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SYSTEMATIC REVIEW

Prevalence of type 2 diabetes among global Indigenous adult populations: a systematic review

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Abstract

Aims/hypothesis Despite evidence documenting high prevalence of type 2 diabetes among several Indigenous populations, a comprehensive systematic review of type 2 diabetes among global Indigenous Peoples has not been recently conducted. Our aim was to report region-, time-, age- and sex-specific type 2 diabetes prevalence among Indigenous adult populations globally.

Methods MEDLINE, Embase and CINAHL were searched for English-language studies published between 1 January 1980 and 3 March 2023. Studies reporting type 2 diabetes prevalence and/or cases of diabetes among global Indigenous adult populations aged 18 years and older were included. Type 2 diabetes prevalence data were extracted for the overall Indigenous population, sex, age group and year. Summaries of extracted data were tabulated, and are presented using comprehensive tables and figures. A modified Newcastle–Ottawa quality assessment scale reflective of Indigenous-specific criteria was applied to assess paper quality.

Results The search identified 2332 studies, of which 202 met the inclusion criteria. The included studies represented at least 187 Indigenous populations from 37 countries, although the exact number of populations is approximate, as some studies did not name specific Nations/Tribes/Groups for populations from different geographic regions. Diabetes prevalence ranged from 0 to 40%, with a mean of 73% of Indigenous populations reporting type 2 diabetes prevalence above the estimated global prevalences for every decade between 1980 and 2020. Prevalence increased over time and with age for many populations, with the highest reported prevalence (50.5%) in the 45–54 year age group. Type 2 diabetes prevalence was notably high among Indigenous women, with 73% of studies reporting higher prevalence for Indigenous women than for Indigenous men. Potential limitations include publication bias, which may have led to fewer studies being included in this review.

Conclusions/interpretation Type 2 diabetes prevalence among Indigenous adult populations was markedly higher than the global averages in every decade from 1980 to 2020, with a mean of 73% of populations reporting higher prevalence. These findings underscore the persistent and disproportionate burden of diabetes experienced by many Indigenous communities over several decades. Future work should aim to generate representative data on type 2 diabetes prevalence across global Indigenous populations, investigate factors that contribute to alarmingly high and notably low diabetes prevalence, and support Indigenous-led, culturally safe, Indigenous population-specific health practices to prevent and manage type 2 diabetes and achieve equitable outcomes.

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Trial registration PROSPERO registration no. CRD42021258623

Keywords Culturally appropriate · Health equity · Indigenous health determinants · Indigenous Peoples · Strengths-based · Systematic review · Type 2 diabetes

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Research in context

What is already known about this subject?

- Type 2 diabetes disproportionately impacts many Indigenous populations worldwide but, despite this knowledge, type 2 diabetes prevalence among Indigenous adult populations has not been systematically reviewed in recent years
- Previous reports have recognised the disproportionate burden experienced by many Indigenous communities but have not estimated age-, sex- or time-specific prevalence
- An updated, comprehensive summary of evidence representing the global diversity of Indigenous populations is imperative for understanding disease burden and prioritising prevention efforts

What is the key question?

- What is the burden of type 2 diabetes among Indigenous adult populations globally?

What are the new findings?

- Across each decade, the proportion of Indigenous populations with type 2 diabetes prevalence reported as above the average estimated global prevalence was markedly high: 93% in the 1980s, 61% in the 1990s, 72% in the 2000s, and 65% in the 2010s
- Many Indigenous populations have faced disproportionately high type 2 diabetes prevalence for several decades; each decade's highest reported Indigenous adult type 2 diabetes prevalence was between 5 and 10 times higher than the global average prevalence
- Of the studies that included sex-specific data, 73% reported a higher prevalence for Indigenous women compared with Indigenous men, presenting concern for intergenerational implications

How might this impact on clinical practice in the foreseeable future?

- The study was designed in a culturally appropriate manner, and the findings serve as an impetus for global leaders to rectify the epidemic levels of type 2 diabetes among Indigenous Peoples through actionable, strengths-based and community-tailored efforts

Introduction

Indigenous Peoples are incredibly diverse, with over 476 million individuals and more than 5000 populations in approximately 90 countries worldwide [1]. Prior to varying experiences of colonisation, many Indigenous Peoples consistently consumed nutritious, biodiverse foods, and practised ways of life that inherently protected and continue to protect against chronic health conditions [2–7]. Chronic conditions (e.g. type 2 diabetes) were rare among Indigenous populations living traditional lifestyles [7]. Many factors have contributed to epidemic levels of chronic disease among Indigenous populations, including ongoing impacts of colonisation, disruption of Indigenous ways of life and traditional food systems, land and resource displacement, geographic isolation, historical and intergenerational trauma, limited healthy food access, structural racism, and social inequity and exclusion [2–7]. Additionally, rapid and detrimental shifts from biodiverse traditional foods to nutritiously deficient foods, combined with stark changes to active lifestyles, substantially contribute to the development of chronic diseases such as type 2 diabetes [3, 4, 7]. Despite the remarkable diversity between global Indigenous populations, common inequities have led to shared experiences of a number of health metrics, including the disproportionate prevalence of communicable and non-communicable diseases, immense life expectancy gaps of 8–22 years between Indigenous and non-Indigenous populations in several regions (Aotearoa New Zealand, Brazil, Australia, Canada, the Pacific region and the USA), and premature mortality [6, 8–13]. These shared experiences emphasise the critical importance of understanding and addressing factors contributing to inequitable health disparities.

Type 2 diabetes prevalence among Indigenous Peoples has rapidly increased over several decades, leading to reduced quality of life and heavy burdens of diabetes-related complications, such as cardiovascular and chronic kidney disease, and premature mortality, with type 2 diabetes being a leading cause of death for many Indigenous populations [14–16]. Regional and country-specific reports show that

type 2 diabetes prevalence among Indigenous Peoples is often significantly higher than that for non-Indigenous populations living in the same regions [8, 17, 18]. This is observed in Canada, the USA, Australia and Aotearoa New Zealand, where type 2 diabetes prevalence among Indigenous populations is between two and five times higher than the national average in each country [2, 8, 17, 18]. For many regions, type 2 diabetes prevalence among Indigenous populations has been disproportionately higher than estimated global prevalences over several decades, with many populations reporting prevalence well over 10% since at least 1980 [14–23]. Type 2 diabetes prevalence among Indigenous Peoples often exceeds projected global estimates for the future, including the 2050 global projected prevalence of 10% [21].

Data concerning type 2 diabetes prevalence among Indigenous adult populations globally have not been systematically reviewed in recent years. Prior to this systematic review, the last comprehensive summary of type 2 diabetes prevalence was published by the International Diabetes Federation in the Diabetes Atlas, 6th edition, in 2013 [14]. The 6th edition recognised the disproportionate burden of type 2 diabetes among global Indigenous populations, with a range of reported diabetes prevalence from 1–40% between 1995 and 2001 [14]. The summary reported region-specific type 2 diabetes prevalence for 59 Indigenous populations, but did not report age-, sex- or time-specific prevalence [14]. Our objective was to conduct a systematic review to report overall, region-, time-, age- and sex-specific type 2 diabetes prevalence among Indigenous adult populations representative of the vast number of global Indigenous Peoples. The overarching aim was to present a comprehensive overview while also acknowledging the interconnected strengths and complexities of Indigenous-specific health determinants.

Methods

Search strategy and selection criteria This systematic review was conducted by the IDF Diabetes Atlas Diabetes in Indigenous Populations Special Interest Group, an international team of Indigenous and non-Indigenous researchers from Turtle Island (USA and Canada), Australia, Aotearoa New Zealand and Brazil (see electronic supplementary material [ESM] Methods for the list of members). Many of the authors (CC, CH, AB, OP, DW and MN) are Indigenous Peoples themselves, with lived experiences of the disproportionate impact that diabetes has on their families and communities. The systematic review adhered to the PRISMA 2020 guidelines, the protocol was registered with PROSPERO (https://www.crd.york.ac.uk/PROSPERO/view/CRD42021258623), and the manuscript was written according to Younging's culturally appropriate publishing practice recommendations [24, 25]. Two protocol deviations were made: (1) the decision to limit the search to three databases after initial searches indicated saturation, as evidenced by several duplicate articles (n=3241 total duplicates); and (2) use of the Newcastle–Ottawa scale to assess the quality of studies because it provided greater flexibility for the integration of culturally appropriate criteria that is representative of Indigenous populations [26].

