Incidence and outcomes of sepsis in Aboriginal and Torres Strait Islander and non-Indigenous residents of New South Wales: population-based cohort study

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In 2017, the World Health Organization (WHO) recognised sepsis, the life-threatening organ dysfunction that occurs in response to infection,[1] as a global health priority. One in five deaths worldwide are caused by sepsis, with the highest incidence of sepsis and sepsis-related mortality occurring in low and middle Socio-Demographic Index regions.[2] Country-level data describing the distribution of sepsis across Socio-Demographic Index regions are lacking. There is limited understanding of socioeconomic disparity in the risk of developing sepsis, its incidence and sepsis-related mortality in under-served populations worldwide.[3]

For more than two centuries, Australia's first peoples have suffered ongoing health inequalities as a result of systemic racism, intergenerational trauma, lack of cultural safety and distrust of the health system.[4] Aboriginal and Torres Strait Islander Australians have substantially lower life expectancy and a disproportionally higher burden of non-communicable and communicable diseases than non-Indigenous Australians.[5,6] Despite this known gap, there are limited epidemiological data to describe sepsis in this priority population. Studies of sepsis in Aboriginal and Torres Strait Islander people have been limited to hospital settings in the Northern Territory, where Aboriginal and Torres Strait Islander people represent one-quarter of the population[7,8] — a much higher proportion than in other Australian states and territories, where the proportion is estimated to be 1–5%.[9] In the Northern Territory, sepsis case rates are fourfold higher, and Aboriginal and Torres Strait Islander people are 11 times more likely to die from infection compared with non-Indigenous Australians.[7,8] There are limited data to describe disparity in the risk of developing sepsis, its incidence and sepsis-related mortality in Aboriginal and Torres Strait Islander people living outside of the Northern Territory.

To add to the limited data and inform a national strategy to prevent sepsis in this priority population, we aimed to estimate the incidence of sepsis hospitalisations, and hospital-associated resource use and mortality, in Aboriginal and Torres Strait Islander and non-Indigenous adults in Australia's most populous state, New South Wales.

ABSTRACT

Objective: To estimate the incidence and outcomes of sepsis hospitalisations in Aboriginal and Torres Strait Islander and non-Indigenous residents of New South Wales.

Design and participants: Prospective cohort study of residents aged 45 years and older, recruited between 2006 and 2009, and followed for hospitalisation for sepsis.

Main outcome measures: Incidence and hazard ratio (HR) of sepsis hospitalisation and intensive care unit (ICU) admission identified using International Classification of Diseases (10th revision) coding on discharge data. Length of stay, readmission and mortality in those admitted for sepsis.

Results: Of 264 678 participants, 1928 (0.7%) identified as Aboriginal and/or Torres Strait Islander. Sepsis hospitalisation was higher in Aboriginal and Torres Strait Islander participants (8.67 *v* 6.12 per 1000 person-years; age- and sex-adjusted HR, 2.35; 95% CI, 1.98–2.80) but was attenuated after adjusting for sociodemographic factors, health behaviour and comorbidities (adjusted HR, 1.56; 95% CI, 1.31–1.86). Among those hospitalised for sepsis, after adjusting for age and sex, there were no differences between the proportions of Aboriginal and Torres Strait Islander and non-Indigenous participants admitted to an ICU (18.0% *v* 16.1%; $P = 0.42$) or deceased at 1 year (36.1% *v* 36.8%; $P = 0.92$). Aboriginal and Torres Strait Islander participants had shorter lengths of hospital stay (9.98 *v* 11.72 days; $P < 0.001$) and ICU stay (4.38 *v* 6.35 days; $P < 0.001$) than non-Indigenous participants. Overall, more than 70% of participants were readmitted to hospital within 1 year.

Conclusion: We found that the rate of sepsis hospitalisation in NSW was higher for Aboriginal and Torres Strait Islander adults. Culturally appropriate, community-led strategies targeting chronic disease prevention and the social determinants of health may reduce this gap. Preventing readmission following sepsis is a priority for all Australians.

