Prevalence of dementia among Indigenous populations of countries with a very high Human Development Index: a systematic review

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Dementia is a health priority for Indigenous peoples. Here, we reviewed studies on the prevalence of dementia or cognitive impairment among Indigenous populations from countries with a very high Human Development Index (≥0·8). Quality was assessed using the Joanna Briggs Institute risk-of-bias tool and CONSolIDated critERia for strengthening the reporting of health research involving Indigenous peoples (CONSIDER), with oversight provided by an Indigenous Advisory Board. After screening, 23 studies were included in the Review. Relative to the respective non-Indigenous populations, greater age-standardised prevalence ratios were observed in the Australian Aboriginal and Torres Strait Islander (2·5–5·2), Aotearoa-New Zealand Māori (1·2–2·0), and Singaporean Malay (1·3–1·7) populations, and greater crude prevalence ratios were observed in the Canadian First Nation (1·3), Singaporean Malay (2·3), Malaysian Melanau (1·7–4·0), American Indian and Alaska Native (1·0–3·2), and Chamorro of Guam (1·2–2·0) populations. The prevalence ratios were greater across younger age groups, predominantly comprising those younger than 70 years. 14 studies presented a moderate risk of bias and few studies reported Indigenous involvement. Despite improved management of risk factors, a greater prevalence of dementia persists in Indigenous populations, overall and at younger ages than in non-Indigenous populations. Future epidemiological work involving Indigenous populations should uphold and prioritise Indigenous perspectives.

Introduction

Nearly 480 million Indigenous people live in more than 90 countries across the world, preserving and practising unique languages, knowledge systems, and traditions.[1] Indigenous peoples have sought, and continue to seek, recognition of their identities, ways of life, and right to traditional lands and resources.[1] Although Indigenous peoples have achieved progress, including the recognition of sovereign autonomy, legacies of colonisation continue to drive biomedical, environmental, and sociopolitical disparities between the dominant non-Indigenous populations within the same regions.[2]

Health inequity is a well-described consequence of disadvantage.[3] Development of dementia is particularly vulnerable to health inequity, reflecting the cumulation of biomedical, socioeconomic, and other structural influences over the course of life.[4] Dementia cases are predicted to increase rapidly in the coming decades, predominantly in low-income and middle-income countries.[5] High-income countries are not immune to an increase in overall dementia cases, despite reporting a decline in incidence, and dementia is an emerging health priority for Indigenous peoples in these countries.[6–8] Only 2·7% of the world's Indigenous peoples live in high-income countries;[9] however, the persistence of socioeconomic gaps between Indigenous and non-Indigenous peoples can be aggravated in these regions. A third of Indigenous peoples in high-income countries live in rural areas, thereby adding the influence of rural–urban disparities on health outcomes.[9] Indigenous women are particularly at risk of health inequity, with discrimination within and outside of their communities contributing to their vulnerability.[9]

Reviews have identified that the global prevalence of dementia ranges from 0·5%[10] to 26·8%[11] for Indigenous populations aged over 65 years and 45 years, respectively.[12–14] A large portion of the variation in prevalence is attributed to differences in the level of educational attainment, cardiometabolic and other biomedical vulnerabilities, and the cultural propriety of cognitive screening tools, in addition to the heterogeneity in study methodologies.[15] A reductive focus on biological processes and surface causes of inequity for Indigenous peoples, however, fails to unearth broader, modifiable sources of bias, including political and economic health policy.[8,16]

The under-representation and under-valuation of Indigenous perspectives on healthy brain ageing can overlook sources of strength. The prioritisation of community, culture, and family structures within Indigenous populations can be protective against some early-life stressors and reduce the risk of social isolation, an established risk factor for neurodegenerative disease.[17–19] The inclusion of strengths-based indicators for dementia among Indigenous populations is key to inform pluralistic and holistic models for optimal brain ageing.

This Review aims to examine the prevalence of dementia in Indigenous and non-Indigenous populations of countries with a very high Human Development Index (HDI), where disparities between these populations could reflect the influence of social, fiscal, and environmental factors on brain health. Additionally, we aimed to evaluate the quality

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of research involving Indigenous peoples to advance health outcomes for these populations.

Methods

This study is a systematic review of studies on the prevalence of dementia in Indigenous populations of high-income countries (HDI≥0·8), conducted according to PRISMA guidelines. Heterogeneity across the studies precluded a pooled meta-analysis within countries.

For more on **PRISMA** see https://www.prisma-statement.org/

Search strategy and selection criteria

The databases Ovid-MEDLINE, Ovid-Embase, Ovid-Global Health, and PsycINFO were comprehensively searched for the following: Indigenous adults in high-income countries; prevalence data; and clinical or coded dementia or cognitive impairment, or both (appendix pp 1–10). Studies published between Jan 1, 2000, and March 31, 2024, were included, without any restrictions on language.

See **Online** for appendix

Original peer-reviewed articles or abstracts with a population-based design that presented data on the prevalence of dementia or cognitive impairment in relevant populations were included in this Review. Articles were translated into English wherever required. No age restriction was applied to the adult study populations. Studies with fewer than 10 Indigenous participants, in which Indigenous data were reported only as baseline characteristics, or combined with other ethnic groups, were excluded. Studies that did not include a clinical or coded classification of dementia or cognitive impairment were excluded.

Two reviewers (AJC and MC) independently validated the search strategy and performed the title and abstract screening using Covidence. Disagreements were resolved through consensus with a third reviewer (AGB).

For more on **Covidence** see https://www.covidence.org/

Data extraction and analysis

Data from included studies were extracted by AJC and MC into a predesigned template that assessed study settings, populations (including sources of Indigenous identification), methodology, diagnostic reference standards, data presentation, and prevalence. Data were reviewed by AHB. As far as possible, age standardisation was performed using the direct method and national population estimates (or the WHO standard population if national data were not available) to facilitate within-country comparisons between studies. Confidence intervals (CIs) for crude and age-standardised prevalence and prevalence ratios were calculated if possible on the basis of the data reported or personal communication with the study authors. Statistical analysis was performed using Microsoft Excel version 16 and Stata Statistical Software (version 18).