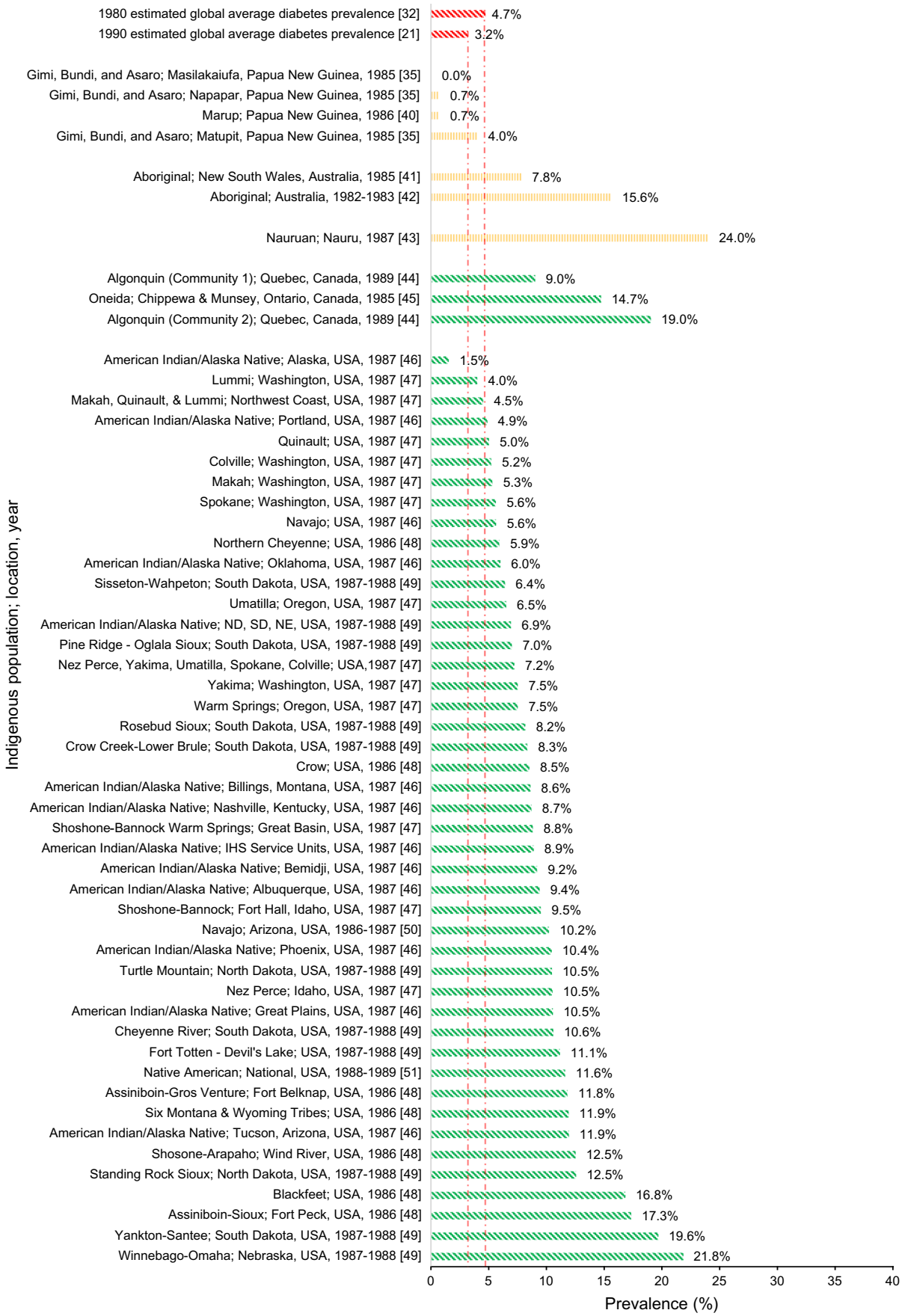
Inclusion criteria Studies were eligible if they were English-language studies reporting type 2 diabetes prevalence and/or cases of type 2 diabetes among global Indigenous adult populations aged 18 years and older. Prevalence data obtained using any diabetes diagnosis method from cross-sectional population/community-based studies, medical records, registries and health insurance databases, prevalence estimates from community-, state-, province-, regional- and national-level data were included.

Exclusion criteria Studies were excluded if they reported type 1 diabetes prevalence, combined Indigenous and non-Indigenous data, only included participants under 18 years (the companion paper to this review assessed type 2 diabetes prevalence for Indigenous youth populations [27]), had a sample size of less than 200 (as a smaller sample size may yield imprecise prevalence estimates), included specific populations (i.e. occupation-, disease- or pregnancy-based), lacked clear methods or extractable data, or were conducted before 1 January 1980 [27, 28].

Search strategy The United Nations Permanent Forum on Indigenous Issues criteria and internal expert knowledge guided the identification of Indigenous populations (while acknowledging that not all populations prefer the colonially imposed term Indigenous) [29]. Database-specific search strategies (see ESM Methods) were developed to search MEDLINE, Embase and CINAHL to identify English-language studies conducted between 1 January 1980 and 3 March 2023. The start year of 1980 was selected due to significant changes in diabetes diagnostic criteria between 1979 and 1980 [30]. The search was conducted by the study team, and results were managed in Covidence (Veritas Health Innovation, Melbourne, Australia [31]). Reference lists were hand-searched to identify additional studies. Potential studies were reviewed in four phases: title and abstract screening, full-text review, data extraction and data analysis. Eight of the authors (CC, AJH, EP, ELMB, DJM, CH, BS and HM) reviewed the identified studies. Consensus by two reviewers was required, and any conflicts were resolved by a third reviewer.

Data extraction and analysis

Data extraction was conducted by eight authors (CC, AJH, EP, ELMB, DJM, CH, BS and HM) and one additional


1980 estimated global average diabetes prevalence [32] 4.7%
1990 estimated global average diabetes prevalence [21] 3.2%
Gimi, Bundi, and Asaro; Masilakaiufa, Papua New Guinea, 1985 [35] 0.0%
Gimi, Bundi, and Asaro; Napapar, Papua New Guinea, 1985 [35] 0.7%
Marup; Papua New Guinea, 1986 [40] 0.7%
Gimi, Bundi, and Asaro; Matupit, Papua New Guinea, 1985 [35] 4.0%
Aboriginal; New South Wales, Australia, 1985 [41] 7.8%
Aboriginal; Australia, 1982-1983 [42] 15.6%
Nauruan; Nauru, 1987 [43] 24.0%
Algonquin (Community 1); Quebec, Canada, 1989 [44] 9.0%
Oneida; Chippewa & Munsey, Ontario, Canada, 1985 [45] 14.7%
Algonquin (Community 2); Quebec, Canada, 1989 [44] 19.0%
American Indian/Alaska Native; Alaska, USA, 1987 [46] 1.5%
Lummi; Washington, USA, 1987 [47] 4.0%
Makah, Quinault, & Lummi; Northwest Coast, USA, 1987 [47] 4.5%
American Indian/Alaska Native; Portland, USA, 1987 [46] 4.9%
Quinault; USA, 1987 [47] 5.0%
Colville; Washington, USA, 1987 [47] 5.2%
Makah; Washington, USA, 1987 [47] 5.3%
Spokane; Washington, USA, 1987 [47] 5.6%
Navajo; USA, 1987 [46] 5.6%
Northern Cheyenne; USA, 1986 [48] 5.9%
American Indian/Alaska Native; Oklahoma, USA, 1987 [46] 6.0%
Sisseton-Wahpeton; South Dakota, USA, 1987-1988 [49] 6.4%
Umatilla; Oregon, USA, 1987 [47] 6.5%
American Indian/Alaska Native; ND, SD, NE, USA, 1987-1988 [49] 6.9%
Pine Ridge - Oglala Sioux; South Dakota, USA, 1987-1988 [49] 7.0%
Nez Perce, Yakima, Umatilla, Spokane, Colville; USA,1987 [47] 7.2%
Yakima; Washington, USA, 1987 [47] 7.5%
Warm Springs; Oregon, USA, 1987 [47] 7.5%
Rosebud Sioux; South Dakota, USA, 1987-1988 [49] 8.2%
Crow Creek-Lower Brule; South Dakota, USA, 1987-1988 [49] 8.3%
Crow; USA, 1986 [48] 8.5%
American Indian/Alaska Native; Billings, Montana, USA, 1987 [46] 8.6%
American Indian/Alaska Native; Nashville, Kentucky, USA, 1987 [46] 8.7%
Shoshone-Bannock Warm Springs; Great Basin, USA, 1987 [47] 8.8%
American Indian/Alaska Native; IHS Service Units, USA, 1987 [46] 8.9%
American Indian/Alaska Native; Bemidji, USA, 1987 [46] 9.2%
American Indian/Alaska Native; Albuquerque, USA, 1987 [46] 9.4%
Shoshone-Bannock; Fort Hall, Idaho, USA, 1987 [47] 9.5%
Navajo; Arizona, USA, 1986-1987 [50] 10.2%
American Indian/Alaska Native; Phoenix, USA, 1987 [46] 10.4%
Turtle Mountain; North Dakota, USA, 1987-1988 [49] 10.5%
Nez Perce; Idaho, USA, 1987 [47] 10.5%
American Indian/Alaska Native; Great Plains, USA, 1987 [46] 10.5%
Cheyenne River; South Dakota, USA, 1987-1988 [49] 10.6%
Fort Totten - Devil's Lake; USA, 1987-1988 [49] 11.1%
Native American; National, USA, 1988-1989 [51] 11.6%
Assiniboin-Gros Venture; Fort Belknap, USA, 1986 [48] 11.8%
Six Montana & Wyoming Tribes; USA, 1986 [48] 11.9%
American Indian/Alaska Native; Tucson, Arizona, USA, 1987 [46] 11.9%
Shosone-Arapaho; Wind River, USA, 1986 [48] 12.5%
Standing Rock Sioux; North Dakota, USA, 1987-1988 [49] 12.5%
Blackfeet; USA, 1986 [48] 16.8%
Assiniboin-Sioux; Fort Peck, USA, 1986 [48] 17.3%
Yankton-Santee; South Dakota, USA, 1987-1988 [49] 19.6%
Winnebago-Omaha; Nebraska, USA, 1987-1988 [49] 21.8%
Indigenous population; location, year
0
5
10
15
20
25
30
35
40
Prevalence (%)

◂**Fig. 1** Indigenous adult type 2 diabetes prevalence (%): 1980–1989. Red stripes denote estimated global average diabetes prevalence. International Diabetes Federation regions include: yellow (Western Pacific) and green (North America and Caribbean). IHS, Indian Health Service

collaborator (Laercio Joel Franco) according to their respective familiarity with each region, and extractions were double-checked by two authors (CC and ELMB). Study characteristics extracted included author, publication year, study year(s), title, Indigenous population, name of cohort/study, state/region, country, sample size, sample type, diabetes diagnosis method, response rate, rural/urban status, and 95% confidence intervals if reported (ESM Table 1). Crude and age-standardised prevalence were extracted for overall population, sex, age group and decade (1980–1989, 1990–1999, 2000–2009, 2010–2020). To facilitate comparison with global averages, prevalence was categorised relative to the estimated global prevalence of 4.7% in 1980 [32], 3.2% in 1990 [21], 4.6% in 2000 [33], 6.6% in 2010 [22] and 9.3% in 2019 [23]. For additional context, we identified populations with high prevalence (>30%), prevalence above and below 10% (the 2050 global projected prevalence), and low prevalence (<2%) [21]. Data were summarised using a bespoke extraction form in Microsoft Excel version 16.76 (Microsoft, Redmond, WA, USA).

Quality assessment A modified Newcastle–Ottawa scale (ESM Methods) developed by the research team was used for quality assessment of studies and key Indigenous-specific data features [26, 34]. Papers were not excluded based on their score, as a comprehensive summary was essential.