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Methods

Population and data sources

We used data from the Sax Institute's 45 and Up Study, a large prospective cohort study of adults aged 45 years or older recruited between 2006 and 2009 in NSW, Australia. The cohort has been described previously.[10] Briefly, potential participants were invited from the Department of Human Services database (formerly Medicare Australia) to participate in the study using a postal questionnaire. The questionnaire included questions on Aboriginal and Torres Strait Islander identification as well as questions on other sociodemographic details, health and behaviour. Participants consented to be included and followed up over time through linkage of their questionnaire data to health records. The cohort represented about 10% of people in the study age range who were living in NSW at the time of recruitment.[10]

For this study, the cohort questionnaire data were linked to the NSW Admitted Patient Data Collection and the NSW Registry of Births Deaths and Marriages. The Centre for Health Record Linkage independently performed the linkage using probabilistic matching. The NSW Admitted Patient Data Collection includes information about all hospital admissions in NSW, including admission and discharge dates, principal diagnosis, and up to 49 secondary diagnoses affecting hospitalisation and length of stay; diagnoses are coded using the International Classification of Diseases (10th revision), Australian modification (ICD-10-AM). The NSW Registry of Births Deaths and Marriages records the date and details of death for all residents of NSW.[10]

The study was approved by the NSW Population Health Research Ethics Committee (reference number 2010/12/292) and the Aboriginal Health and Medical Research Council Human Research Ethics Committee (reference number 1169/16). In accordance with the National Health and Medical Research Council's guidelines on ethical conduct in research with Aboriginal and Torres Strait Islander peoples and communities,[11] an Aboriginal and Torres Strait Islander reference group was established to oversee the design, analysis and interpretation of results. The group members are listed online (Online Appendix).

Identification of sepsis

Sepsis cases were identified from hospitalisation records using principal and secondary ICD-10-AM diagnosis codes. We adapted codes used in the Global Burden of Disease Study.[2] Sepsis diagnoses were ascertained in two ways: through the presence of an explicit ICD-10-AM diagnosis code for sepsis in principal or secondary fields (eg, A40.0, Sepsis due to *Streptococcus*, group A), or through a combination of an infection code listed in the principal diagnosis field (eg, J12, Viral pneumonia) and a code in a secondary diagnosis field for organ dysfunction (eg, J80, Acute respiratory distress syndrome).[2] The codes and detailed methods of our process are provided in the Online Appendix.

Analysis

As we aimed to measure the incidence of sepsis hospitalisations, we excluded participants with a record of a sepsis hospitalisation that met our study criteria in the 5 years before recruitment. Included participants were followed from the date of recruitment until 30 June 2016 or death, whichever came first. Cox regression models were used to estimate the hazard ratios (HRs) for first sepsis hospitalisation in the overall population, in Aboriginal and Torres Strait Islander participants and in non-Indigenous participants, adjusting for time-updated age (in single years), sex, household income (< $20 000, $20 000 to < $40 000, $40 000 to < $70 000, $70 000 +), education (no degree or diploma, diploma, university degree), region of residence (major city, inner regional, outer regional or remote), having private health insurance (yes, no), body mass index (BMI) in kg/m^2 (< 18.5, 18.5 to < 25, 25 to < 30, 30 +), smoking (never, past, current), alcohol consumption (none, 1–7 units/week, 7 + units/week), and various comorbidities (heart disease, stroke, diabetes, asthma, Charlson Comorbidity Index).[12] Adjustments for measures of depression, anxiety and psychological stress (ever treated for depression or anxiety, and Kessler 10 Psychological Distress Scale score) were also made.[13] Adjustment factors were based on data collected from the recruitment questionnaire, except for Charlson Comorbidity Index data (which were based on linked hospitalisation data in the year before recruitment).[14]

We described and compared hospitalisation for sepsis in Aboriginal and Torres Strait Islander and non-Indigenous participants. We compared the ICD-10-AM classification of the principal diagnosis and the presence of organ dysfunction codes (Online Appendix).[2,15] We calculated: the proportion of participants admitted to an intensive care unit (ICU), the proportion of participants who were mechanically ventilated, the lengths of hospital and ICU stay, and 90-day and 1-year mortality rates, both crude and for the Aboriginal and Torres Strait Islander population, adjusted by age and sex. We also calculated the proportions of participants readmitted to hospital within 90 days and within 1 year, and the proportion readmitted with a subsequent sepsis diagnosis. We conducted all analyses using Stata software, version 16 (StataCorp).