The prevalence of dementia among Indigenous populations of different countries was not compared given the diverse definitions of Indigeneity, study design, and the preference of some Indigenous groups not to be compared. Risk-of-bias analysis was conducted for all full-text articles using the Joanna Briggs Institute risk-of-bias tool for prevalence studies, followed by categorisation into low, moderate, or high risk.[20] The CONSolIDated critERia for strengthening the reporting of health research involving Indigenous peoples (CONSIDER) statement was applied to all full-text articles to evaluate the quality of health research involving Indigenous peoples.[21]

Ethics approval, registration, and Indigenous oversight

Ethics approval was not sought for this review of published data. The protocol was registered with PROSPERO (CRD42023438704). An Indigenous Advisory Board with global representation from Indigenous medical and public health researchers (ADS, PAB, AB, MH, CSM, DKW, and AW) oversaw the cultural safety and propriety of the analyses (appendix p 11).

Results

Of the 4097 studies screened, 4011 were excluded on the basis of titles and abstracts (figure 1). A further 63 studies were excluded following full-text screening, mainly owing to the absence of Indigenous data (n=30; appendix pp 12–14). 23 studies (21 full-text articles and two abstracts) were included in the analysis.

The included studies were conducted in six (24%) of the 25 eligible countries or regions (HDI≥0·8) that have Indigenous populations; no studies from South America, the Middle East, Europe, or Russia met the inclusion criteria (figure 2). Eight studies reported period prevalence;[22–29] all other studies reported point prevalence. All studies examined dementia with or without cognitive impairment. One Australian study that assessed cognitive impairment alone used the same derivation cohort as another included study to report the risk factors and longitudinal outcomes of mild cognitive impairment and was thus not included in this Review.[30] The age range of the populations examined varied from no age restriction[22] to 68 years and older;[23] 12 studies focused on Indigenous populations that were 60 years or older. 12 (52%) of the 23 studies used a cross-sectional study design, obtaining data from community assessments or surveys, with the other 11 using a retrospective analysis of administrative data (table 1).

Community prevalence studies largely used a two-phase screening design with an initial screening measure followed by a dedicated clinical assessment using the Diagnostic and Statistical Manual-IV, National Institute on Aging and Alzheimer's Association criteria, or objective cognitive impairment as the diagnostic reference standard (table 2). ICD-9 or ICD-10 was the reference standard for dementia diagnosis across all administrative data-based studies. Indigenous status was self-reported in 17 (74%) of the 23 studies. The Canadian study by Jacklin and colleagues[22] excluded non-Status-First Nations and Métis populations. Galasko and colleagues[31] examined the prevalence of dementia in the Chamorro population of Guam, Sentell and colleagues[32] focused on the Native Hawaiian population in Hawaii, and all other US-based studies examined the American Indian and Alaska Native population.

Nine studies reported the age-specific prevalence of dementia across varying age groups.[11,19,22,32–35,37,40] In each study, the prevalence of dementia increased with age for Indigenous and non-Indigenous peoples. Disparities in age-specific prevalence were more pronounced at younger ages than at older ages (figure 2). In Australia, the prevalence ratio between Aboriginal and Torres Strait Islander peoples and non-Indigenous peoples ranged from 3·5–26·0 in the group of people younger than 70 years to 1·2–3·4 in the group of people older than 75 years.[11,19,33,34] In Aotearoa-New Zealand, the prevalence ratio between Māori and European New Zealanders was 1·5–1·8 in the 60–69 years age group and 1·1 in the group older than 95 years.[28] Age-specific prevalence ratios of 2·5–5·8 for dementia or any cognitive impairment were reported between Singaporean Malays and Singaporean Chinese in those aged between 50 and 65 years; these values decreased to 0·6–2·4 in people older than 75 years.[37,40] In the USA, only Sentell and colleagues[32] reported age-specific prevalence ratios for dementia between Native Hawaiian and non-Hispanic White populations, which ranged from 2·5 in the 60–69 years age group to 1·1 in the group older than 90 years.

The overall crude and age-standardised prevalence of dementia or cognitive impairment varied widely, from less than 1%[22,39] to more than 20%[35] in both Indigenous and non-Indigenous populations (table 2). Relative to that in the respective dominant non-Indigenous populations, a higher age-standardised prevalence ratio of dementia was observed in the Australian Aboriginal and Torres Strait Islander peoples (2·5–5·2),[11,19,34,35] Aotearoa-New Zealand Māori (1·2–2·0),[27–29] and Singaporean Malay populations (1·3–1·7).[37,40] In cases that did not present age-standardised prevalence or in which this prevalence was not computable, higher crude prevalence ratios of dementia were reported for the Canadian Status-First Nations (1·3),[22] Singaporean Malay (2·3),[38] Malaysian Melanau (1·7–4·0),[41] American Indian and Alaska Native (1·0–3·2, including any cognitive impairment),[23,25,26,49,50] and Chamorro of Guam (1·2–2·0) populations[31] than those for the reference non-Indigenous populations. Conversely, one US-based study reported a reduced crude prevalence of dementia for the American Indian and Alaska Native population, relative to that for the non-Hispanic White population (prevalence ratio of 0·9).[24] No studies provided prevalence estimates according to the urban or rural location, although regression modelling revealed no significant difference in the risk of dementia across rurality for American Indian and Alaska Native and non-Hispanic White populations.[25]

Differences in the sex-specific prevalence of dementia within Indigenous populations were infrequently reported and even less so in comparison to the respective non-Indigenous populations. In remote Australia, Aboriginal and Torres Strait Islander men showed a significantly greater prevalence of dementia than did women (17% for men; 9% for women; 95% CI of the difference=0·4–15·6%),[11] although no significant sex-based differences were reported within this population in more urban or regional areas.[34,35] A higher prevalence of dementia was reported for Canadian Status-First Nations men than for women, a finding significantly different from that in the non-First Nations population.[22]