Results

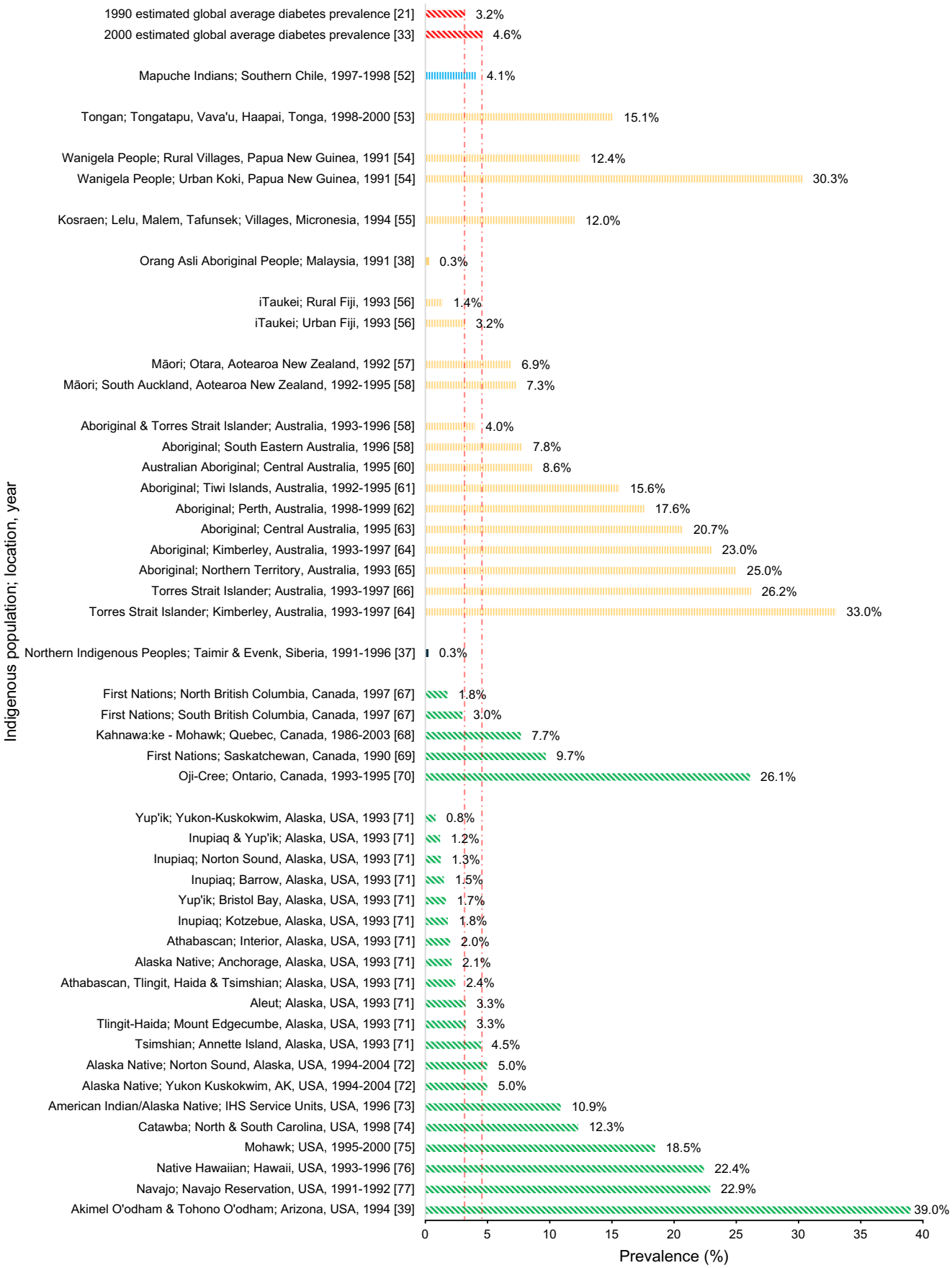
Study characteristics The search identified 2332 studies. After title and abstract screening, 623 full-text studies were assessed for eligibility. An additional 32 studies were added from bibliographies. After review, 202 studies were retained for data extraction. Exclusion reasons and search details are outlined in the PRISMA study selection flow diagram (ESM Fig. 1).

The studies included in this review (n=202) were published between 1980 and 2022 (none of the studies that met the inclusion criteria were from 2023) and represented at least 187 Indigenous populations from 37 countries. This number is approximate because it does not reflect the number of populations represented in aggregate datasets using umbrella terms such as American Indian/Alaska Native, First Nations, Indigenous Australian, etc. The data from the 202 studies resulted in 1105 extracted records comprising region-, time-, age- and sex-specific data. The data included 263 Indigenous study populations for which overall type 2 diabetes prevalence was reported for men and women combined. All 263 data points are included in ESM Table 1, representing Indigenous Nations/Tribes/Groups from various locations. However, because some studies referred to populations using a collective term, rather than specific Nations/Tribes/Groups from distinct regions, the exact number of distinct populations represented could not be determined. Over half of the studies (120/202, 59%) were conducted between 2001 and 2020. Countries with the most studies included the USA (n=54), Canada (n=30), Australia (n=27), India (n=16) and Aotearoa New Zealand (n=13). The remaining 62 studies were from 32 other countries.

Of the 202 studies, 62% were community-based, cross-sectional surveys, and the remaining 38% comprised telephone/mailed surveys or use of electronic medical records, case registry or census data, and/or records from community/regional/national/or country-wide assessments. Diabetes was classified using OGTT (30%), self-report (28%) or fasting glucose (24%), with the remainder (18%) being based on ICD codes, HbA_{1c}, random glucose measurements or a combination of these methods. ESM Fig. 2 shows prevalence estimates by mode of determining diabetes, with similar estimates obtained for studies that diagnosed diabetes according to HbA_{1c} or OGTT criteria, with the highest estimates observed in studies using self-reported diagnosis.

Global Indigenous adult type 2 diabetes prevalence The reported type 2 diabetes prevalence for Indigenous men and women combined ranged from 0% in Papua New Guinea in 1985 to 40.3% in Guyana in 2010 [35, 36]. For studies that provided age-standardised data (180/263, 68%), prevalence ranged from 0.3% among Northern Indigenous Peoples of Siberia between 1991 and 1996 and 0.3% among Orang Asli Aboriginal People of Malaysia in 1991, to 39% among the Akimel & Tohono O'odham Peoples of Arizona, USA, in 1994 [37–39]. Prevalence of 30% and above was reported for nine Indigenous populations between 1991 and 2020. Of the 263 populations, 45% (n=119) reported type 2 diabetes prevalence greater than 10%. In contrast, 9% (24/263) of Indigenous populations had reported prevalence below 2%; 67% of these studies were conducted prior to 2000. However, after 2000, Indigenous populations in many of the same locations reported prevalence above 2%, including Alaska (2.4–11%), Canada (4–29%), the Solomon Islands (2.6%), Brazil (4.2–28.2%) and India (2.9–33.1%).

Figures 1, 2, 3 and 4 present type 2 diabetes prevalence for each decade from 1980 to 2020. Between 1980 and 1989 (results presented in Fig. 1 [35, 40–51]), type 2 diabetes prevalence ranged from 0% to 24% for the 55 Indigenous populations reported in studies available in this time period (Fig. 1). Of these, 93% (51/55) reported prevalence above the decade's average global prevalence of 4.0% [21, 32].


1990 estimated global average diabetes prevalence [21] 3.2%
2000 estimated global average diabetes prevalence [33] 4.6%
Mapuche Indians; Southern Chile, 1997-1998 [52] 4.1%
Tongan; Tongatapu, Vava'u, Haapai, Tonga, 1998-2000 [53] 15.1%
Wanigela People; Rural Villages, Papua New Guinea, 1991 [54] 12.4%
Wanigela People; Urban Koki, Papua New Guinea, 1991 [54] 30.3%
Kosraen; Lelu, Malem, Tafunsek; Villages, Micronesia, 1994 [55] 12.0%
Orang Asli Aboriginal People; Malaysia, 1991 [38] 0.3%
iTaukei; Rural Fiji, 1993 [56] 1.4%
iTaukei; Urban Fiji, 1993 [56] 3.2%
Māori; Otara, Aotearoa New Zealand, 1992 [57] 6.9%
Māori; South Auckland, Aotearoa New Zealand, 1992-1995 [58] 7.3%
Aboriginal & Torres Strait Islander; Australia, 1993-1996 [58] 4.0%
Aboriginal; South Eastern Australia, 1996 [58] 7.8%
Australian Aboriginal; Central Australia, 1995 [60] 8.6%
Aboriginal; Tiwi Islands, Australia, 1992-1995 [61] 15.6%
Aboriginal; Perth, Australia, 1998-1999 [62] 17.6%
Aboriginal; Central Australia, 1995 [63] 20.7%
Aboriginal; Kimberley, Australia, 1993-1997 [64] 23.0%
Aboriginal; Northern Territory, Australia, 1993 [65] 25.0%
Torres Strait Islander; Australia, 1993-1997 [66] 26.2%
Torres Strait Islander; Kimberley, Australia, 1993-1997 [64] 33.0%
Northern Indigenous Peoples; Taimir & Evenk, Siberia, 1991-1996 [37] 0.3%
First Nations; North British Columbia, Canada, 1997 [67] 1.8%
First Nations; South British Columbia, Canada, 1997 [67] 3.0%
Kahnawa:ke - Mohawk; Quebec, Canada, 1986-2003 [68] 7.7%
First Nations; Saskatchewan, Canada, 1990 [69] 9.7%
Oji-Cree; Ontario, Canada, 1993-1995 [70] 26.1%
Yup'ik; Yukon-Kuskokwim, Alaska, USA, 1993 [71] 0.8%
Inupiaq & Yup'ik; Alaska, USA, 1993 [71] 1.2%
Inupiaq; Norton Sound, Alaska, USA, 1993 [71] 1.3%
Inupiaq; Barrow, Alaska, USA, 1993 [71] 1.5%
Yup'ik; Bristol Bay, Alaska, USA, 1993 [71] 1.7%
Inupiaq; Kotzebue, Alaska, USA, 1993 [71] 1.8%
Athabascan; Interior, Alaska, USA, 1993 [71] 2.0%
Alaska Native; Anchorage, Alaska, USA, 1993 [71] 2.1%
Athabascan, Tlingit, Haida & Tsimshian; Alaska, USA, 1993 [71] 2.4%
Aleut; Alaska, USA, 1993 [71] 3.3%
Tlingit-Haida; Mount Edgecumbe, Alaska, USA, 1993 [71] 3.3%
Tsimshian; Annette Island, Alaska, USA, 1993 [71] 4.5%
Alaska Native; Norton Sound, Alaska, USA, 1994-2004 [72] 5.0%
Alaska Native; Yukon Kuskokwim, AK, USA, 1994-2004 [72] 5.0%
American Indian/Alaska Native; IHS Service Units, USA, 1996 [73] 10.9%
Catawba; North & South Carolina, USA, 1998 [74] 12.3%
Mohawk; USA, 1995-2000 [75] 18.5%
Native Hawaiian; Hawaii, USA, 1993-1996 [76] 22.4%
Navajo; Navajo Reservation, USA, 1991-1992 [77] 22.9%
Akimel O'odham & Tohono O'odham; Arizona, USA, 1994 [39] 39.0%
Indigenous population; location, year
0
5
10
15
20
25
30
35
40
Prevalence (%)

