time of writing recognises obesity as a risk factor for severe COVID-19 illness (Supplementary Table 1). Including obesity in the cumulative risk count increases the percentage with ≥1 health related-risk factors and/or aged ≥65 years from 59.0% to 62.4% (n=304,0000 adults) (Supplementary Table 4). The broader learnings from the analysis are relevant regardless of the specific outcomes chosen.

We acknowledge that some of the health-related factors explored are correlated – such as hypertension, smoking, and CVD – which could potentially inflate cumulative risk if each factor does not have an independent association with severe COVID-19 illness.

The analysis is cross-sectional and is not intended to provide evidence of causality or directionality, or to quantify a precise effect size. The aim of this paper was to conduct exploratory analysis and test alignment with a conceptual framework for understanding risk of severe COVID-19 illness. As such, models were minimally adjusted, and it is possible that associations are confounded by other factors. We explored six examples of contextual factors; this was not intended to be comprehensive. For example, Stolen Generation is one of many indicators of intergenerational trauma, and there are other domains not represented (such as housing) that are likely to influence health-related risk factors. We also recognise that reporting no interpersonal discrimination does not mean the absence of racism across systemic, interpersonal or internalised levels.

We have made multiple comparisons and the findings should be interpreted accordingly[25]; we note that all contextual factors were agreed by authors *a priori* through a collaborative process, informed by literature and experience.

In drawing on an existing dataset, we were limited in the variables that we could explore and in the way these were measured. We acknowledge that there may be under-reporting of health conditions or other factors in

Table 2: Distribution across categories of contextual factors, and associations with cumulative risk category (0, 1, or ≥2).

Contextual factor	% in each exposure category				Odds Ratio for increasing risk category (95%CI)	
	Overall	By cumulative risk category				
	% (95%CI)	0	1	≥2		
		% (95%CI)	% (95%CI)	% (95%CI)	Unadjusted	Adjusted
Household income *						
Lowest (1st decile)	26.8 (24.5,29.1)	30.1 (25.7,34.6)	47.7 (43.0,52.4)	22.1 (18.4,25.9)	1 (Ref)	1 (Ref)
Middle (2nd-4th decile)	35.7 (33.2,38.3)	35.6 (31.1,40.1)	40.0 (35.4,44.5)	24.4 (21.4,27.5)	0.91 (0.73,1.15)	0.82 (0.64,1.04)
Highest (5th-10th decile)	37.5 (34.4,40.5)	60.9 (56.4,65.4)	29.5 (25.1,33.9)	9.6 (7.3,11.9)	0.31 (0.24,0.40)	0.30 (0.23,0.40)
Area-level disadvantage *						
Most disadvantaged (1st decile)	36.8 (32.0,41.6)	31.3 (28.2,34.4)	47.5 (44.8,50.2)	21.2 (18.7,23.6)	1 (Ref)	1 (Ref)
Middle (2nd-3rd decile)	27.2 (22.6,31.9)	43.7 (38.8,48.7)	37.4 (32.8,42.1)	18.8 (15.1,22.6)	0.68 (0.54,0.86)	0.67 (0.52,0.86)
Most advantaged (4th-10th decile)	35.9 (32.1,39.8)	54.1 (49.9,58.4)	31.1 (27.1,35.1)	14.7 (11.9,17.6)	0.45 (0.37,0.56)	0.50 (0.39,0.64)
Food security *						
Ran out of food and went without	10.2 (8.8,11.7)	26.2 (18.4,34.0)	47.0 (39.3,54.6)	26.8 (20.7,32.9)	1 (Ref)	1 (Ref)
Ran out of food but didn't go without	15.4 (13.7,17.2)	33.6 (28.9,38.2)	46.5 (41.8,51.2)	19.9 (16.3,23.5)	0.71 (0.54,0.95)	0.69 (0.52,0.92)
Did not run out of food	74.3 (72.1,76.6)	47.2 (44.5,49.9)	36.2 (33.4,38.9)	16.7 (15.0,18.4)	0.46 (0.34,0.62)	0.40 (0.30,0.55)
Discrimination *						
Unfair treatment sometimes to always	13.4 (12.0,14.9)	34.1 (27.5,40.7)	44.6 (37.9,51.4)	21.3 (16.3,26.2)	1 (Ref)	1 (Ref)
Unfair treatment once or rarely	11.5 (9.8,13.1)	46.0 (38.7,53.3)	36.0 (29.2,42.8)	18.0 (12.0,24.0)	0.67 (0.46,0.97)	0.78 (0.53,1.13)
No unfair treatment	75.1 (73.1,77.1)	43.8 (41.0,46.6)	38.9 (36.2,41.5)	17.4 (15.6,19.1)	0.71 (0.56,0.90)	0.70 (0.54,0.90)
Forced removal *						
Respondent was forcibly removed	14.8 (13.1,16.4)	28.3 (23.2,33.4)	43.1 (37.8,48.4)	28.7 (23.2,34.1)	1 (Ref)	1 (Ref)
Relative was forcibly removed	30.3 (27.8,32.8)	43.5 (39.8,47.3)	39.0 (34.7,43.3)	17.5 (14.4,20.6)	0.52 (0.40,0.68)	0.64 (0.49,0.84)
Neither respondent nor relative was removed	39.1 (36.4,41.8)	47.2 (43.1,51.2)	37.8 (33.7,42.0)	15.0 (12.7,17.3)	0.44 (0.35,0.57)	0.53 (0.41,0.67)
Not stated	15.9 (13.9,17.9)	--	--	--	--	--
Access to health care *						
≥1 barriers to accessing health care	44.5 (41.7,47.3)	37.9 (34.3,41.4)	41.6 (38.1,45.1)	20.5 (17.8,23.2)	1 (Ref)	1 (Ref)
No barriers to accessing health care	55.5 (52.7,58.3)	47.0 (43.7,50.2)	36.7 (33.8,39.5)	16.4 (14.4,18.3)	0.71 (0.58,0.86)	0.57 (0.46,0.70)