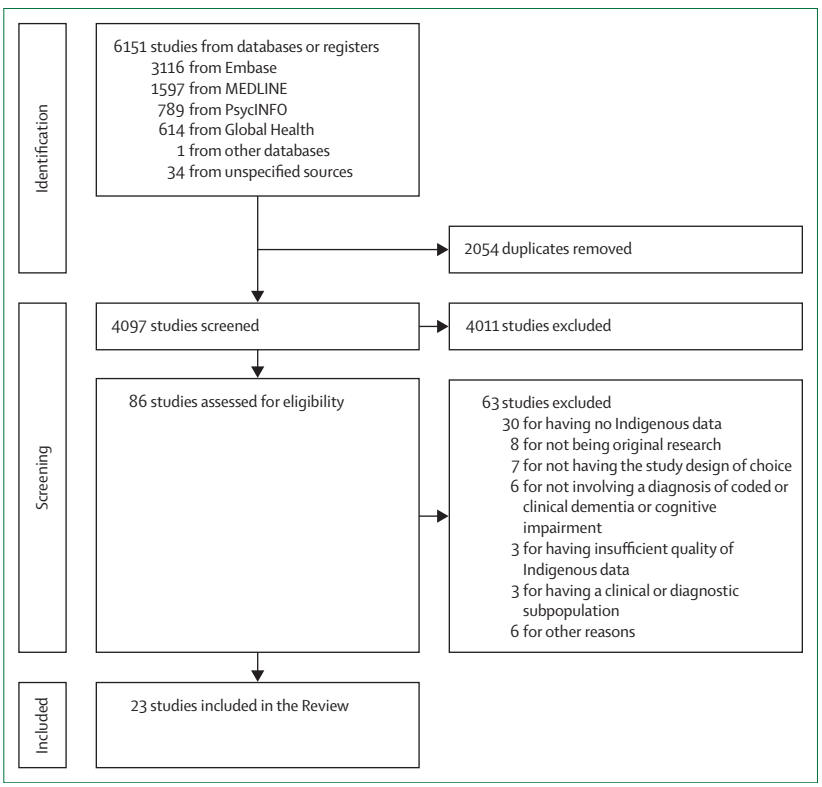

Figure 1: **Flow diagram of study inclusion and exclusion**

Singaporean Malay women had a greater prevalence of dementia or any cognitive impairment in two studies (prevalence of 1·9% [95% CI 1·3–2·8] for women; 1·2% [0·7–2·1] for men),[37] even at younger ages (16·5% for women and 12·6% for men aged 60–64 years),[40] with regression modelling predicting female sex as a significant risk factor for dementia in the Singaporean Malay population.[40] No significant differences in the prevalence of dementia were found between Malaysian Melanau women and men.[41] In the USA, two studies reported a greater prevalence of dementia in American Indian and Alaska Native women than in men of the same population (10·0% for women and 7·9% for men), similar to the findings in the non-Hispanic White population (11·9% for women and 8·3% for men)[24] and Chamorro women (13·4% [95% CI 12·7–14·3] for women; 10·4% [9·6–11·6] for men).[31] Conversely, regression modelling predicted a lower risk of diagnosis of Alzheimer's disease or a related condition for American Indian and Alaska Native women than for men of the same population.[25]

Subtypes of dementia were predominantly reported in community prevalence studies, with the variance in documentation of dementia subtypes precluding this analysis in most retrospective studies. Dementia not

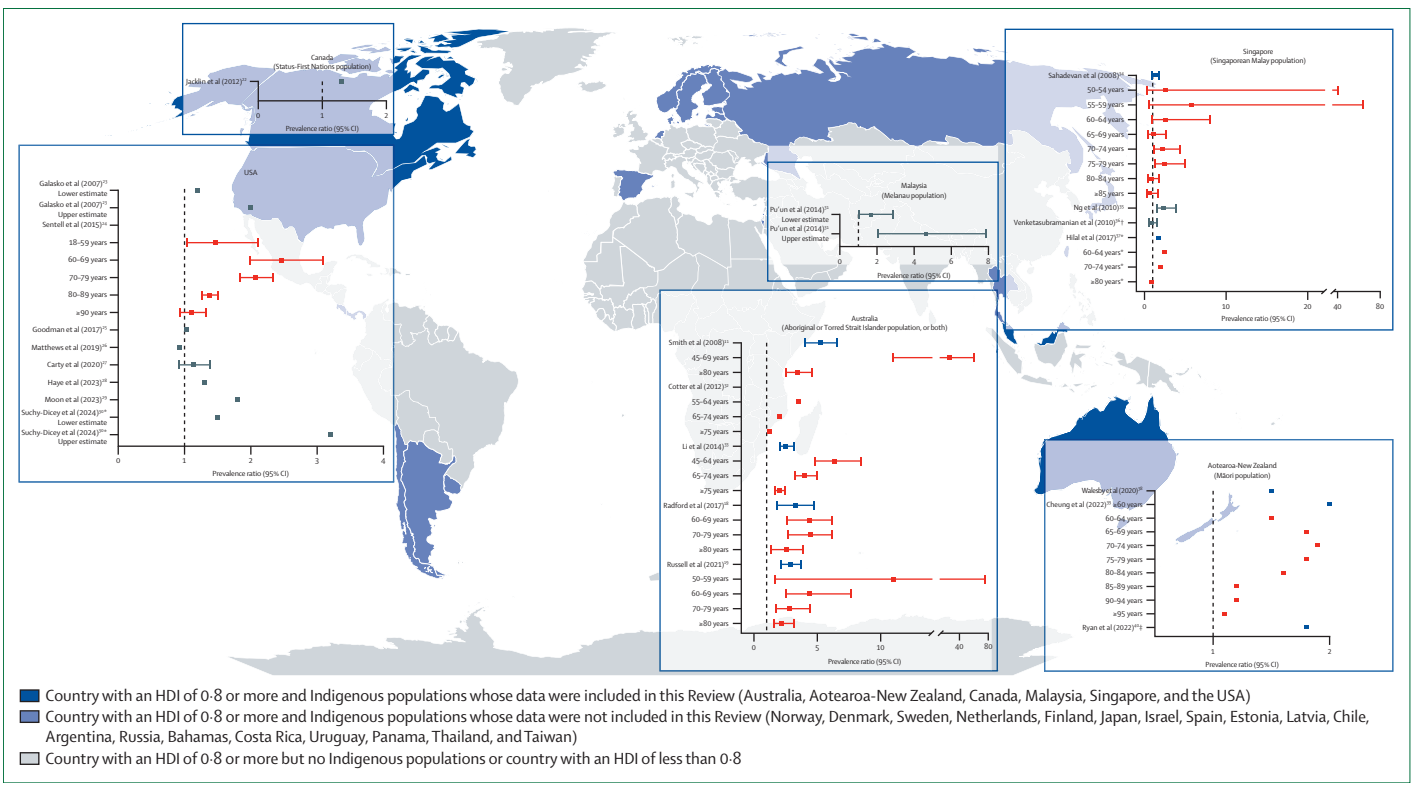

Figure 2: **The age-standardised (blue), age-specific (red), and crude (grey) prevalence ratios for dementia in Indigenous populations relative to non-Indigenous populations of countries with a very high HDI (≥0·8)**