◂**Fig. 2** Indigenous adult type 2 diabetes prevalence (%): 1990–1999. Red stripes denote estimated global average diabetes prevalence. International Diabetes Federation regions include: light blue (South and Central America), yellow (Western Pacific), dark blue (Europe) and green (North America and Caribbean). IHS, Indian Health Service

Multiple Indigenous populations of the USA, Canada, Nauru and Australia (*n*=21) reported prevalence above 10%, with values ranging from 10.2% among Navajo Peoples of Arizona, USA, to 24% among Nauruans of Nauru, while other Indigenous populations from the USA, Canada, Australia and Papua New Guinea reported prevalence below 10% (*n*=34). Prevalence reported below 10% ranged from 0% among Indigenous People of Masilakaiufa, Papua New Guinea, to 9.5% among the Shoshone-Bannock of Fort Hall, Idaho, USA.

Between 1990 and 1999 (results presented in Fig. 2 [37–39, 52–77]), type 2 diabetes prevalence ranged from 0.3% to 39% for the 46 Indigenous populations reported in studies available in this time period (Fig. 2). Of these, 61% (28/46) reported prevalence above the decade's average global prevalence of 3.9% [21, 33]. Indigenous populations from the USA, Canada, Australia, Micronesia, Papua New Guinea and Tonga (*n*=18) reported prevalence above 10%, with values ranging from 10.9% among American Indian and Alaska Natives living near Indian Health Service units across the USA, to 39% among the Akimel and Tohono O'odham of Arizona, USA. Indigenous populations from the USA, Canada, Siberia, Australia, Aotearoa New Zealand, Fiji, Malaysia and Chile (*n*=29) reported prevalence below 10%, with values ranging from 0.3% among both Northern Indigenous Peoples of Siberia and Orang Asli Aboriginal People in Malaysia, to 9.7% among First Nations in Saskatchewan, Canada.

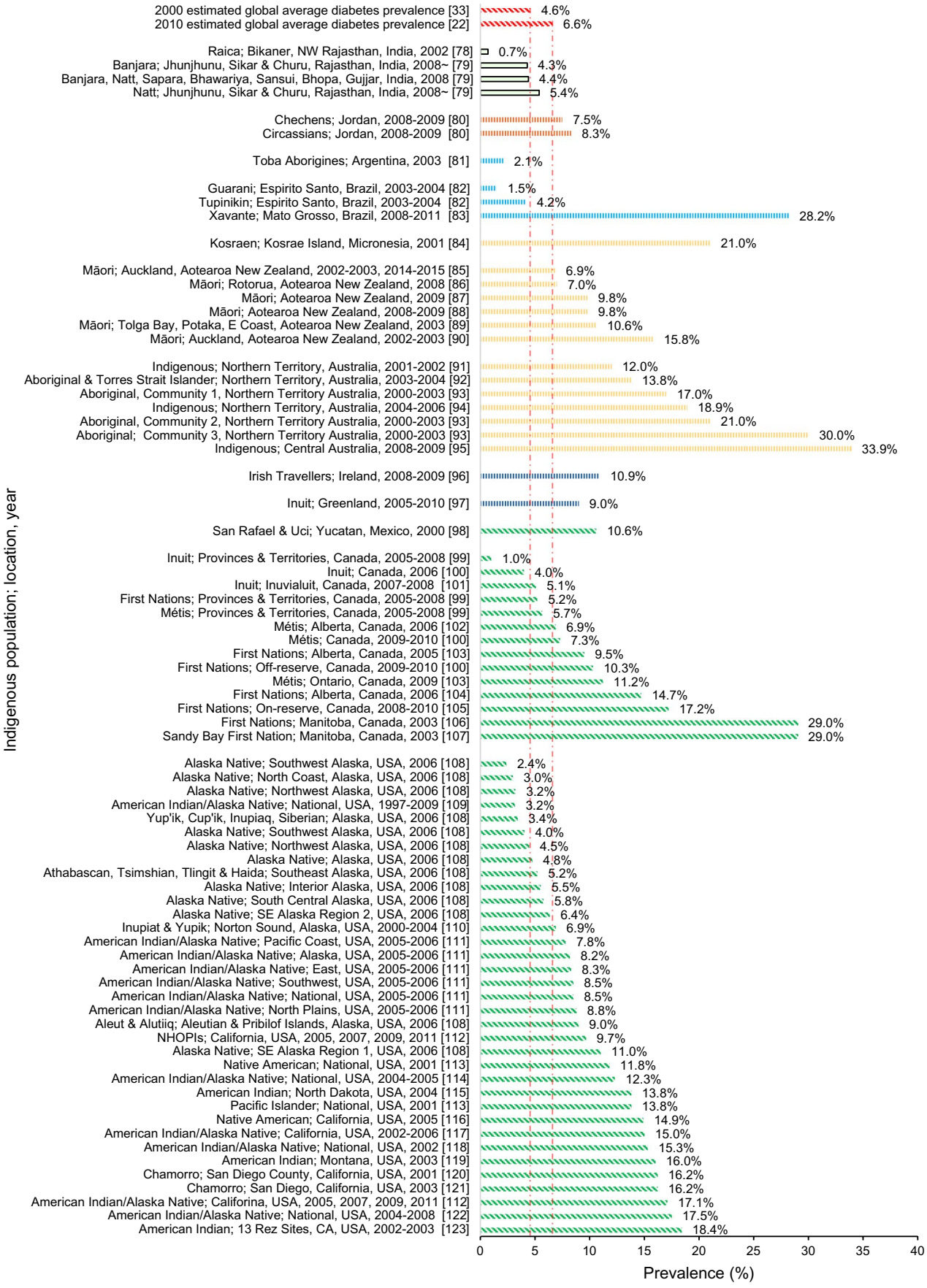
Between 2000 and 2009 (results presented in Fig. 3 [78–123]), type 2 diabetes prevalence ranged from 0.7% to 33.9% for the 76 Indigenous populations reported in studies available in this time period (Fig. 3). Of these, 72% (55/76) reported prevalence above the decade's average global prevalence of 5.6% [22, 33]. Indigenous populations from the USA, Canada, Mexico, Ireland, Australia, Aotearoa New Zealand, Micronesia and Brazil (*n*=33) reported prevalence above 10%, with values ranging from 12.0% among Indigenous Australians (one remote Northern Territory community from 2001–2002) to 33.9% among Indigenous Australians in Central Australia (2008–2009). Other Indigenous populations from the USA, Canada, Greenland, Aotearoa New Zealand, Argentina, Brazil, Jordan and India (*n*=43) reported prevalence below 10%, with values ranging from 0.7% among Raica People of Northwest Rajasthan, India, to 9.8% among Māori of Aotearoa New Zealand.

Between 2010 and 2020 (results presented in Fig. 4 [17, 18, 36, 124–164]), type 2 diabetes prevalence ranged from 0.7% to 40.3% for 69 Indigenous populations reported in studies available in this time period (Fig. 4). Of these, 65% (45/69) reported prevalence above the decade's average global prevalence of 8% [22, 23]. Indigenous populations from the USA, Canada, Mexico, Australia, Samoa, China, Brazil, Guatemala, Guyana, Panama, Sudan and India (*n*=43) reported prevalence above 10%, with values ranging from 10.2% among American Indian and Alaska Natives of Northwest USA, and Naga People in India, to 40.3% among Arawaks and Lokono Peoples in Guyana. In contrast, 26 Indigenous populations from the USA, Mexico, Greenland, Solomon Islands, China, Brazil, Panama, Cameroon and India, reported prevalence lower than 10%, ranging from 0.7% among Manuopo People of the Solomon Islands to 9.9% among Native Hawaiian and Other Pacific Islanders of Hawaii, USA.

ESM Table 2 presents overall reported prevalence above and below 10% for each decade. The proportions of populations with type 2 diabetes prevalence above and below 10% reverse within four decades, with 38% of populations who experienced prevalence above 10%, and 62% who experienced prevalence below 10% in the 1980s, compared with 62% of populations who experienced prevalence above 10%, and 36% who experienced prevalence below 10% between 2010 and 2019.

Type 2 diabetes prevalence by age group Of the 202 studies, 42% (84/202) reported prevalence by age group. For many populations, prevalence increased with age. The lowest reported prevalence was 0% among a group aged 18–34 years of Northern Indigenous Peoples of Siberia between 1991 and 1996 [37]. The highest reported prevalence was 50.5% among a 45–54 year age group of Wanigela Peoples of Papua New Guinea in 1991 [54]. ESM Fig. 3 shows prevalence ranges by age group for each decade. Alaska Indigenous populations had the lowest reported prevalence among every age group and decade. Indigenous populations of Siberia, Aotearoa New Zealand, Greenland and India also had some of the lowest reported prevalence for some age groups. Those who reported the highest prevalence included Indigenous populations of Canada, Australia, Papua New Guinea, the USA, Aotearoa New Zealand and Brazil. The number of populations who reported prevalence above 10% in each age group included: (*n*=4) 18–34 years; (*n*=4) 35–44 years; (*n*=10) 45–54 years; (*n*=12) 55–64 years; (*n*=52) 65 years and older.