Results

Of 264 678 participants, 1928 (0.7%) identified as Aboriginal and/or Torres Strait Islander and 257 627

(97.5%) as non-Indigenous. The 4660 participants (1.7%) with unknown Aboriginal and/or Torres Strait Islander status were analysed separately.

The sociodemographic and behavioural characteristics (overall and by Aboriginal and Torres Strait Islander and non-Indigenous status) are reported in detail online (Online Appendix, eTable1). Similar to findings previously reported for this cohort,[6] compared with non-Indigenous participants, Aboriginal and Torres Strait Islander participants were on average younger (mean ± SD age, 57.9 ± 9.2 *v* 62.6 ± 11.1 years; $P < 0.001$) and more likely to be living in a regional or remote area (22.0% *v* 11.1%; $P < 0.001$). Aboriginal and Torres Strait Islander participants were less likely to consume seven or more standard drinks per week (28.4% *v* 37.1%; $P < 0.001$). Higher rates of diabetes (17.3% *v* 8.7%; $P < 0.001$), asthma (19.4% *v* 12.5%; $P < 0.001$) and treatment for depression (14.6% *v* 7.0%; $P < 0.001$) were recorded for Aboriginal and Torres Strait Islander participants.

Incidence and relative risk of sepsis

Over 2 070 343 person-years, there were 12 912 first hospital admissions for sepsis, giving an incidence rate of 6.24 per 1000 person-years. Of those hospitalised, 16.2% (2089 participants) were admitted to an ICU. The incidence of sepsis hospitalisation was higher for Aboriginal and Torres Strait Islander participants (8.67 *v* 6.12 per 1000 person-years). Aboriginal and Torres Strait Islander participants were also younger at the time of first sepsis diagnosis (mean age, 68.4 *v* 77.0 years).

The sociodemographic and behavioural characteristics of participants with sepsis, overall and by Aboriginal and Torres Strait Islander and non-Indigenous status, are shown in Table 1. After adjusting for age and sex, the risk of sepsis hospitalisation in Aboriginal and Torres Strait Islander participants was more than twice that of non-Indigenous participants (adjusted HR, 2.35; 95% CI, 1.98–2.80) but this attenuated after adjusting for other sociodemographic factors, measures of health behaviour and comorbidities (adjusted HR, 1.56; 95% CI, 1.31–1.86) (Table 2). Estimates were similar for sepsis ICU admissions.

Characteristics of sepsis hospitalisation

The ICD-10-AM classifications of the principal diagnosis for sepsis hospitalisation were similar when comparing Aboriginal and Torres Strait Islander and non-Indigenous participants. The most common classifications for participants hospitalised with sepsis were infectious or parasitic causes (ICD-10-AM codes A00–A99) (28.9% Aboriginal and Torres Strait Islander *v* 30.8% non-Indigenous) followed by respiratory, genitourinary and gastrointestinal causes (Figure 1).

The codes for organ dysfunction did not differ substantially between Aboriginal and Torres Strait Islander and non-Indigenous participants. Of those with an organ system dysfunction code recorded, cardiovascular dysfunction was the most common, followed by renal and respiratory organ dysfunction (Figure 2). Aboriginal and Torres Strait Islander participants were more likely to have an explicit sepsis code recorded (see Methods and Online Appendix) (71.5% *v* 62.2%; $P = 0.02$). Of those with an explicit sepsis diagnosis, a similar proportion of Aboriginal and Torres Strait Islander and non-Indigenous participants also had organ dysfunction codes recorded (43.0% *v* 46.4%; $P = 0.51$). The proportions of Aboriginal and Torres Strait Islander and non-Indigenous participants with two organ dysfunction codes recorded did not differ (14.6% *v* 14.2%; $P = 0.31$) but a higher proportion of Aboriginal and Torres Strait Islander participants had three or more organ dysfunction codes recorded (7.7% *v* 3.9%; $P < 0.001$).