HDI=Human Development Index. *Any cognitive impairment. †Vascular dementia only. ‡Young-onset dementia only. For Aotearoa-New Zealand period prevalence studies, data from the most recent year only are presented.

otherwise specified was the most reported dementia subtype for Aboriginal and Torres Strait Islander peoples in Australia (53·0%[11], 57·2%[34], 38·5%[19]), followed by Alzheimer's disease, except for one study in which Alzheimer's disease was the most frequent (43·9%) dementia subtype.[35] The prevalence of dementia not otherwise specified was greater for Aboriginal and Torres Strait Islander peoples (57·2%) than for non-Indigenous Australians (45·2%).[34] Mixed dementia was the most common dementia subtype reported for the Singaporean Malay population (48·1%), followed by Alzheimer's disease (37·0%).[40] Another study reported a similar prevalence of Alzheimer's disease and vascular dementia for Singaporean Malay (Alzheimer's disease 0·9% and vascular dementia 0·5%) and Chinese (Alzheimer's disease 0·6% and vascular dementia, 0·6%) populations.[37] Dementia or Alzheimer's disease was more prevalent (8·8%) than Parkinsonism-disease complex (1·5%) in the Chamorro population of Guam.[31] In a community prevalence study on the American Indian and Alaska Native population, Alzheimer's disease was implicated in most dementia (44%) and mild cognitive impairment (41%) diagnoses, followed by vascular dementia (44%) and cognitive impairment (51%).[50] Dementia not otherwise specified was the most frequent codiagnosis across American Indian and Alaska Native and non-Hispanic White populations in the USA, although the relative proportion of the American Indian and Alaska Native peoples with an Alzheimer's disease diagnosis was lower (32·8%) than that in the non-Hispanic White population (43·1%).[23]

Substantial heterogeneity existed across all studies in terms of the disease in focus (dementia or cognitive impairment), case ascertainment methods, and analysis and reporting of results. 14 studies showed a moderate risk of bias, with almost all studies failing to include adequate subgroups in data presentation (appendix p 15). Six community prevalence studies showed a low risk of bias,[11,19,31,35,37,40] whereas one study showed a high risk of bias.[41] Age standardisation was performed in most studies, other than those carried out in the USA, where only crude prevalence was reported. The standard population used was that of each respective country or territory, with the WHO standard population applied in two Singaporean studies. The information reported by most studies was not adequate for the application of the CONSIDER guidelines (appendix p 16). Six studies outlined the sociopolitical and environmental context for their methodological approaches and five studies described their relationships with Indigenous stakeholders (figure 3). No studies reported details relating to Indigenous analysis or interpretation of the research.

	Australia	Aotearoa-New Zealand	Canada	Singapore	Malaysia	USA	Total
Indigenous population	Aboriginal and Torres Strait Islander	Māori	First Nations, Métis, Inuit*	Singaporean Malay	Melanau	American Indian and Alaska Native, Native Hawaiian, Chamorro	
Publication type							
Peer-reviewed paper	5	3	1	3	1	8	21
Abstract	..	..	1	1	..	..	2
Definition of dementia or cognitive impairment							
DSM-V (or previous)	3	..	..	3	1	1	8
ICD-10 (or previous)	2	..	1	..	..	5	8
Other (including self-reported, consensus criteria, or neuropsychological assessment)	..	3	1	1	..	2	7
Case ascertainment							
Clinical	3	..	..	4	1	2	10
Administrative (including hospital data and dementia medication prescription)	2	3	1	..	..	5	11
Other	..	..	1	..	..	1	2
Indigenous denominator source							
Census	1	..	..	..	..	..	1
Study sample	3	..	..	4	1	8	16
Other (including multiple)	1	3	2	..	..	..	6
Identification of Indigenous population							
Self-reported (including hospital data)	5	3	1	..	..	8	17
Population register	..	..	1	..	..	..	1
Other (including unclear)	..	..	..	4	1	..	5
Data collection period							
2000–09	2	..	1	3	..	1	7
2010 onwards	3	3	1	1	1	7	16

*One study did not include non-Status-First Nations and Métis populations. DSM=Diagnostic and Statistical Manual. ICD=International Classification of Diseases.

Table 1: **Characteristics of studies examining the prevalence of dementia or cognitive impairment among Indigenous populations of countries with a very high Human Development Index (≥0·8)**

Discussion

This Review highlights a generally greater prevalence of dementia and cognitive impairment overall and at younger ages among Indigenous peoples of countries with a very high HDI, relative to the respective non-Indigenous populations. The disparity continues despite improvement in the management of risk factors, which has resulted in the declining incidence of dementia in these countries.[51] Estimates of prevalence tend to vary widely, reflecting differences in study design, case ascertainment and definitions, and reporting of Indigenous status and age ranges. Indigenous perspectives on brain ageing have rarely been reported. These findings highlight opportunities to improve future studies examining the epidemiology of dementia in these populations.