Sex-specific type 2 diabetes prevalence Sex-specific data were reported for 51% (*n*=133) of the 263 study populations. Type 2 diabetes prevalence ranged from 0% to 40.6% among Indigenous women and from 0% to 32.4% among Indigenous men. Of the 133 study populations reporting sex-specific data, 73% (*n*=97) reported higher prevalence


2000 estimated global average diabetes prevalence [33] 4.6%
2010 estimated global average diabetes prevalence [22] 6.6%
Raica; Bikaner, NW Rajasthan, India, 2002 [78] 0.7%
Banjara; Jhunjhunu, Sikar & Churu, Rajasthan, India, 2008~ [79] 4.3%
Banjara, Natt, Sapara, Bhawariya, Sansui, Bhopa, Gujjar, India, 2008 [79] 4.4%
Natt; Jhunjhunu, Sikar & Churu, Rajasthan, India, 2008~ [79] 5.4%
Chechens; Jordan, 2008-2009 [80] 7.5%
Circassians; Jordan, 2008-2009 [80] 8.3%
Toba Aborigines; Argentina, 2003 [81] 2.1%
Guarani; Espirito Santo, Brazil, 2003-2004 [82] 1.5%
Tupinikin; Espirito Santo, Brazil, 2003-2004 [82] 4.2%
Xavante; Mato Grosso, Brazil, 2008-2011 [83] 28.2%
Kosraen; Kosrae Island, Micronesia, 2001 [84] 21.0%
Māori; Auckland, Aotearoa New Zealand, 2002-2003, 2014-2015 [85] 6.9%
Māori; Rotorua, Aotearoa New Zealand, 2008 [86] 7.0%
Māori; Aotearoa New Zealand, 2009 [87] 9.8%
Māori; Aotearoa New Zealand, 2008-2009 [88] 9.8%
Māori; Tolga Bay, Potaka, E Coast, Aotearoa New Zealand, 2003 [89] 10.6%
Māori; Auckland, Aotearoa New Zealand, 2002-2003 [90] 15.8%
Indigenous; Northern Territory, Australia, 2001-2002 [91] 12.0%
Aboriginal & Torres Strait Islander; Northern Territory, Australia, 2003-2004 [92] 13.8%
Aboriginal, Community 1, Northern Territory Australia, 2000-2003 [93] 17.0%
Indigenous; Northern Territory, Australia, 2004-2006 [94] 18.9%
Aboriginal, Community 2, Northern Territory Australia, 2000-2003 [93] 21.0%
Aboriginal; Community 3, Northern Territory Australia, 2000-2003 [93] 30.0%
Indigenous; Central Australia, 2008-2009 [95] 33.9%
Irish Travellers; Ireland, 2008-2009 [96] 10.9%
Inuit; Greenland, 2005-2010 [97] 9.0%
San Rafael & Uci; Yucatan, Mexico, 2000 [98] 10.6%
Inuit; Provinces & Territories, Canada, 2005-2008 [99] 1.0%
Inuit; Canada, 2006 [100] 4.0%
Inuit; Inuvialuit, Canada, 2007-2008 [101] 5.1%
First Nations; Provinces & Territories, Canada, 2005-2008 [99] 5.2%
Métis; Provinces & Territories, Canada, 2005-2008 [99] 5.7%
Métis; Alberta, Canada, 2006 [102] 6.9%
Métis; Canada, 2009-2010 [100] 7.3%
First Nations; Alberta, Canada, 2005 [103] 9.5%
First Nations; Off-reserve, Canada, 2009-2010 [100] 10.3%
Métis; Ontario, Canada, 2009 [103] 11.2%
First Nations; Alberta, Canada, 2006 [104] 14.7%
First Nations; On-reserve, Canada, 2008-2010 [105] 17.2%
First Nations; Manitoba, Canada, 2003 [106] 29.0%
Sandy Bay First Nation; Manitoba, Canada, 2003 [107] 29.0%
Alaska Native; Southwest Alaska, USA, 2006 [108] 2.4%
Alaska Native; North Coast, Alaska, USA, 2006 [108] 3.0%
Alaska Native; Northwest Alaska, USA, 2006 [108] 3.2%
American Indian/Alaska Native; National, USA, 1997-2009 [109] 3.2%
Yup'ik, Cup'ik, Inupiaq, Siberian; Alaska, USA, 2006 [108] 3.4%
Alaska Native; Southwest Alaska, USA, 2006 [108] 4.0%
Alaska Native; Northwest Alaska, USA, 2006 [108] 4.5%
Alaska Native; Alaska, USA, 2006 [108] 4.8%
Athabascan, Tsimshian, Tlingit & Haida; Southeast Alaska, USA, 2006 [108] 5.2%
Alaska Native; Interior Alaska, USA, 2006 [108] 5.5%
Alaska Native; South Central Alaska, USA, 2006 [108] 5.8%
Alaska Native; SE Alaska Region 2, USA, 2006 [108] 6.4%
Inupiat & Yupik; Norton Sound, Alaska, USA, 2000-2004 [110] 6.9%
American Indian/Alaska Native; Pacific Coast, USA, 2005-2006 [111] 7.8%
American Indian/Alaska Native; Alaska, USA, 2005-2006 [111] 8.2%
American Indian/Alaska Native; East, USA, 2005-2006 [111] 8.3%
American Indian/Alaska Native; Southwest, USA, 2005-2006 [111] 8.5%
American Indian/Alaska Native; National, USA, 2005-2006 [111] 8.5%
American Indian/Alaska Native; North Plains, USA, 2005-2006 [111] 8.8%
Aleut & Alutiiq; Aleutian & Pribilof Islands, Alaska, USA, 2006 [108] 9.0%
NHOPIs; California, USA, 2005, 2007, 2009, 2011 [112] 9.7%
Alaska Native; SE Alaska Region 1, USA, 2006 [108] 11.0%
Native American; National, USA, 2001 [113] 11.8%
American Indian/Alaska Native; National, USA, 2004-2005 [114] 12.3%
American Indian; North Dakota, USA, 2004 [115] 13.8%
Pacific Islander; National, USA, 2001 [113] 13.8%
Native American; California, USA, 2005 [116] 14.9%
American Indian/Alaska Native; California, USA, 2002-2006 [117] 15.0%
American Indian/Alaska Native; National, USA, 2002 [118] 15.3%
American Indian; Montana, USA, 2003 [119] 16.0%
Chamorro; San Diego County, California, USA, 2001 [120] 16.2%
Chamorro; San Diego, California, USA, 2003 [121] 16.2%
American Indian/Alaska Native; Califorina, USA, 2005, 2007, 2009, 2011 [112] 17.1%
American Indian/Alaska Native; National, USA, 2004-2008 [122] 17.5%
American Indian; 13 Rez Sites, CA, USA, 2002-2003 [123] 18.4%
Indigenous population; location, year
0
5
10
15
20
25
30
35
40
Prevalence (%)

◂**Fig. 3** Indigenous adult type 2 diabetes prevalence (%): 2000–2009. Red stripes denote estimated global average diabetes prevalence. International Diabetes Federation regions include: white (South-East Asia), orange (Middle East and North Africa), light blue (South and Central America), yellow (Western Pacific), dark blue (Europe) and green (North America and Caribbean). NHOPIs, Native Hawaiian and Other Pacific Islanders; Rez, Reservation

for Indigenous women compared with Indigenous men, with differences ranging from 2.0% to 22.2%. This trend was observed across data for all years and age groups. The largest sex-specific difference was 22.2% in Mato Grosso, Brazil, with a prevalence of 40.6% among Xavante women compared with 18.4% among Xavante men [83]. In some countries, (USA, Brazil, Australia, Fiji, Solomon Islands and Vanuatu), Indigenous women had more than twice the prevalence when compared with Indigenous men from the same populations (ESM Fig. 4).

In contrast, there were multiple instances (n=17) where Indigenous men reported between 2% and 16.4% higher prevalence than Indigenous women. Two examples of this were in California, USA, with 32.4% and 16.0% prevalence for American Indian men and women, respectively, and in Papua New Guinea, with 17.9% and 10.0% prevalence for Wanigela men and women, respectively (ESM Fig. 4). For the populations with reported sex-specific data (n=133), 53% of Indigenous women and 61% of Indigenous men reported prevalence below 10%. ESM Fig. 4 presents sex-specific data by decade. Type 2 diabetes prevalence was reportedly higher for Indigenous women compared with men for every decade. The percentages of populations in which Indigenous women had a greater prevalence than men for each decade were 70%, 82%, 61% and 72%, respectively.

