



Supporting Information

Supplementary methods and results

This appendix was part of the submitted manuscript and has been peer reviewed.
It is posted as supplied by the authors.

Appendix to: Moynihan KM, Russ V, Clinch D, et al. Social determinants of health and intensive unit care admission rates and outcomes for children, Australia, 2013–2020: analysis of national registry data. *Med J Aust* 2025; doi: 10.5694/mja2.52643.

Supplementary methods

Table 1. Variables included in the Socio-Economic Indices for Areas (SEIFA) Index of Relative Socio-economic Disadvantage (IRSD)*

% Occupied private dwellings with no internet connection
% Employed people classified as labourers
% People aged 15 years and over with no post-school qualifications
% People with stated annual household equivalised income between \$13,000 and \$20,799
% Households renting from government or community organization
% People (in the labour force) unemployed
% One parent families with dependent offspring only
% Households paying rent less than \$120 per week (excluding \$0 per week)
% People aged <70 who have a long-term health condition or disability and need assistance with core activities
% Occupied private dwellings with no car
% People who identified themselves as being of Aboriginal and/or Torres Strait Islander origin
% Occupied private dwellings requiring one or more extra bedrooms
% People aged 15 years and over who are separated or divorced
% Employed people classified as machinery operators and drivers
% People aged 15 years and over who did not go to school
% Employed people classified as low skill community and personal service workers
% People who do not speak English well

Source: Australian Bureau of Statistics. List of SEIFA variables. In: Information paper: an introduction to Socio-Economic Indexes for Areas (SEIFA), 2006 (2039.0). 26 Mar 2008.
<https://www.abs.gov.au/ausstats/abs@.nsf/Latestproducts/2039.0Appendix82006?opendocument&tabname=Notes&prodno=2039.0&issue=2006&num=&view=> (viewed Apr 2021).

Supplementary results

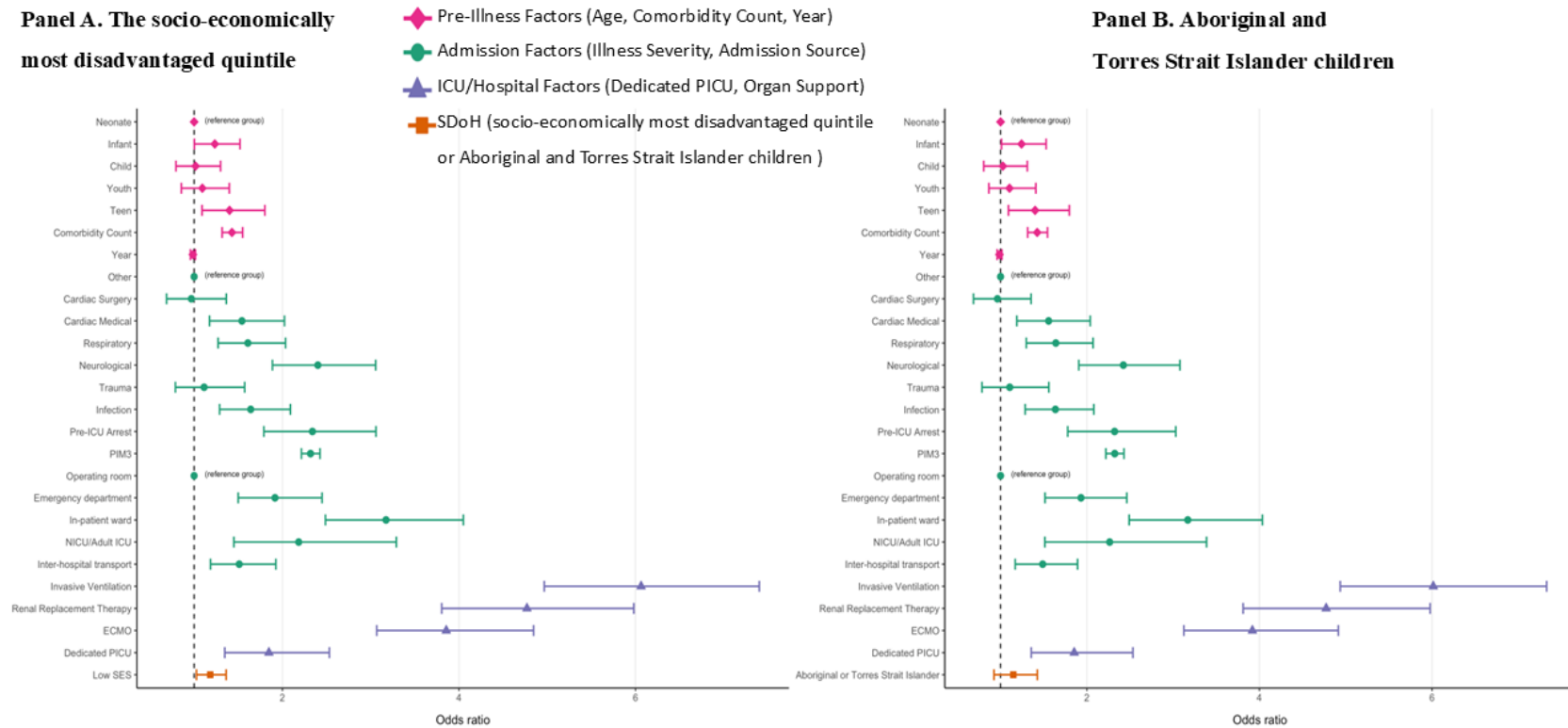
Table 2. Admissions of children to intensive care units (ICUs) in Australia, 1 January 2013 – 31 December 2020, by ICU outcome (death or survival) and admission year