Age-specific prevalence revealed important trends related to the risk of dementia in Indigenous populations. Age-specific prevalence ratios for dementia were greater across younger age groups, especially those aged 70 years and younger, in Australian Aboriginal and Torres Strait Islander, Aotearoa-New Zealand Māori, Singaporean Malay, and US Native Hawaiian populations than across groups of people older than 70 years. The reported prevalence across younger age groups is most likely underestimated owing to the generally younger age structure of Indigenous populations relative to non-Indigenous populations. In contrast, the decreasing age-specific prevalence ratio with older age most likely represents the resilient survival of older Indigenous peoples within these cohorts and is less reflective of broader structural influences on disease. Notably, only ten studies examined age ranges younger than 60 years (excluding one study that evaluated young-onset dementia). Although the risk of dementia increases exponentially with age, the exclusion of younger age groups from estimates of prevalence elides the early-life and mid-life influences on brain ageing, including inadequate educational opportunities and early onset of cardiometabolic comorbidities, which affect Indigenous populations disproportionately.[5,8,52,53]

The widely accepted notion that women have an increased risk of dementia in high-income countries[6] was not universally observed. Three studies across Australia, Canada, and the USA reported a higher risk or prevalence of dementia for men in the respective Indigenous populations than for women. Jacklin and colleagues[22] emphasised that the disproportionate burden of dementia seen in men from First Nation populations occurred despite the greater prevalence of cardiovascular comorbidities in women from these populations, suggesting

	Indigenous population	Region	Age range (mean)	Screening test	Diagnostic reference test	Sample size (denominator)		Age-standardised prevalence per 100 individuals (95% CI) (standard population used)		Prevalence ratios for dementia, Cog Imp, or both (95% CI)
						Indigenous	Non-Indigenous	Indigenous	Non-Indigenous	
Australia										
*Smith et al (2008)[11]	Aboriginal, Torres Strait Islander, or both	WA (remote)	≥45 years (60·7 [SD 11·9])	KICA	DSM-IV	363	NA	Dementia: 13·1 (9·9–16·3)† Cog Imp: 7·8 (5·1–10·5)† (Australian population, 2003)	Dementia: 2·4 (Australian population, 2003)	≥45 years: 5·2 (4·0–6·6) 45–69 years: 26·0 (10·9–61·8) ≥80 years: 3·4 (2·5–4·6)
‡Cotter et al (2012)[33]	Aboriginal, Torres Strait Islander, or both	Australia (national)	≥45 years (NA)	NA	ICD-10	Not reported		Not reported	Not reported	45–54 years: 0·0 55–64 years: 3·5 65–74 years: 2·0 ≥75 years: 1·2
‡Li et al (2014)[34]	Aboriginal, Torres Strait Islander, or both	NT (regional or remote)	≥45 years (median 72)	NA	ICD-10; ICPC; Aged Care Assessment Program Data Dictionary; free word search in BDM registry	11 646	53 566	Dementia: 6·5 (5·8–6·8) (Australian population, 2011)	Dementia: 2·6 (2·3–2·8) (Australian population, 2011)	≥45 years: 2·5 (2·0–3·2) 45–64 years: 6·4 (4·8–8·5) 65–74 years: 4·0 (3·2–5·0) ≥75 years: 2·0 (1·7–2·4)
*Radford et al (2015)[35]	Aboriginal, Torres Strait Islander, or both	NSW (urban or regional)	≥60 years (66·6 ± 6·3)	mKICA RUDAS MMSE	DSM-IV	336	NA	Dementia: 21·0 (12·8–29·2) (Australian population, 2011) MCI: 17·7 (13·4–21·9) (Crude)	Dementia: 6·8 (Australian population, 2011)	≥60 years: 3·1 (1·9–4·9) 60–69 years: 4·2 (2·7–6·3) 70–79 years: 4·2 (2·8–6·3) ≥80 years: 2·4 (1·4–4·0)
*Russell et al (2021)[19]	Aboriginal, Torres Strait Islander, or both	Torres Strait Islands (remote)	≥45 years (65·1 ± 10·8)	KICA	DSM-IV	274	11 248 640	Dementia: 11·9 (8·8–15·0)† Cog Imp: 18·5 (14·0–22·9)† (Australian population, 2016)	Dementia: 3·6 (Australian population, 2016)	≥45 years: 2·9 (2·1–3·8) 45–49 years: 0·0 (0·0–0·0) 50–59 years: 11·0 (1·6–76·9) 60–69 years: 4·4 (2·5–7·7) 70–79 years: 2·8 (1·7–4·5) ≥80 years: 2·2 (1·5–3·2)
Aotearoa-New Zealand										
‡Walesby et al (2020)[27]	Māori	New Zealand (national)	≥60 years (NA)	NA	ICD-10; dementia medication prescription	59 145 (2012) 62 208 (2013) 65 508 (2014) 68 670 (2015)	742 536 (2012) 761 670 (2013) 781 581 (2014) 794 670 (2015)	Dementia: 2·0 (New Zealand population)	Dementia: 1·0 (New Zealand population)	≥60 years 2012–15: 2·0
‡Cheung et al (2022)[28]	Māori	New Zealand (national)	≥60 years ≥80 years (NA)	NA	ICD-9 or ICD-10; free text search in interRAI; dementia medication prescription; Dementia in Service coordination system	New Zealand population only ≥60 years: 1 001 367 ≥80 years: 188 580		Dementia ≥60 years 2016–17: 5·1 2017–18: 5·4 2018–19: 5·5 2019–20: 5·4 ≥80 years 2016–17: 16·4 2017–18: 17·5 2018–19: 18·0 2019–20: 17·5 (New Zealand population)	Dementia ≥60 years 2016–17: 3·8 2017–18: 3·9 2018–19: 3·8 2019–20: 3·7 ≥80 years 2016–17: 14·1 2017–18: 14·2 2018–19: 14·0 2019–20: 13·6 (New Zealand population)	≥60 years 2016–17: 1·3 2017–18: 1·4 2018–19: 1·4 2019–20: 1·5 ≥80 years 2016–17: 1·2 2017–18: 1·2 2018–19: 1·3 2019–20: 1·3 2019–20 60–64 years: 1·5 65–69 years: 1·8 70–74 years: 1·9 75–79 years: 1·8 80–84 years: 1·6 85–89 years: 1·2 90–94 years: 1·2 ≥95 years: 1·1

(Table 2 continues on next page)