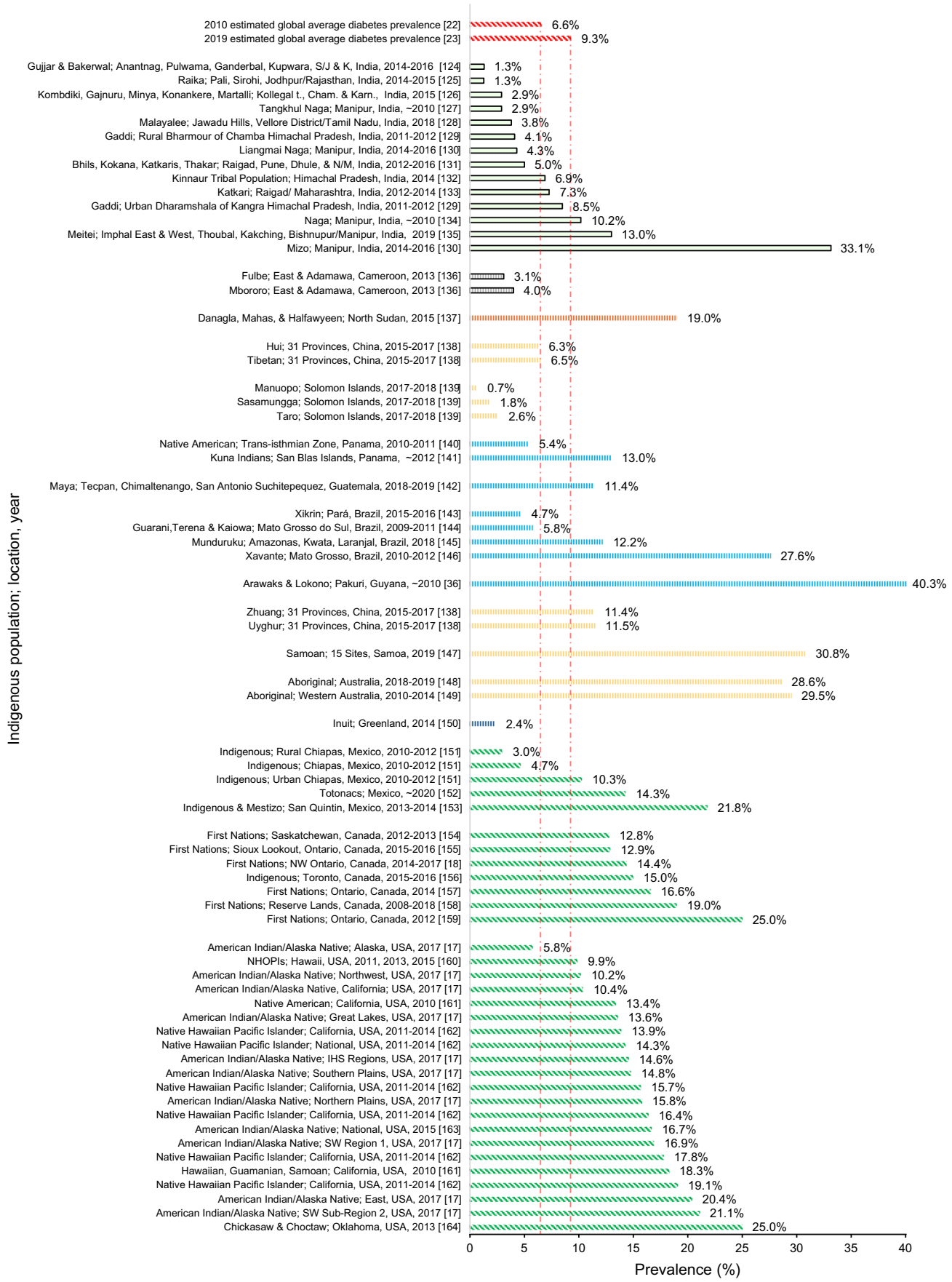
Quality of studies Quality assessment of the studies (n=202) revealed that 37% were high quality, 61% were medium quality and 2% were low quality (ESM Table 3).

Discussion

This paper presents the first comprehensive systematic review in over a decade concerning type 2 diabetes prevalence among Indigenous adult populations globally. It is the first to present a global view of type 2 diabetes prevalence among Indigenous populations, examining prevalence according to region, time period, age and sex. The systematic review reveals a consistent pattern of alarmingly high prevalence for many Indigenous populations. The highest reported prevalence for an Indigenous adult population (40.3% in 2010) was over six times the estimated global prevalence for the same year (6.6% in 2010) [22, 36]. For each decade from 1980 to 2020, the proportion of Indigenous populations with type 2 diabetes above the average estimated global prevalence was markedly high: 93% in the 1980s, 61% in the 1990s, 72% in the 2000s, and 65% in the 2010s. The highest reported type 2 diabetes prevalence for each decade was between 5 and 10 times higher than the global average for each time period. Almost half (45%) of the Indigenous populations included in this review have faced glaring realities of type 2 diabetes prevalence above 10% for several decades. The 2050 global projected prevalence of 10% was selected as a threshold to illustrate that many Indigenous communities have experienced prevalence above 10% since at least the 1980s, well ahead of global trends by as much as 70 years [21]. This finding underscores the longstanding and disproportionate burden of type 2 diabetes in Indigenous populations. In contrast, only 9% of populations reported low prevalence below 2%; two-thirds of these reports were from studies conducted before 2000, and many of these populations have since reported higher prevalence in recent decades. High prevalence was reported across all age groups in every decade, including young adults aged 18–34 years. Type 2 diabetes prevalence was consistently higher among Indigenous women compared with Indigenous men. Importantly, many of the studies were conducted in high-income countries with some of the most advanced economies and access to sophisticated healthcare systems. This juxtaposition illustrates enduring disparities and an inequitable distribution of resources for the most under-resourced and marginalised populations in each country.

This systematic review identified several Indigenous populations who consistently reported low prevalence, with some reporting 0% or very low type 2 diabetes prevalence. Many Alaska Indigenous populations reported notably low prevalence between 1984 and 2017. This was also observed among some First Nations populations in Canada, with a range of 1–5.7% between 1983 and 2008. Indigenous populations who have very low type 2 diabetes prevalence appear to be those who have managed to retain or reclaim cultural practices, language, ceremonies and traditional food systems [14, 165, 166]. This finding is also supported by evidence that even a short-term return to traditional lifestyles improves weight and glucose tolerance [167]. Additionally, Akimel O'odham Peoples in rural Mexico are reported to have much lower type 2 diabetes and obesity prevalence than Akimel O'odham Peoples living in the USA, suggesting potential differences in lifestyle and Indigenous-specific health determinants [168]. It is essential that we look to traditional and contemporary lifestyle practices of Indigenous populations for guidance. However, despite some Indigenous populations reporting lower prevalence, the burden is still often considerably higher than that reported for non-Indigenous populations living in the same regions [8, 17, 18].

Type 2 diabetes prevalence increased with age, and prevalence above 10% was observed for younger adults in four Indigenous populations in the USA, Australia and Papua


2010 estimated global average diabetes prevalence [22] 6.6%
2019 estimated global average diabetes prevalence [23] 9.3%
Gujjar & Bakerwal; Anantnag, Pulwama, Ganderbal, Kupwara, S/J & K, India, 2014-2016 [124] 1.3%
Raika; Pali, Sirohi, Jodhpur/Rajasthan, India, 2014-2015 [125] 1.3%
Kombdiki, Gajnuru, Minya, Konankere, Martalli; Kollegal t., Cham. & Karn., India, 2015 [126] 2.9%
Tangkhul Naga; Manipur, India, ~2010 [127] 2.9%
Malayalee; Jawadu Hills, Vellore District/Tamil Nadu, India, 2018 [128] 3.8%
Gaddi; Rural Bharmour of Chamba Himachal Pradesh, India, 2011-2012 [129] 4.1%
Liangmai Naga; Manipur, India, 2014-2016 [130] 4.3%
Bhils, Kokana, Katkaris, Thakar; Raigad, Pune, Dhule, & N/M, India, 2012-2016 [131] 5.0%
Kinnaur Tribal Population; Himachal Pradesh, India, 2014 [132] 6.9%
Katkari; Raigad/ Maharashtra, India, 2012-2014 [133] 7.3%
Gaddi; Urban Dharamshala of Kangra Himachal Pradesh, India, 2011-2012 [129] 8.5%
Naga; Manipur, India, ~2010 [134] 10.2%
Meitei; Imphal East & West, Thoubal, Kakching, Bishnupur/Manipur, India, 2019 [135] 13.0%
Mizo; Manipur, India, 2014-2016 [130] 33.1%
Fulbe; East & Adamawa, Cameroon, 2013 [136] 3.1%
Mbororo; East & Adamawa, Cameroon, 2013 [136] 4.0%
Danagla, Mahas, & Halfawyeen; North Sudan, 2015 [137] 19.0%
Hui; 31 Provinces, China, 2015-2017 [138] 6.3%
Tibetan; 31 Provinces, China, 2015-2017 [138] 6.5%
Manuopo; Solomon Islands, 2017-2018 [139] 0.7%
Sasamungga; Solomon Islands, 2017-2018 [139] 1.8%
Taro; Solomon Islands, 2017-2018 [139] 2.6%
Native American; Trans-isthmian Zone, Panama, 2010-2011 [140] 5.4%
Kuna Indians; San Blas Islands, Panama, ~2012 [141] 13.0%
Maya; Tecpan, Chimaltenango, San Antonio Suchitepequez, Guatemala, 2018-2019 [142] 11.4%
Xikrin; Pará, Brazil, 2015-2016 [143] 4.7%
Guarani,Terena & Kaiowa; Mato Grosso do Sul, Brazil, 2009-2011 [144] 5.8%
Munduruku; Amazonas, Kwata, Laranjal, Brazil, 2018 [145] 12.2%
Xavante; Mato Grosso, Brazil, 2010-2012 [146] 27.6%
Arawaks & Lokono; Pakuri, Guyana, ~2010 [36] 40.3%
Zhuang; 31 Provinces, China, 2015-2017 [138] 11.4%
Uyghur; 31 Provinces, China, 2015-2017 [138] 11.5%
Samoan; 15 Sites, Samoa, 2019 [147] 30.8%
Aboriginal; Australia, 2018-2019 [148] 28.6%
Aboriginal; Western Australia, 2010-2014 [149] 29.5%
Inuit; Greenland, 2014 [150] 2.4%
Indigenous; Rural Chiapas, Mexico, 2010-2012 [151] 3.0%
Indigenous; Chiapas, Mexico, 2010-2012 [151] 4.7%
Indigenous; Urban Chiapas, Mexico, 2010-2012 [151] 10.3%
Totonacs; Mexico, ~2020 [152] 14.3%
Indigenous & Mestizo; San Quintin, Mexico, 2013-2014 [153] 21.8%
First Nations; Saskatchewan, Canada, 2012-2013 [154] 12.8%
First Nations; Sioux Lookout, Ontario, Canada, 2015-2016 [155] 12.9%
First Nations; NW Ontario, Canada, 2014-2017 [18] 14.4%
Indigenous; Toronto, Canada, 2015-2016 [156] 15.0%
First Nations; Ontario, Canada, 2014 [157] 16.6%
First Nations; Reserve Lands, Canada, 2008-2018 [158] 19.0%
First Nations; Ontario, Canada, 2012 [159] 25.0%
American Indian/Alaska Native; Alaska, USA, 2017 [17] 5.8%
NHOPIs; Hawaii, USA, 2011, 2013, 2015 [160] 9.9%
American Indian/Alaska Native; Northwest, USA, 2017 [17] 10.2%
American Indian/Alaska Native, California; USA, 2017 [17] 10.4%
Native American; California, USA, 2010 [161] 13.4%
American Indian/Alaska Native; Great Lakes, USA, 2017 [17] 13.6%
Native Hawaiian Pacific Islander; California, USA, 2011-2014 [162] 13.9%
Native Hawaiian Pacific Islander; National, USA, 2011-2014 [162] 14.3%
American Indian/Alaska Native; IHS Regions, USA, 2017 [17] 14.6%
American Indian/Alaska Native; Southern Plains, USA, 2017 [17] 14.8%
Native Hawaiian Pacific Islander; California, USA, 2011-2014 [162] 15.7%
American Indian/Alaska Native; Northern Plains, USA, 2017 [17] 15.8%
Native Hawaiian Pacific Islander; California, USA, 2011-2014 [162] 16.4%
American Indian/Alaska Native; National, USA, 2015 [163] 16.7%
American Indian/Alaska Native; SW Region 1, USA, 2017 [17] 16.9%
Native Hawaiian Pacific Islander; California, USA, 2011-2014 [162] 17.8%
Hawaiian, Guamanian, Samoan; California, USA, 2010 [161] 18.3%
Native Hawaiian Pacific Islander; California, USA, 2011-2014 [162] 19.1%
American Indian/Alaska Native; East, USA, 2017 [17] 20.4%
American Indian/Alaska Native; SW Sub-Region 2, USA, 2017 [17] 21.1%
Chickasaw & Choctaw; Oklahoma, USA, 2013 [164] 25.0%
Indigenous population; location, year
0
5
10
15
20
25
30
35
40
Prevalence (%)