Outcomes of sepsis hospitalisation

Among those hospitalised, after adjusting for age and sex, there was no significant difference between the proportions of Aboriginal and Torres Strait Islander and non-Indigenous participants admitted to the ICU (18.0% *v* 16.1%; $P = 0.42$). The mean length of hospital stay was shorter for Aboriginal and Torres Strait Islander participants (9.98 *v* 11.72 days; $P < 0.001$) as was the mean length of ICU stay (4.38 *v* 6.35 days; $P < 0.001$). There were no significant differences between mortality of Aboriginal and Torres Strait Islander and non-Indigenous participants at 90 days (27.2% *v* 23.9%; $P = 0.92$) or 1 year (36.1% *v* 36.8%; $P = 0.95$). About half of those with sepsis were readmitted to hospital within 90 days and more than 70% were readmitted within a year. Readmission with a subsequent admission diagnosis of sepsis occurred in about 20% of cases at 1 year. There were no significant differences between readmission rates for Aboriginal and Torres Strait Islander and non-Indigenous participants (Table 3).

Discussion

In this large cohort of adults living in NSW, sepsis incidence was higher in Aboriginal and Torres Strait Islander Australians compared with non-Indigenous Australians. Most, but not all, of the excess risk was explained by differences in sociodemographic factors, health behaviour and comorbidities. The reasons for sepsis admission were similar for Aboriginal and Torres Strait Islander and non-Indigenous adults. Once hospitalised with sepsis and after accounting for age, there was no difference in the severity of disease between Aboriginal and Torres Strait Islander and non-Indigenous participants; similar proportions of each

Table 1. Baseline sociodemographic, behavioural and health characteristics of participants with a sepsis hospitalisation by Aboriginal and Torres Strait Islander and non-Indigenous status*

Characteristerics	Overall (*n* = 12 912)	Aboriginal and Torres Strait Islander (*n* = 130)	Non-Indigenous (*n* = 12 366)
Mean (SD) age at recruitment	72.3 (11.1)	63.8 (10.7)	72.3 (11.0)
Mean (SD) age at first sepsis episode	77.0 (11.1)	68.4 (10.7)	77.0 (11.1)
Sex			
Women	5 218 (40.4%)	63 (48.5%)	4 956 (40.1%)
Men	7 694 (59.6%)	67 (51.5%)	7 410 (59.9%)
Annual household income			
< $20 000	4 467 (34.6%)	66 (50.8%)	4 263 (34.5%)
$20 000–$39 999	2 516 (19.5%)	24 (18.5%)	2 439 (19.7%)
$40 000–$69 999	1 379 (10.7%)	3 (2.3%)	1 345 (10.9%)
≥ $70 000	1 136 (8.8%)	4 (3.1%)	1 114 (9.0%)
Unknown/missing	3 414 (26.4%)	33 (25.4%)	3 205 (25.9%)
Highest education level attained			
No university degree or diploma	2 524 (19.5%)	50 (38.5%)	2 385 (19.3%)
Certificate or diploma	8 229 (63.7%)	62 (47.7%)	7 951 (64.3%)
University degree	1 744 (13.5%)	11 (8.5%)	1 700 (13.7%)
Unknown/missing	415 (3.2%)	7 (5.4%)	330 (2.7%)
Region of residence			
Major city	7 632 (59.1%)	67 (51.5%)	7 300 (59.0%)
Inner regional	3 959 (30.7%)	43 (33.1%)	3 810 (30.8%)
Outer regional/remote	1 140 (8.8%)	20 (15.4%)	1 079 (8.7%)
Unknown/missing	181 (1.4%)	0	177 (1.4%)
Index of disadvantage quintile			
1st (least)	2 158 (16.7%)	5 (3.8%)	2 094 (16.9%)
2nd	1 879 (14.5%)	14 (10.8%)	1 812 (14.6%)
3rd	2 250 (17.4%)	15 (11.5%)	2 165 (17.5%)
4th	2 965 (23.0%)	39 (30.0%)	2 828 (22.9%)
5th (most)	3 370 (26.1%)	57 (43.8%)	3 186 (25.8%)
Unknown/missing	290 (2.2%)	0	281 (2.3%)
Body mass index (kg/m^2)			
< 18.5	233 (1.8%)	3 (2.4%)	217 (1.8%)
18.5 to < 25.0	3 878 (30.6%)	18 (14.2%)	3 737 (30.8%)
25.0 to < 30.0	4 399 (34.7%)	31 (24.4%)	4 251 (35.0%)
≥ 30.0	3 149 (24.8%)	58 (45.7%)	3 005 (24.7%)
Unknown/missing	1 253 (9.9%)	20 (15.7%)	1 156 (9.5%)
Country of birth			
Australia	9 387 (72.7%)	121 (93.1%)	9 011 (72.9%)
Other	3 335 (25.8%)	7 (5.4%)	3 218 (26.0%)
Unknown/missing	190 (1.5%)	2 (1.5%)	137 (1.1%)