	Indigenous population	Region	Age range (mean)	Screening test	Diagnostic reference test	Sample size (denominator)		Age-standardised prevalence per 100 individuals (95% CI) (standard population used)		Prevalence ratios for dementia, Cog Imp, or both (95% CI)
						Indigenous	Non-Indigenous	Indigenous	Non-Indigenous	
(Continued from previous page)										
‡Ryan et al (2022)[29]	Māori	New Zealand (national)	0–64 years (NA)	NA	ICD-9 or ICD-10; free text search in interRAI; dementia medication prescription	New Zealand population only 30–64 years 2 098 542 (2016–17) 2 135 565 (2017–18) 2 160 623 (2018–19) 2 212 482 (2019–20)		Young onset dementia 2016–17: 0·23 2017–18: 0·23 2018–19: 0·24 2019–20: 0·23 (New Zealand population)	Young onset dementia 2016–17: 0·13 2017–18: 0·13 2018–19: 0·13 2019–20: 0·13 (New Zealand population)	2016–17: 1·8 2017–18: 1·8 2018–19: 1·8 2019–20: 1·8
Canada										
‡Jacklin et al (2012)[22]	Status-First Nations	AB (urban or rural)	All ages (not reported)	NA	ICD-9	99 204 (1998) 129 774 (2008)	Not reported	Dementia 1998: 0·36 2009: 0·8 (0·7–0·9) (Alberta population)	Dementia 1998: 0·43 2009: 0·6 (0·6–0·6) (Alberta population)	1998: 0·8 2009: 1·3
§Warren et al (2015)[36]	First Nations, Métis, and Inuk (Inuit)	Canada (national)	≥12 years (not reported)	NA	Self-reported	10 000 (weighted)	265 000 (weighted)	Dementia: <1 Cog Imp (mild or significant): 33·0 (Crude)	Dementia: <1 Cog Imp (mild or severe): 27·0 (Crude)	Cog Imp: 1·2¶
Singapore										
*Sahadevan et al (2008)[37]	Singaporean Malay	Ang Mo Kio, Bishan, Serangood, Toa Payoh, Yishun (urban)	≥50 years (NA)	AMT; previous diagnosis of dementia	DSM-IV	3053	8849	Dementia: 1·6 (1·1–2·2) (WHO standard)	Dementia: 1·2 (1·0–1·4) (WHO standard)	≥50 years: 1·3 (0·9–1·8) 50–54 years: 2·6 (0·2–41·4) 55–59 years: 5·8 (0·5–64·1) 60–64 years: 2·6 (0·8–8·1) 65–69 years: 1·1 (0·4–2·7) 70–74 years: 2·2 (1·1–4·4) 75–79 years: 2·4 (1·2–5·0) 80–84 years: 0·9 (0·4–1·9) ≥85 years: 0·6 (0·2–1·7)
‡Ng et al (2010)[38]	Singaporean Malay	Singapore (national)	≥60 years (69·0 ± 6·7)	NA	GMS schedule	320	479	Dementia: 9·4 (6·2–12·6) (Crude, weighted)	Dementia: 4·2 (2·5–6·0) (Crude, weighted)	≥60 years: 2·3 (1·4–3·9)
§Venketasubramanian et al (2010)[39]	Singaporean Malay	Ang Mo Kio, Bishan, Serangood, Toa Payoh, Yishun (urban)	≥50 years (NA)	AMT; self-report of forgetfulness	DSM-IV	2964	8892	Vascular dementia: 0·5 (0·3–0·9) (Crude)	Vascular dementia: 0·6 (0·4–0·7) (Crude)	≥50 years: 0·9 (0·5–1·6)
*Hilal et al (2017)[40]	Singaporean Malay	Southwestern Singapore (urban)	≥60 years (median=70)	AMT; self-report of forgetfulness	DSM-IV; impairment in one or more neuropsychological test	966	1226	Dementia: 2·0 (1·2–2·7) Moderate Cog Imp: 12·5 (10·5–14·5) MCI: 11·0 (8·9–13·0) (WHO standard)	Dementia or Moderate Cog Imp: 7·9 (6·2–9·7) MCI: 7·2 (5·6–8·8) (WHO standard)	Any Cog Imp: 1·7 60–64 years: 2·5 70–74 years: 2·0 ≥80 years: 0·9
Malaysia										
‖Pu'un et al (2014)[41]	Melanau	Mukah (regional)	≥60 years (70·4 ± 6·7)	ECAQ	DSM-IV	344	NA	Dementia: 10·5 (7·2–13·7) (Crude) 10·4 (7·2–13·2) (WHO standard)*	Dementia:[42–44] 2·5–6·0 (Crude)	≥60 years: 1·7 (1·0–2·9)[45] 4·0 (2·0–7·9)[46]

(Table 2 continues on next page)

	Indigenous population	Region	Age range (mean)	Screening test	Diagnostic reference test	Sample size (denominator)		Age-standardised prevalence per 100 individuals (95% CI) (standard population used)		Prevalence ratios for dementia, Cog Imp, or both (95% CI)
						Indigenous	Non-Indigenous	Indigenous	Non-Indigenous	
(Continued from previous page)										
USA										
*Galasko et al (2007)[31]	Chamorro	GU (regional or rural)	≥65 years (73·8 ± 6·0)	CASI	DSM-IV	1984	NA	Dementia: 12·2 (11·7–12·9) (Crude) 15·9 (14·1–17·8)† (US population, 2000)	Dementia:[47,48] 6·0–10·0 (Crude)	≥65 years: 1·2–2·0
‡Sentell et al (2015)[32]	Native Hawaiian	HI (urban or rural)	≥18 years (NA)	NA	ICD-9	174 240 (Indigenous + non-Indigenous population)		Not reported		18–59 years: 1·5 (1·0–2·1) 60–69 years: 2·5 (2·0–3·1) 70–79 years: 2·1 (1·8–2·3) 80–89 years: 1·4 (1·3–1·5) ≥90 years: 1·1 (0·9–1·3)
‡Goodman et al (2017)[23]	American Indian and Alaska Native	USA (national)	≥68 years (NA)	NA	ICD-9	86 497	18 229 224	Dementia: 14·4 (14·2–14·6) (Crude)	Dementia: 14·0 (14·0–14·0) (Crude)	≥68 years: 1·0 (1·0–1·0)
‡Matthews et al (2019)[24]	American Indian and Alaska Native	USA (national)	>65 years (NA)	NA	ICD-9	125 087	23 149 644	Dementia: 10·5 (10·3–10·6) (Crude)	Dementia: 11·3 (11·3–11·4) (Crude)	≥65 years: 0·9 (0·9–0·9)
‡Carty et al (2020)[25]	American Indian	AZ, CA, CO, NE, NV (urban or rural)	≥55 years (median: 64)	NA	ICD-10	3464	3626	Dementia: 5·7 (4·9–6·4) (Crude) 6·6 (age-adjusted)	Dementia: 5·0 (4·3–5·7) (Crude) 4·4 (age-adjusted)	≥55 years: 1·1 (0·9–1·4)
‡Haye et al (2023)[26]	American Indian and Alaska Native	USA (national)	≥65 years (NA)	NA	ICD-9 or ICD-10 and one dementia symptom code or dementia medication code	Not reported		Dementia: 9·7 (9·5–9·9) (Crude)	Dementia: 7·7 (7·7–7·7) (Crude)	≥65 years: 1·3
‡Moon et al (2023)[49]	American Indian and Alaska Native	USA (national)	≥65 years (NA)	NA	Self-report or proxy-report, AD8 ≥ 2, ≤ 1·5 SD on two or three neuropsychological tests	68	5136	Dementia: 9·0 (1–16) (Crude, weighted)	Dementia: 5·0 (4·0–6·0) (Crude, weighted)	≥65 years: 1·8
‡Suchy-Dicey et al (2024)[50]	American Indian	Northern and southern US plains, southwest USA (urban or rural)	≥65 years (78·1 ± 4·7)	Neuropsychological battery**	NIA-AA criteria	397	NA	Any Cog Imp: 45·6 (40·7–50·5) Dementia: 10·3 (7·3–13·3) MCI: 35·3 (30·6–40·0) (Crude)	Any Cog Imp:[42–44] 14·0–30·0 Dementia:[42–44,50] 11·0 (10·0–13·0) MCI:[44] 23·0 (21·0–25·0) (Crude)	≥65 years Any Cog Imp:[42–44,50] 1·5–3·2 Dementia: 1·0 (0·7–1·3)† MCI: 1·4 (1·1–2·1)†