◂**Fig. 4** Indigenous adult type 2 diabetes prevalence (%): 2010–2019. Red stripes denote estimated global average diabetes prevalence. International Diabetes Federation (IDF) regions include: white (South-East Asia), grey (Africa), orange (Middle East and North Africa), yellow (Western Pacific), light blue (South and Central America), dark blue (Europe) and green (North America and Caribbean). S/J & K, Srinagar/Jammu and Kashmir; Kollegal t., Kollegal taluk; Cham., Chamrajanagar; Karn., Karnataka; N/M, Nandurbar/Maharashtra. IHS, Indian Health Service; NHOPIs, Native Hawaiian and Other Pacific Islanders

New Guinea. Notably, a prevalence of 20.4% among 18–35 year olds was reported among the Wanigela People of Papua New Guinea [54]. High type 2 diabetes prevalence among young adults demonstrates an urgent need for prevention strategies targeting younger age groups, especially given accumulating evidence showing adverse trajectories of complications among those who develop type 2 diabetes at younger ages. The companion paper further reinforces the critical importance of understanding drivers of the disproportionate diabetes burden in younger generations of Indigenous Peoples [27]. Many of the young populations with high prevalence were also from high-income countries, consistent with findings from the adult populations described above.

Critical sex-specific differences were observed, with 73% of studies reporting higher prevalence for Indigenous women compared with Indigenous men. Similar differences were also observed in the companion paper, with higher prevalence reported among Indigenous girls compared with boys [27]. Studies have considered the potential connection between maternal diabetes and the later risk of developing type 2 diabetes [169]. Heightened prevalence among Indigenous women presents concern for the health outcomes of Indigenous mothers and their children. Further research focused on understanding higher reported prevalence among Indigenous women should be conducted considering the potential connection between maternal diabetes and the later risk of youth developing diabetes [169], especially considering the potential roles of intrauterine, early-life and intergenerational factors in the aetiology of type 2 diabetes [169].

This systematic review highlights the lack of prevalence data for Indigenous populations. The search resulted in studies that represented only 37 of 90 countries with known Indigenous populations and approximately 187 of more than 5000 known populations. The strengths of this review include the use of standardised systematic review methods, as well as the familiarity of the Indigenous/non-Indigenous researchers with respective regions. The study was intentionally designed and reported in a culturally appropriate manner, recognising the diversity of disaggregate Indigenous populations while using respectful terminology. The research team's Indigenous/non-Indigenous regional expertise within North America, South America and Oceania, enhanced data extraction and interpretation. The studies included came from multiple time periods and often used outdated and sometimes harmful language when referring to Indigenous populations, because of this, the authors made a conscious effort to use respectful language for populations identified and apologise for the use of any disrespectful terminology that may have been missed.

Potential limitations include the review of English-language studies only, potentially excluding relevant research from non-English sources. Publication bias is possible, given that community-based efforts may be undocumented or reported in studies with smaller sample sizes than our inclusion criterion (n>200), and that studies reporting low prevalence may be less likely to be accepted for publication. However, upon further assessment, all studies excluded due to small sample size came from populations and/or geographic regions that are represented in the included data. Low- and middle-income countries and communities may lack resources to assess diabetes prevalence among Indigenous populations, which may have led to fewer studies from these regions. Additionally, the small number of low-quality studies may be attributed to the exclusion of studies with small sample sizes. Finally, the authors acknowledge that comparisons with global prevalence projections should be interpreted with caution, as some projections have historically underestimated the true burden.

Future directions Future research should focus on improving access to screening and diagnostic technology, which is not always available to Indigenous populations due to geographic and resource barriers. Although increases in prevalence may reflect a reduction in mortality, heightened prevalence estimates deepen the importance of access to healthcare to improve early detection and clinical management of type 2 diabetes. It is also essential to focus on the facilitating factors that contribute to low type 2 diabetes prevalence and implementing culturally safe and relevant prevention and management strategies. Notably, many countries that reported populations with low prevalence also reported populations with high prevalence, demonstrating the potential impact of localised and culturally adapted approaches. Increased access to culturally appropriate, community-led care implemented by and with Indigenous populations is critical for improved health. Adherence to Indigenous governance processes by researchers and professionals is essential to achieve respectful data collection and reporting. When conducting research involving Indigenous Peoples, respectful methods include gaining proper approvals from Indigenous populations prior to conducting research, prioritising Indigenous community input from project inception, promoting community-led research that is representative of each Indigenous population, prioritising culturally based and safe practices, using respectful

language, disaggregating data to understand Indigenous population-specific disease burdens, focusing on Indigenous community strengths rather than deficits, and disseminating culturally appropriate, community-informed research findings. Indigenous community-led research and programme delivery are crucial for preventing and managing diabetes and achieving equitable health outcomes among global Indigenous populations.

Conclusion This systematic review provides a comprehensive summary of the global burden of type 2 diabetes among Indigenous adult populations. For several decades, most Indigenous populations reported type 2 diabetes prevalence disproportionately higher than the average estimated global prevalence. Prevalence increased with age, and most Indigenous populations reported higher prevalence for Indigenous women compared with Indigenous men from the same population. This systematic review serves as an impetus for global leaders to rectify the epidemic levels of type 2 diabetes among Indigenous populations through actionable Indigenous-led efforts to achieve equitable health outcomes. Strengths-based, culturally grounded and community-tailored approaches are imperative for the prevention and management of type 2 diabetes among Indigenous Peoples.

Supplementary Information The online version of this article (https://doi.org/10.1007/s00125-025-06624-y) contains peer-reviewed but unedited supplementary material.

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Data availability All data generated or analysed during this study are included in the electronic supplementary material (ESM).

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Authors' relationships and activities DJM is the Chair of the Diabetes Atlas of the International Diabetes Federation and a member of *Diabetologia* editorial board. The remaining authors declare that there are no relationships or activities that might bias, or be perceived to bias, their work.

Contribution statement DJM conceived the project and identified internal experts to conduct the literature search. CC served as the lead for all aspects of the systematic review process and drafted the manuscript, ESM tables, and all figures with significant input from AJH, ELMB, DJM and EP. CC, AJH, EP, ELMB, DJM, CH, BS, HM and DW developed the search strategy. CC, AJH, EP, ELMB, DJM, CH, BS and HM screened abstracts and full texts. CC, AJH, EP, ELMB, DJM, CH, BS and HM extracted the data. CC, AJH, ELMB, DJM and EP analysed and interpreted the data, conducted a quality assessment of studies and provided significant intellectual input to the manuscript. AJH, ELMB, DJM, MN, EP, CH, BS, HM, AB, OP, DW and LM-B provided significant intellectual input into the study design, manuscript review and revision. All authors had access to the data, contributed significantly to this manuscript, and were involved in the final decision to submit the current version of the manuscript for publication. CC is the guarantor for this manuscript.

References

1. United Nations Permanent Forum on Indigenous Issues (2015) State of the World's Indigenous Peoples, 2nd volume, Indigenous Peoples' Access to Health Services. Available from https://www.refworld.org/docid/55c89dac4.html. Accessed 19 Sep 2022
2. Crowshoe LL, Henderson R, Jacklin K, Calam B, Walker L, Green ME (2019) Educating for Equity Care Framework: addressing social barriers of Indigenous patients with type 2 diabetes. Can Fam Physician 65(1):25–33
3. Carroll SR, Suina M, Jäger MB et al (2022) Reclaiming Indigenous health in the US: moving beyond the social determinants of health. Int J Environ Res Public Health 19(12):7495. https://doi.org/10.3390/ijerph19127495
4. Warne D, Wescott S (2019) Social determinants of American Indian nutritional health. Curr Dev Nutr 3(Suppl 2):12–18. https://doi.org/10.1093/cdn/nzz054
5. Public Health Agency of Canada (2011) Diabetes in Canada: facts and figures from a public health perspective. Public Health Agency of Canada, Ottawa
6. Power C (2021) Alex Brown: fighting for the health of Indigenous Australians. Lancet Diabetes Endocrinol 9(3):142. https://doi.org/10.1016/S2213-8587(21)00025-5