(*Continues*)

Table 1. Baseline sociodemographic, behavioural and health characteristics of participants with a sepsis hospitalisation by Aboriginal and Torres Strait Islander and non-Indigenous status* (*continued*)

Characteristerics	Overall (*n* = 12 912)	Aboriginal and Torres Strait Islander (*n* = 130)	Non-Indigenous (*n* = 12 366)
Smoking status			
Never	6 270 (48.6%)	43 (33.1%)	5 986 (48.4%)
Past	5 650 (43.8%)	62 (47.7%)	5 442 (44.0%)
Current	985 (7.6%)	24 (18.5%)	932 (7.5%)
Unknown/missing	7 (0.05%)	1 (0.7%)	6 (0.05%)
Alcohol consumption			
None	5 161 (40.0%)	72 (55.4%)	4 931 (39.9%)
1 to < 7 units/week	2 990 (23.2%)	21 (16.1%)	2 876 (23.3%)
≥ 7 units/week	4 276 (33.1%)	25 (19.2%)	4 143 (33.5%)
Unknown/missing	485 (3.8%)	12 (9.2%)	416 (3.3%)
Medical history (self-report)			
Heart disease			
No	9 647 (74.7%)	90 (69.2%)	9 228 (74.6%)
Yes	3 265 (25.3%)	40 (30.8%)	3 138 (25.4%)
Stroke			
No	11 867 (91.9%)	114 (87.7%)	11 376 (92.0%)
Yes	1 045 (8.1%)	16 (12.3%)	990 (8.0%)
Diabetes			
No	10 345 (80.1%)	73 (56.1%)	9 945 (80.4%)
Yes	2 567 (19.9%)	57 (43.9%)	2 421 (19.6%)
Asthma			
No	11 113 (86.1%)	97 (74.6%)	10 657 (86.2%)
Yes	1 799 (13.9%)	33 (25.4%)	1 709 (13.8%)
Health insurance			
Private insurance	7 025 (50.2%)	25 (17.6%)	6 845 (51.1%)
No private insurance	6 953 (49.7%)	117 (82.4%)	6 550 (48.9%)
Unknown/missing	1 (0.01%)	0	1 (0.01%)
Charlson Comorbidity Index score			
0	10 978 (85.0%)	98 (75.4%)	10 528 (85.15%)
1–2	1 509 (11.7%)	23 (17.7%)	1 436 (11.6%)
≥ 3	425 (3.3%)	9 (6.9%)	402 (3.3%)
Ever treated for depression or anxiety (as recorded at baseline)			
No	9 572 (74.1%)	81 (62.3%)	9 208 (74.5%)
Yes	1 120 (8.7%)	26 (20.00%)	1 060 (8.6%)
Missing	2 220 (17.2%)	23 (17.7%)	2 098 (17.0%)
K10 score (questionnaire-derived, average of non-missing entries)			
< 3.0	10 844 (84.0%)	99 (76.1%)	10 473 (84.7%)
≥ 3.0 (max 5.0)	1 402 (10.9%)	24 (18.5%)	1 297 (10.5%)
Missing (all K10 dimensions missing)	666 (5.1%)	7 (5.4%)	596 (4.8%)