AMT=Abbreviated Mental Test. BDM=Births, Deaths, Marriages. CASI=Cognitive Assessment Screening Instrument. CI=confidence interval. Cog Imp=cognitive impairment not otherwise specified. DSM=Diagnostic and Statistical Manual. ECAQ=Elderly Cognitive Assessment Questionnaire. GMS=Geriatric Mental State. ICPC=International Classification of Primary Care. InterRAI=New Zealand-based comprehensive geriatric assessment. JBI=Joanna Briggs Institute. KICA=Kimberley Indigenous Cognitive Assessment. MCI=mild cognitive impairment. mKICA=modified KICA. MMSE=Mini-Mental State Examination. NA=not available. NIA-AA=National Institute on Aging and Alzheimer's Association. RUDAS=Rowland Universal Dementia Assessment Scale. *Low risk-of-bias. †Age standardisation done using the direct method for this Review. ‡Moderate risk-of-bias. §Abstract or risk-of-bias not assessed, as per Joanna Briggs Institute grading. ¶Study under-powered to examine dementia. Subjective cognitive impairment reported instead, not meeting inclusion criteria. ||high risk-of-bias. **3MSE=Modified Mini-Mental State Examination. BCFT=Benson Complex Figure copy, naming Test. COWA=Controlled Oral Word Association. CVLT=California Verbal Learning Test. DSF/B=Digit Span Forwards/Backwards. MINT=Multilingual Naming Test. MoCA=Montreal Cognitive Assessment. WAIS-IV DSST=Weschler Adult Intelligence Scale Digit Symbol Substitution Test. TMT=Trail Making Test. Craft Story.

***Table 2*: Prevalence of dementia or cognitive impairment, or both, by geographical region among Indigenous or non-Indigenous populations, or both, of countries with a very high Human Development Index (≥0·8)**

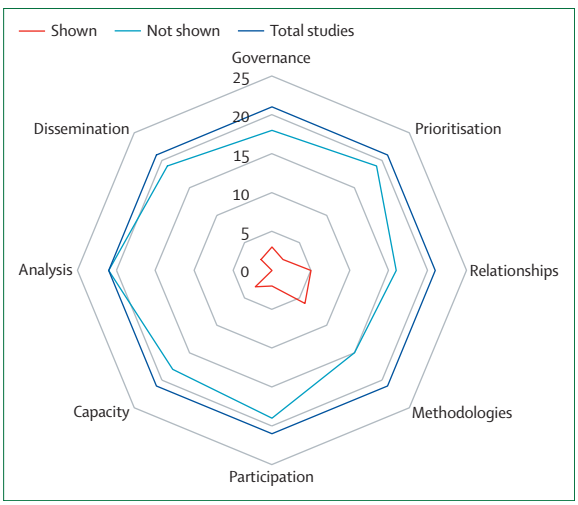

Figure 3: **Radar plot of the number of full-text studies that reported addressing the domains of the CONSIDER guidelines**
CONSIDER=CONSolIDated critERtia for strengthening the reporting of health research involving Indigenous peoples.

that biomedical comorbidities alone do not underlie this finding. In a follow-up study of an Aboriginal and Torres Strait Islander population in urban and regional Australia, male sex was identified as a risk factor for dementia, with a significantly higher prevalence of social determinants of health, including lower educational attainment and history of police custody, in men than in women.[54]

Most studies did not report analysis of dementia prevalence by subtype. In studies that reported the subtype, dementia not otherwise specified was more frequently diagnosed in the Australian Aboriginal and Torres Strait Islander population as compared with within-country estimates, which reported the highest prevalence of Alzheimer's disease overall.[11,19,34] Mixed dementia was the most common diagnosis in a community prevalence study of Singaporean Malays, although subtype analysis was not done for the Singaporean Chinese population.[40] The relative proportion of American Indian and Alaska Native peoples with a diagnosis of Alzheimer's disease was lower than that of the non-Hispanic White population.[23] Although most community-dwelling adults living with dementia harbour an overlap of neuropathologies,[55] failing to adequately delineate dementia subtypes hampers a detailed understanding of the disease, given its relation to age, genetic, socioenvironmental, and cardiovascular risks. Importantly, in the advancing era of disease-modifying therapies, accurate diagnosis of dementia subtypes is key for inclusion of diverse populations in therapeutic opportunities.[56] Only one study in Aotearoa-New Zealand examined young-onset dementia in the Māori population,[29] and therefore, further investigation is required for this condition.