	Survived	Died	<i>P</i>
Calendar year			0.19
2013	8962 (11.9%)	211 (12.8%)	
2014	9523 (12.6%)	194 (11.8%)	
2015	9411 (12.5%)	208 (12.6%)	
2016	9033 (12.0%)	219 (13.3%)	
2017	9361 (12.4%)	224 (13.6%)	
2018	10188 (13.5%)	202 (12.2%)	
2019	10241 (13.5%)	215 (13.0%)	

Table 3. Admissions of children to intensive care units (ICUs) in Australia, 1 January 2013 – 31 December 2020, by Indigenous status and Index of Socio-Economic Disadvantage (IRSD) quintile and calendar year

	IRSD quintile 1	IRSD quintiles 2 to 5	<i>P</i>	Indigenous	Non-Indigenous	<i>P</i>
Calendar year			0.003			<0.001
2013	2002 (12.4%)	7062 (11.8%)		571 (9.3%)	8600 (12.1%)	
2014	2023 (12.5%)	7549 (12.6%)		647 (10.5%)	9070 (12.8%)	
2015	2011 (12.5%)	7471 (12.5%)		718 (11.7%)	8901 (12.5%)	
2016	1845 (11.4%)	7249 (12.1%)		763 (12.4%)	8489 (12.0%)	
2017	2053 (12.7%)	7360 (12.3%)		867 (14.1%)	8696 (12.3%)	
2018	2120 (13.1%)	8081 (13.5%)		898 (14.6%)	9466 (13.3%)	
2019	2273 (14.1%)	7968 (13.3%)		901 (14.6%)	9519 (13.4%)	
2020	1817 (11.3%)	7086 (11.8%)		792 (12.9%)	8203 (11.6%)	

Figure 1. Influence of social determinants on the likelihood of dying in intensive care for children living in areas in the socio-economically most disadvantaged quintile (A) and for Aboriginal and Torres Strait Islander children (B) admitted to intensive care units (ICUs) in Australia, 1 January 2013 – 31 December 2020: multivariable logistic regression analyses*



Index of Relative Socio-Economic Disadvantage (IRSED), Intensive Care Unit (ICU), Paediatric Intensive Care Unit (PICU), Neonatal Intensive Care Unit (NICU), Extracorporeal Membrane Oxygenation (ECMO), Paediatric Index of Mortality 3 (PIM 3)

* The data underlying this figure are reported in table 4.