Notes:

Adjusted ORs are adjusted for age group, sex, and remoteness. Association with cumulative risk category is not shown for the 'not stated' group for forced removal.

** Indicates overall variable is significant in the adjusted model, with p-value for the Wald test <0.05.*

the sample. However, the 2018-19 NATSIHS enabled generation of contemporary, nationally representative prevalence estimates.

It is critical to reiterate that, despite the high prevalence of risk factors for severe COVID-19 illness, there is a low infection rate within the population, reflecting the many strengths of the Aboriginal and Torres Strait Islander community and community-controlled health sector.[18,22-24]

Conclusion

Aboriginal and Torres Strait Islander peoples of all ages must continue to be recognised as a priority population in all stages of the COVID-19 pandemic preparedness and response as they experience disproportionate exposure to the social factors associated with risk of severe COVID-19 illness. However, Indigeneity is not a 'risk' factor for severe COVID-19 illness and observation of an elevated risk within any population must be viewed in the context of wider inequities in the conditions that support or diminish health, including systemic racism. Multi-sectoral responses are required to improve health during and after the COVID-19 pandemic, including those that: enable self-determination; improve access to incomes, neighbourhood safety, food security and culturally safe healthcare; and address discrimination and intergenerational trauma.

Acknowledgements

KT (NHMRC Fellowship, ref: 1156276), NP (NHMRC Fellowship, ref: 1123677); the Lowitja Institute. The funders had no role in the study; the researchers were independent from the funders.

The authors acknowledge and thank all participants in the ABS national surveys. We acknowledge the leadership and contributions of the Aboriginal and Torres Strait Islander health sector, and Aboriginal and Torres Strait Islander communities in responding to COVID-19. This article was written during 2020, where a policy of elimination had been largely achieved in most Australian jurisdictions. This included significantly lower rates of COVID-19 infection cases among Aboriginal and Torres Strait Islander peoples, and no reported deaths attributed to COVID-19 in the population. The authors recognise the evolving nature of the pandemic in 2021, including direct impacts on Aboriginal and Torres Strait Islander communities with inequitable vaccination coverage, increasing transmission of more infectious variants and a policy shift towards suppression. Aboriginal and Torres Strait Islander communities are priority populations for urgent policy action throughout the pandemic.

We acknowledge Professor David Atkinson and Associate Professor Raymond Lovett for their contributions to this work.

Data

KT, EB, JW had full access to all of the data (including statistical reports and tables) in the study through ABS DataLab. All authors had access to all aggregated results cleared for release from ABS DataLab.

The unit-record survey data are available to researchers, in accordance with Australian Bureau of Statistics (ABS) data access procedures and policies. More information is available at the ABS website: https://www.abs.gov.au/websitedbs/d3310114.nsf/home/microdata+entry+page.

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Supporting Information

Additional supporting information may be found in the online version of this article:

Supplementary File 1: Modelling strategy; Testing assumptions.

Supplementary Table 1: Definition of outcome variables.

Supplementary Table 2: Definition of exposure variables.

Supplementary Table 3: Associations between each contextual factors and each individual health-related risk factor (binary logistic regression OR and 95%CI).

Supplementary Table 4: Percentage (95%CI) and number of Aboriginal and Torres Strait Islander adults (aged ≥18 years) with obesity and in each cumulative risk category, when obesity is included in the count, overall and by age group.

Supplementary Figure 1: Proportion of Aboriginal and Torres Strait Islander adults in each cumulative risk score category (0, 1, or ≥2) by contextual factors.