Adequately capturing the epidemiology of dementia is challenging, and this Review outlines several gaps in the current understanding of dementia and cognitive impairment among Indigenous populations. A gold standard for the diagnosis of either condition does not exist, and global estimates rely on a mix of community prevalence studies and cohort and registry data or administrative dataset analyses, all of which have strengths and weaknesses.[57] Differing methods of case ascertainment and analysis contributed to substantial heterogeneity and at least a moderate risk of bias across many of the studies. In Aotearoa-New Zealand, only retrospective analysis of administrative data was performed, and research conducted in North America relied predominantly on administrative datasets for estimates of dementia. By contrast, most studies in Australia, Singapore, and Malaysia involved community prevalence studies using clinical diagnostic tools.

Considerations relating to accurate case ascertainment are important for Indigenous populations globally. Historical policies of institutionalisation, differing health-care practices and perspectives on cognitive decline, and reliance on community-based approaches to care have a major influence on the diagnosis and management of cognitive decline, factors that have been highlighted in many of the studies. Use of administrative datasets, which rely on documented diagnoses of dementia or cognitive impairment is most likely to underestimate prevalence in Indigenous populations. For community-based prevalence studies, the use of culturally appropriate diagnostic tools could help to reduce under-ascertainment. All community prevalence studies in Australia, Singapore, and Malaysia used locally validated tools for cognitive screening.

Other major potential sources of bias across the studies included sampling frame variation, identification of Indigenous individuals, and inadequate study descriptions or failure of inclusion of subgroups. Relative to national estimates, a greater prevalence of dementia was observed in most community-based studies undertaken in Indigenous populations living in rural or remote areas,[11,19,31,41,50] raising concerns about the validity of the sampling frame relative to the target populations and highlighting the need to examine the role of rurality in brain ageing.[58]

Most studies relied on self-reported Indigenous status. Notable exceptions include one Canadian study, which relied on a population registry merged with administrative data,[22] potentially resulting in under-ascertainment, and unclear reporting of Indigenous status across all Singaporean and Malaysian studies. Consistent methods for identifying Indigenous individuals are challenging given different social and administrative norms but are crucial for estimating the burden of disease over time. Descriptions of study samples were largely insufficient; most studies did not provide age or sex subgroups or describe whether individuals from residential aged care facilities were included. The absence of age standardisation or inadequate age group reporting that would allow for this calculation is a key limitation. Standardising outcomes to an appropriate age distribution is important to facilitate policies addressing pathological brain ageing over time in Indigenous populations, although care needs to be taken to ensure that the estimates are not distorted by the dominant population age structure.[59] Given the generally younger age structure of Indigenous populations in

high-income countries and the close relationship between cognitive decline and ageing, reporting of age-specific prevalence is likely to be most informative.

This Review is published almost a decade after the two previous systematic reviews that examined the epidemiology of dementia in Indigenous populations.[12,13] Since then, many studies have evaluated the global prevalence and incidence of dementia. We report a wide variation in estimates of dementia for Indigenous populations within high-income countries, which are generally considered to collate comprehensive general health data.[6] Nonetheless, this Review has some limitations. The search strategy did not include grey literature, which potentially reduced the number of reported estimates. The results are subject to the limitations of the individual studies, most of which showed a moderate risk of bias, and are most likely to under-represent prevalence in Indigenous populations. The strengths of this Review include the minimisation of interobserver bias in study screening and quality assessment through independent consensus. Search criteria excluded studies used for screening test validation[60] or those that included cases within a clinical or diagnostic subpopulation,[10,61] which most likely confounded previous dementia estimates.[12–14] The focus on prevalence alone allowed for robust critical appraisal of the current standards for epidemiological research. Most importantly, this Review was designed in collaboration with a global Indigenous Advisory Board who provided guidance regarding its scope and the interpretation of studies. We evaluated the prioritisation of Indigenous involvement and views by adhering to the CONSIDER statement and acknowledge that many of the studies included predate the introduction of these guidelines.

The findings highlight priorities for future studies related to dementia and cognitive impairment that involve Indigenous populations. We advocate for the inclusion of Indigenous worldviews in the conceptualisation and interpretation of studies related to the epidemiology of dementia involving Indigenous populations. Specifically, clarity regarding approaches to Indigenous health data acquisition and interpretation is essential to uphold Indigenous data sovereignty.[62] Publication standards should encourage reporting of these principles to enable precise assessments of study quality and inform strengths-based health-care research and development of translational policies for diagnosis of dementia and care for the condition. We highlight the need to broaden methodological approaches for estimation of the prevalence of dementia to include a judicious combination of community-based studies alongside registry and administrative datasets within countries to precisely illustrate disease trends.[57] Continued changes should be made within administrative and registry-based data to appropriately identify Indigenous peoples. As far as possible, studies on dementia and cognitive impairment should routinely capture prevalence at young ages and age-standardise estimates of prevalence across subtypes.

With more than 40% of dementia cases attributable to modifiable risk factors across the life course,[5,8,52] robust representations of the epidemiology of dementia for Indigenous populations can illustrate trends accurately and help to better understand the biomedical and structural contributors to the disease. Inclusion of Indigenous perspectives can further strengthen research accountability and inform targeted and culturally appropriate policies on healthy brain ageing.

Contributors

AJC, AHB, KR, AW, and AGB conceptualised the Review. AJC performed the database searches. AJC and MC independently validated the search strategy and performed title and abstract screening. AJC, MC, and AHB extracted data from the included studies. AGB resolved any conflicts. ADS, PAB, AB, MH, CSM, DKW, and AW provided the Indigenous insight and guidance regarding the scope of the Review, interpretation of the findings, and integration of the analysis into the manuscript. AHB, JMK, and MA provided advice regarding study design, age standardisation, and presentation of data. All authors contributed to the writing and editing of the manuscript. AHB, KR, AW, and AGB supervised the project.

Declaration of interests

AJC is supported by stipends from the National Health and Medical Research Council (NHMRC), the Australian and New Zealand Association of Neurologists (ANZAN), and Australian Academy of Science for research related to this study. PAB is a part of the advisory board for the EMView Study and is the President of ANZAN. AW is a recipient of an NHMRC Ideas Grant 2021–23 to support the development of a cognitive screening tool and is an adviser to the New South Wales Ministerial Advisory Council on Ageing. AGB is a part of the advisory boards for Roche, Biogen, Eisai, and Eli Lilly and is an honorary medical adviser for Dementia Australia. All other authors declare no competing interests.

Data sharing

Publicly available data were accessed for this Review.

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