Table 4. Influence of social determinants on the likelihood of dying in intensive care for children living in areas in the socio-economically most disadvantaged quintile (A) and for Aboriginal and Torres Strait Islander children (B) admitted to intensive care units (ICUs) in Australia, 1 January 2013 – 31 December 2020: multivariable logistic regression analyses

	Adjusted odds ratio (95% confidence interval)	
Characteristic	Indigenous children	Index of Relative Socio-Economic Disadvantage (quintile 1)
Predictor (Indigenous/IRSD quintile 1)	1.15 (0.92–1.43)	1.18 (1.03–1.36)
Age		
<28 days	1	1
28 days to 1 year	1.24 (1.01–1.53)	1.23 (1.00–1.52)
≥2–5 years	1.03 (0.80–1.31)	1.02 (0.79–1.30)
≥6–12 years	1.10 (0.86–1.41)	1.09 (0.86–1.40)
≥13–18 years	1.40 (1.09–1.80)	1.40 (1.09–1.80)
Number of medical conditions, per condition	1.42 (1.31–1.54)	1.43 (1.32–1.55)
Admission year, per year	0.99 (0.96–1.02)	0.99 (0.96–1.01)
Diagnosis		
Cardiac Surgery	0.96 (0.69–1.35)	0.97 (0.69–1.36)
Cardiac Medical	1.56 (1.19–2.04)	1.54 (1.17–2.02)
Respiratory	1.64 (1.30–2.07)	1.61 (1.27–2.04)
Neurological	2.42 (1.91–3.08)	2.40 (1.89–3.06)
Trauma	1.11 (0.78–1.56)	1.11 (0.79–1.57)
Infection	1.64 (1.28–2.08)	1.64 (1.29–2.09)
Arrest	2.32 (1.78–3.03)	2.34 (1.79–3.06)
Other	1	1
Paediatric Index of mortality 3, per unit	2.32 (2.22–2.43)	2.32 (2.22–2.43)
Admission source		
Operating theatre	1	1
Emergency department	1.93 (1.52–2.46)	1.92 (1.50–2.45)
In-patient ward	3.17 (2.49–4.03)	3.17 (2.49–4.05)
Neonatal/Adult ICU	2.26 (1.51–3.39)	2.18 (1.45–3.29)
Inter-hospital transport	1.49 (1.17–1.89)	1.51 (1.19–1.93)
Invasive Ventilation	6.01 (4.94–7.33)	6.06 (4.97–7.40)
Renal Replacement Therapy	4.77 (3.81–5.98)	4.77 (3.80–5.98)
Extracorporeal Membrane oxygenation	3.92 (3.12–4.91)	3.86 (3.07–4.85)
Dedicated PICU	1.85 (1.36–2.53)	1.85 (1.35–2.53)

Table 5. Clinical variables and the likelihood of dying in intensive care for children admitted to intensive care units (ICUs) in Australia, 1 January 2013 – 31 December 2020: univariate analyses