K10 = Kessler 10 Psychological Distress Scale. * Data are number (percentage) unless otherwise specified.

Figure 1. Principal diagnoses of sepsis hospitalisation in Aboriginal and Torres Strait islander and non-Indigenous participants

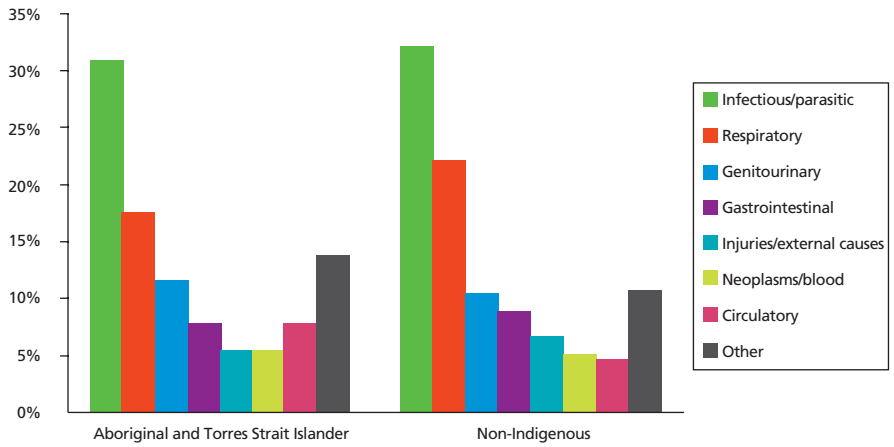
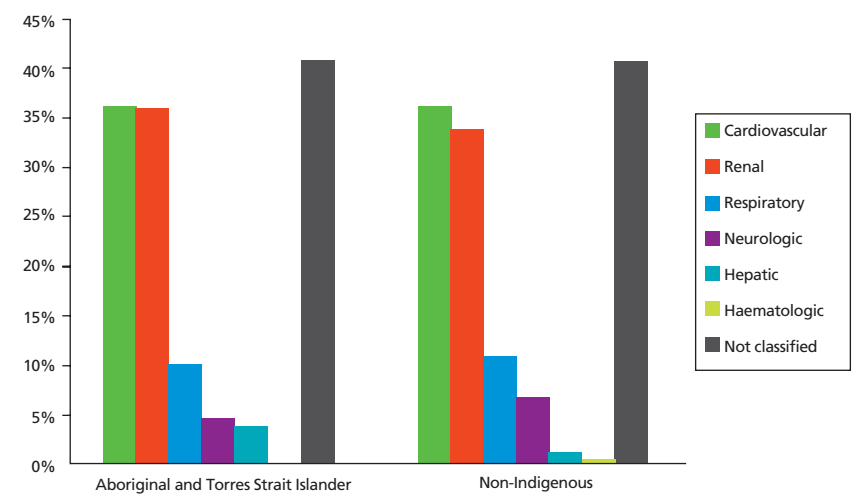


Figure 2. Organ dysfunction categories for sepsis hospitalisation in Aboriginal and Torres Strait islander and non-Indigenous participants



group were admitted to an ICU, died before 90 days and died before 1 year. Aboriginal and Torres Strait Islander adults had shorter lengths of ICU and hospital stay. Within 1 year, about 70% of participants were readmitted to hospital and about one-fifth were readmitted with a secondary sepsis episode.