Characteristic	Odds ratio (95% confidence interval)
Pre-illness Factors	
Age	
<28 days	1
28 days to 1 year	0.44 (0.38–0.52)
≥2–5 years	0.42 (0.35–0.49)
≥6–12 years	0.45 (0.37–0.53)
≥13–18 years	0.58 (0.49–0.69)
Number of medical conditions, per condition	1.22 (1.14–1.30)
Admission year, per year	0.98 (0.96–1.00)
Admission Factors	
Diagnosis	
Cardiac Surgery	1.41 (1.01–1.96)
Cardiac Medical	1.59 (1.26–2.03)
Respiratory	1.31 (1.06–1.63)
Neurological	2.18 (1.74–2.74)
Trauma	0.75 (0.53–1.05)
Infection	1.29 (1.03–1.62)
Arrest	1.75 (1.36–2.24)
Other	1
Paediatric Index of Mortality 3	2.89 (2.76–3.02)
Admission source	
Operating theatre	
Emergency department	1.36 (1.07–1.73)
Inpatient ward	2.34 (1.85–2.95)
Neonatal/Adult Intensive Care Unit	2.89 (2.00–4.19)
Inter-hospital transport	1.40 (1.11–1.77)
Intensive Care Unit/Hospital Factors	
Invasive Ventilation	17.1 (14.3–20.5)
Renal Replacement Therapy	6.03 (4.98–7.31)
Extracorporeal Membrane Oxygenation	7.09 (5.90–8.52)
Dedicated Paediatric Intensive Care Unit	1.10 (0.83–1.47)

Table 6. Area under the receiver operating characteristic curve for the baseline models including only clinical characteristics

Model	Area under the receiver operating characteristic curve (95% confidence interval)
Pre-Illness Clinical Model	0.609 (0.595–0.622)
Admission Factors Model	0.921 (0.914–0.927)
ICU/Hospital Factor Model	0.835 (0.825–0.845)

The research team:

Collaboration with the Indigenous Data Network through an existing Memorandum of Understanding with the Australian and New Zealand Intensive Care Society (ANZICS) allowed access to Indigenous researchers to collaborate closely and provide Aboriginal and/or Torres Strait Islander perspectives, voice and leadership. Darren Clinch, a Badimia man from Yamatji country in Western Australia, was the Data Analytics Coordinator for the Indigenous Data Network, University of Melbourne. Vanessa Russ is a Ngarinyin/Gija woman from the Kimberley, researcher in the Indigenous Data Network, as well as National Health and Medical Research Council on Alcohol and Family Violence in Aboriginal and Torres Strait Islander communities. The clinicians worked with Indigenous Data Network researchers to conceptualize the planned research with supervision to align with the 5 key principles and values inherent to maintaining respect and ethical practice when completing research with Aboriginal and Torres Strait Islanders. Considerable care was taken at the time this project was designed to ensure that issues around Indigenous Data Sovereignty were respected. Darren Clinch unfortunately passed prior to the results being obtained, however his prior influence informed the discussion and Vanessa Russ subsequently further guided interpretation of the Aboriginal and/or Torres Strait Islander (as well as rural and Index of Relative Socio-economic Disadvantage) results.

CRediT taxonomy contribution list:

Conceptualization – Ideas; formulation or evolution of overarching research goals and aims.

KM, VR, DC, LS, JM, MF, TT, DL, PS, AS.

Data curation – Management activities to annotate (produce metadata), scrub data and maintain research data (including software code, where it is necessary for interpreting the data itself) for initial use and later re-use.

AS, LS

Formal analysis – Application of statistical, mathematical, computational, or other formal techniques to analyze or synthesize study data.

AS, LS, KM

Methodology – Development or design of methodology; creation of models.

KM, LS

Software – Programming, software development; designing computer programs; implementation of the computer code and supporting algorithms; testing of existing code components.

LS, AS, KM

Supervision – Oversight and leadership responsibility for the research activity planning and execution, including mentorship external to the core team.

PS, AS, DC, VR, NN, SB,

Visualization – Preparation, creation and/or presentation of the published work, specifically visualization/data presentation.

KM

Writing – original draft – Preparation, creation and/or presentation of the published work, specifically writing the initial draft (including substantive translation).

KM

Writing – review & editing – Preparation, creation and/or presentation of the published work by those from the original research group, specifically critical review, commentary or revision – including pre- or post-publication stages.

KM, VR, LS, JM, NN, SB, MF, TT, DL, PS, AS.

STROBE Statement: Checklist of items that should be included in reports of *cohort studies*.

Note: The page numbers refer to the submitted manuscript, not to the published article or its Supporting Information file.