To our knowledge, this is the first population-level study to assess the incidence and outcomes of sepsis in Aboriginal and Torres Strait Islander and non-Indigenous Australians. Strengths include the use of a large cohort with prospectively collected data on risk factors, and linkage of the data to routinely collected outcome data, reducing the potential for ascertainment bias. In addition, an Aboriginal and Torres Strait Islander reference group was established to oversee the study design, analysis and interpretation of results. Limitations include that sepsis cases were ascertained using ICD codes, modified from the Global Burden of Disease Study,[2] which may result in misclassification of sepsis cases. Also, as the data for this study were collected before the introduction of the Sepsis-3 definition, some participants with an explicit sepsis diagnosis did not have specific organ dysfunction codes recorded and may have been classified based on the previous systemic inflammatory response syndrome criteria. Also, these data may not be representative of the broader Aboriginal and Torres Strait Islander population owing to the minimum age of recruitment to the 45 and Up Study being 45 years, and because the proportion of Aboriginal and Torres Strait Islander people included in our study is lower than the proportion of Aboriginal and Torres Strait Islander people living in New South Wales.[9] Finally, we could not account for changes during follow-up in some of the adjustment factors, such as alcohol consumption and smoking status.

Two previous Australian studies of sepsis were conducted in the Northern Territory and reported that rates of sepsis in Aboriginal and Torres Strait Islander Australians were four times higher than in non-Indigenous Australians.[7,8] In our study, when age and sex were considered, the risk of sepsis in Aboriginal and Torres Strait Islander Australians was more than double, but after adjustment for other sociodemographic factors, health behaviour and comorbidities it was only 50% higher. These differences are likely due to several factors. First, rates of many diseases are higher among people residing in the Northern Territory than among those residing in NSW,[16] and this difference may be amplified between Aboriginal and Torres Strait Islander and non-Indigenous populations in the Northern Territory, where Aboriginal and Torres Strait Islander people experience higher levels of overcrowding, poorer housing

Table 2. Risk of first hospitalisation for sepsis or first hospitalisation for sepsis with an intensive care unit (ICU) admission — Aboriginal and Torres Strait Islander participants compared with non-Indigenous participants

	Indigenous status	Events	Person-years	HR 1 (95% CI)	HR 2 (95% CI)	HR 3 (95% CI)	HR 4 (95% CI)
Risk of first hospitalisation for sepsis	No	12 366	2 020 793	1.00	1.00	1.00	1.00
	Yes	130	14 996	2.35 (1.98–2.8)	1.98 (1.66–2.35)	1.75 (1.47–2.08)	1.56 (1.31–1.86)
	Unsure	416	34 553	1.20 (1.09–1.32)	1.09 (0.99–1.2)	1.07 (0.97–1.18)	1.05 (0.95–1.16)
Risk of first hospitalisation for sepsis with an ICU admission	No	1 996	2 020 793	1.00	1.00	1.00	1.00
	Yes	30	14 996	2.86 (1.99–4.10)	2.28 (1.59–3.28)	1.97 (1.37–2.84)	1.70 (1.18–2.45)
	Unsure	63	34 553	1.37 (1.06–1.76)	1.26 (0.98–1.62)	1.23 (0.95–1.59)	1.18 (0.92–1.53)

HR 1 = hazard ratio adjusted for time-updated age and sex. HR 2 = hazard ratio adjusted for time-updated age, sex and sociodemographic factors (income, education, region of residence, private health insurance). HR 3 = hazard ratio adjusted for time-updated age, sex, sociodemographic factors, body mass index, smoking status and alcohol consumption. HR 4 = hazard ratio adjusted for time-updated age, sex, sociodemographic factors, body mass index, smoking status, alcohol consumption, comorbidities (heart disease, stroke, diabetes, asthma, teeth left, Charlson Comorbidity Index), anxiety, depression and K10 score. K10 = Kessler 10 Psychological Distress Scale.