	Item No	Recommendation	Page No
Title and abstract	1	(a) Indicate the study’s design with a commonly used term in the title or the abstract	1,2
		(b) Provide in the abstract an informative and balanced summary of what was done and what was found	
Introduction			
Background/rationale	2	Explain the scientific background and rationale for the investigation being reported	4
Objectives	3	State specific objectives, including any prespecified hypotheses	4
Methods			
Study design	4	Present key elements of study design early in the paper	5
Setting	5	Describe the setting, locations, and relevant dates, including periods of recruitment, exposure, follow-up, and data collection	5
Participants	6	(a) Give the eligibility criteria, and the sources and methods of selection of participants. Describe methods of follow-up	5
		(b) For matched studies, give matching criteria and number of exposed and unexposed	
Variables	7	Clearly define all outcomes, exposures, predictors, potential confounders, and effect modifiers. Give diagnostic criteria, if applicable	5,6
Data sources/measurement	8*	For each variable of interest, give sources of data and details of methods of assessment (measurement). Describe comparability of assessment methods if there is more than one group	5,6
Bias	9	Describe any efforts to address potential sources of bias	6
Study size	10	Explain how the study size was arrived at	6
Quantitative variables	11	Explain how quantitative variables were handled in the analyses. If applicable, describe which groupings were chosen and why	5,6
Statistical methods	12	(a) Describe all statistical methods, including those used to control for confounding	6,7
		(b) Describe any methods used to examine subgroups and interactions	
		(c) Explain how missing data were addressed	
		(d) If applicable, explain how loss to follow-up was addressed	
		(e) Describe any sensitivity analyses	
Results			
Participants	13*	(a) Report numbers of individuals at each stage of study—eg numbers potentially eligible, examined for eligibility, confirmed eligible, included in the study, completing follow-up, and analysed	8, Figure 1
		(b) Give reasons for non-participation at each stage	
		(c) Consider use of a flow diagram	
Descriptive data	14*	(a) Give characteristics of study participants (eg demographic, clinical, social) and information on exposures and potential confounders	8, Table 1 and 2,
		(b) Indicate number of participants with missing data for each variable of interest	Figure 1
		(c) Summarise follow-up time (eg, average and total amount)	
Outcome data	15*	Report numbers of outcome events or summary measures over time	8,9, table 2, Figure 2, 3
Main results	16	(a) Give unadjusted estimates and, if applicable, confounder-adjusted estimates and their precision (eg, 95% confidence interval). Make clear which confounders were adjusted for and why they were included	8,9 Fig 3, Supp table
		(b) Report category boundaries when continuous variables were categorized	8, Fig 2
		(c) If relevant, consider translating estimates of relative risk into absolute risk for a meaningful time period	

Other analyses	17	Report other analyses done—eg analyses of subgroups and interactions, and sensitivity analyses	
Discussion			
Key results	18	Summarise key results with reference to study objectives	10
Limitations	19	Discuss limitations of the study, taking into account sources of potential bias or imprecision. Discuss both direction and magnitude of any potential bias	12
Interpretation	20	Give a cautious overall interpretation of results considering objectives, limitations, multiplicity of analyses, results from similar studies, and other relevant evidence	10,11,12
Generalisability	21	Discuss the generalisability (external validity) of the study results	12
Other information			
Funding	22	Give the source of funding and the role of the funders for the present study and, if applicable, for the original study on which the present article is based	1

*Give information separately for exposed and unexposed groups.

Note: An Explanation and Elaboration article discusses each checklist item and gives methodological background and published examples of transparent reporting. The STROBE checklist is best used in conjunction with this article (freely available on the Web sites of PLoS Medicine at <http://www.plosmedicine.org/>, Annals of Internal Medicine at <http://www.annals.org/>, and Epidemiology at <http://www.epidem.com/>). Information on the STROBE Initiative is available at <http://www.strobe-statement.org>.