Table 3. Outcomes of sepsis hospitalisation

	Overall	Non-Indigenous	Aboriginal and Torres Strait Islander, raw mean (%)	Aboriginal and Torres Strait Islander, adjusted mean or %*	*P*
First admission for sepsis					
Admitted to ICU, *n* (%)	2 089 (16.2%)	1996 (16.1%)	30 (23.1%)	18.0%	0.42
Mechanically ventilated, *n* (%)	920 (7.1%)	882 (7.1%)	10 (7.7%)	7.4%	0.47
Mean length of hospital stay, days	11.72	11.72	10.39	9.98	< 0.001
Mean length of ICU stay, days	6.33	6.35	5.05	4.38	< 0.001
90-day mortality, *n*/*N* (%)	3 016/12 553 (24.0%)	2 868/12 017 (23.9%)	22/126 (17.5%)	27.2%	0.95
365-day mortality, *n*/*N* (%)	4 225/11 450 (36.9%)	4 030/10 957 (36.8%)	32/116 (27.6%)	36.1%	0.92
Readmissions for sepsis					
At 90 days, *n*/*N* (%)	1 915/12 553 (15.3%)	1 827/12 017 (15.2%)	19/126 (15.0%)	18.1%	0.74
At 365 days, *n*/*N* (%)	2 420/11 450 (21.1%)	2 310/10 957 (21.1%)	26/116 (22.4%)	25.3%	0.46
Readmissions for any reason					
At 90 days, *n*/*N* (%)	6 467/12 553 (51.5%)	6 187/12 017 (51.5%)	65/126 (51.6%)	50.6%	0.73
At 365 days, *n*/*N* (%)	8 252/11 450 (72.1%)	7 896/10 957 (72.6%)	92/116 (79.3%)	74.3%	0.17

* Adjusted for age and sex differences between Aboriginal and Torres Strait Islander and non-Indigenous participants.

quality[17] and higher prevalence of infectious and non-communicable diseases.[18] Second, our study population consisted of adults recruited into a prospective cohort who are known to be healthier than the general population.[10] Third, our analyses were adjusted for differences in age and the higher levels of comorbidities and social disadvantage in Aboriginal and Torres Strait Islander people. Since the risk of sepsis hospitalisation was substantially attenuated after adjustment for comorbidities and social factors, addressing these modifiable factors may reduce disparities in the incidence of sepsis hospitalisations.

Compared with other Australian studies assessing sepsis incidence and mortality, we found higher rates of sepsis, but similar mortality rates.[19,20] This difference could be because our cohort was older, or because we did not limit our analysis to participants recruited in an ICU. Compared with earlier studies assessing outcomes of critically ill Aboriginal and Torres Strait Islander people,[21,22] we found shorter lengths of hospital and ICU stay. This may reflect a faster recovery in this population, who were 8.5 years younger on average. It could also reflect a lack of cultural safety in the Australian health care system, resulting in higher rates of discharge against medical advice among Aboriginal and Torres Strait Islander patients.[4]

Our study confirms that sepsis is an important cause of hospital readmission. In another NSW-based analysis of matched ICU patients with and without sepsis, a similar proportion of patients (70%) required readmission to hospital within 2 years.[23] A high proportion of participants were readmitted with sepsis, a finding consistent with findings from research conducted in the United States.[24,25] High readmission rates following an episode of sepsis highlight the importance of public health initiatives that increase community awareness and prevent sepsis, plus the need for targeted and coordinated cross-specialty research aimed at reducing readmissions.

Conclusion

Sepsis incidence is higher in Aboriginal and Torres Strait Islander Australians compared with non-Indigenous Australians. This difference is partially explained by underlying differences in sociodemographic factors, health behaviour and comorbidities. Strategies to reduce sepsis in this population should target modifiable risk factors, including addressing disparity in the social and cultural determinants of health. The design of future sepsis awareness campaigns should be codesigned with Aboriginal and Torres Strait Islander people.

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Competing interests

No relevant disclosures.

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