7. Lipski E (2010) Traditional non-Western diets. Nutr Clin Pract 25(6):585–593. https://doi.org/10.1177/0884533610385821
8. Health New Zealand – Te Whatu Ora (2024) Aotearoa New Zealand Health Status Report. New Zealand Government. Available from https://www.tewhatuora.govt.nz/publications/health-status-report. Accessed 19 Sep 2022
9. Anderson I, Robson B, Connolly M et al (2016) Indigenous and tribal peoples' health (The Lancet-Lowitja Institute Global Collaboration): a population study. Lancet 388(10040):131–157. https://doi.org/10.1016/S0140-6736(16)00345-7
10. The Canadian Press (2018) Lifespan of Indigenous people 15 years shorter than that of other Canadians, federal documents say. Available from https://www.cbc.ca/news/health/indigenous-people-live-15-years-less-philpott-briefing-1.4500307. Accessed 15 Oct 2024
11. Horwood PF, Tarantola A, Goarant C et al (2019) Health challenges of the Pacific region: insights from history, geography, social determinants, genetics, and the microbiome. Front Immunol 10:2184. https://doi.org/10.3389/fimmu.2019.02184
12. Parker T, Kelley A (2023) American Indian and Alaska Native life expectancy: writing a new narrative. JAMA 330(21):2053–2054. https://doi.org/10.1001/jama.2023.22614
13. South Dakota Department of Health (2024) American Indian Health Data Book Full Report: Selected Concerns in South Dakota. Available from https://doh.sd.gov/media/htxbhvmu/american-indian-health-data-book_2024.pdf. Accessed 1 Feb 2024
14. International Diabetes Federation (2013) IDF Diabetes Atlas, 6th edition. Chapter 4, Section 4.3: Diabetes in Indigenous Peoples, p. 80. Available from https://diabetesatlas.org/resources/previous-editions/
15. Poudel A, Zhou JY, Story D, Li L (2018) Diabetes and associated cardiovascular complications in American Indians/Alaskan Natives: a review of risks and prevention strategies. J Diabetes Res 2018:2742565. https://doi.org/10.1155/2018/2742565
16. Park J (2021) Mortality among First Nations people, 2006 to 2016. Health Rep 32(10):3–13. https://doi.org/10.25318/82-003-x202101000001-eng
17. Bullock A, Sheff K, Hora I et al (2020) Prevalence of diagnosed diabetes in American Indian and Alaska Native adults, 2006–2017. BMJ Open Diabetes Res Care 8(1):e001218. https://doi.org/10.1136/bmjdrc-2020-001218
18. Matsumoto CL, Tobe S, Schreiber YS et al (2020) Diabetes prevalence and demographics in 25 First Nations communities in northwest Ontario (2014–2017). Can J Rural Med 25(4):139–144. https://doi.org/10.4103/CJRM.CJRM_99_19
19. Centers for Disease Control and Prevention (2024) National Diabetes Statistics Report. Available from https://www.cdc.gov/diabetes/php/data-research/index.html. Accessed Feb 2024
20. Australian Institute of Health and Welfare (2024) Diabetes: Australian facts. Available from https://www.aihw.gov.au/reports/diabetes/diabetes Accessed 4 Jan 2025
21. GBD 2021 Diabetes Collaborators (2023) Global, regional, and national burden of diabetes from 1990 to 2021, with projections of prevalence to 2050: a systematic analysis for the Global Burden of Disease Study 2021. Lancet 402(10397):203–234. https://doi.org/10.1016/S0140-6736(23)01301-6
22. International Diabetes Federation (2009) IDF Diabetes Atlas, 4th edition. Available from https://diabetesatlas.org/resources/previous-editions/. Accessed 1 Feb 2024
23. International Diabetes Federation (2019) IDF Diabetes Atlas, 9th edition. Available from https://diabetesatlas.org/resources/previous-editions/ Accessed 1 Feb 2024
24. Page MJ, McKenzie JE, Bossuyt PM et al (2021) The PRISMA 2020 statement: an updated guideline for reporting systematic reviews. BMJ 372:n71. https://doi.org/10.1136/bmj.n71
25. Younging G (2018) Elements of Indigenous style: a guide for writing by and about Indigenous Peoples. Brush Education, Edmonton, AB, Canada
26. Wells GA, Shea B, O'Connell D et al (2021) The Newcastle–Ottawa scale (NOS) for assessing the quality of nonrandomised studies in meta-analyses. Available from https://www.ohri.ca/programs/clinical_epidemiology/oxford.asp. Accessed 13 March 2023
27. Papadimos ER, Claussen C, Magliano DJ et al (2025) Prevalence of youth type 2 diabetes in global Indigenous populations: a systematic review. Diabetologia. https://doi.org/10.1007/s00125-025-06556-7
28. Memon MA, Ting H, Cheah JH, Thurasamy R, Chuah F, Cham TH (2020) Sample size for survey research: review and recommendations. JASEM 4(2):i–xx. https://doi.org/10.47263/JASEM.4(2)01
29. United Nations Permanent Forum on Indigenous Issues (n.d.) Who are Indigenous Peoples? Factsheet. Available from https://www.un.org/esa/socdev/unpfii/documents/5session_factsheet1.pdf. Accessed 19 Sep 2022
30. Engelgau Michael M (2004) Diabetes diagnostic criteria and impaired glycemic states: evolving evidence base. Clin Diabetes 22(2):69–70. https://doi.org/10.2337/diaclin.22.2.69
31. Covidence (2022) Covidence systematic review software, Veritas Health Innovation, Melbourne, Australia. Available from www.covidence.org. Accessed 12 Dec 2021
32. NCD Risk Factor Collaboration (NCD-RisC) (2016) Worldwide trends in diabetes since 1980: a pooled analysis of 751 population-based studies with 4.4 million participants. Lancet 387(10027):1513–1530. https://doi.org/10.1016/S0140-6736(16)00618-8
33. International Diabetes Federation (2000) IDF Diabetes Atlas, 1st edition. Available from https://diabetesatlas.org/resources/previous-editions/. Accessed 1 Feb 2024
34. Magliano DJ, Islam RM, Barr ELM et al (2019) Trends in incidence of total or type 2 diabetes: systematic review. BMJ 366:l5003. https://doi.org/10.1136/bmj.l5003
35. King H, Finch C, Collins A et al (1989) Glucose tolerance in Papua New Guinea: ethnic differences, association with environmental and behavioural factors and the possible emergence of glucose intolerance in a highland community. Med J Aust 151(4):204–210. https://doi.org/10.5694/j.1326-5377.1989.tb115991.x
36. Boston C, Rosales J, Singh J, Kurup R (2019) Knowledge and utilization of traditional medicine for type 2 diabetes mellitus among residents of Pakuri (St. Cuthbert's Mission) in Guyana. J Complement Altern Med Res 7(3):1–12. https://doi.org/10.9734/jocamr/2019/v7i330100
37. Dogadin SA, Mashtakov BP, Taranushenko TE (2001) Prevalence of type 2 diabetes in northern populations of Siberia. Int J Circumpolar Health 60(2):205–210
38. Ali O, Tan TT, Sakinah O, Khalid BA, Wu LL, Ng ML (1993) Prevalence of NIDDM and impaired glucose tolerance in aborigines and Malays in Malaysia and their relationship to socioodemographic, health, and nutritional factors. Diabetes Care 16(1):68–75. https://doi.org/10.2337/diacare.16.1.68
39. de Courten MP, Pettitt DJ, Knowler WC (1996) Hypertension in Pima Indians: prevalence and predictors. Public Health Rep 111(Suppl 2):40–43
40. King H, Finch C, Koki G, King LF, Alpers M, Zimmet P (1991) Glucose tolerance in Papua New Guinea: comparison of Austronesian and non-Austronesian communities of Karkar Island. Diabet Med 8(5):481–488. https://doi.org/10.1111/j.1464-5491.1991.tb01636.x
41. Williams DR, Moffitt PS, Fisher JS, Bashir HV (1987) Diabetes and glucose tolerance in New South Wales coastal Aborigines: possible effects of non-Aboriginal genetic admixture. Diabetologia 30(2):72–77. https://doi.org/10.1007/BF00274574

42. Cameron WI, Moffitt PS, Williams DR (1986) Diabetes mellitus in the Australian aborigines of Bourke, New South Wales. Diabetes Res Clin Pract 2(5):307–314. https://doi.org/10.1016/s0168-8227(86)80008-0
43. Dowse GK, Zimmet PZ, Finch CF, Collins VR (1991) Decline in incidence of epidemic glucose intolerance in Nauruans: implications for the "thrifty genotype." Am J Epidemiol 133(11):1093–1104. https://doi.org/10.1093/oxfordjournals.aje.a115822
44. Delisle HF, Ekoé JM (1993) Prevalence of non-insulin-dependent diabetes mellitus and impaired glucose tolerance in two Algonquin communities in Quebec. CMAJ 148(1):41–47
45. Evers S, McCracken E, Antone I, Deagle G (1987) The prevalence of diabetes in Indians and Caucasians living in southwestern Ontario. Can J Public Health 78(4):240–243
46. Valway S, Freeman W, Kaufman S, Welty T, Helgerson SD, Gohdes D (1993) Prevalence of diagnosed diabetes among American Indians and Alaska Natives, 1987. Estimates from a national outpatient data base. Diabetes Care 16(1):271–276. https://doi.org/10.2337/diacare.16.1.271
47. Freeman WL, Hosey GM, Diehr P, Gohdes D (1989) Diabetes in American Indians of Washington, Oregon, and Idaho. Diabetes Care 12(4):282–288. https://doi.org/10.2337/diacare.12.4.282
48. Acton K, Rogers B, Campbell G, Johnson C, Gohdes D (1993) Prevalence of diagnosed diabetes and selected related conditions of six reservations in Montana and Wyoming. Diabetes Care 16(1):263–265. https://doi.org/10.2337/diacare.16.1.263
49. Stahn RM, Gohdes D, Valway SE (1993) Diabetes and its complications among selected tribes in North Dakota, South Dakota, and Nebraska. Diabetes Care 16(1):244–247. https://doi.org/10.2337/diacare.16.1.244
50. Sugarman J, Percy C (1989) Prevalence of diabetes in a Navajo Indian community [published correction appears in Am J Public Health 1989 Jun;79(6):690]. Am J Public Health 79(4):511–513. https://doi.org/10.2105/ajph.79.4.511
51. Muneta B, Newman J, Wetterall S, Stevenson J (1993) Diabetes and associated risk factors among Native Americans. Diabetes Care 16(12):1619–1620. https://doi.org/10.2337/diacare.16.12.1619
52. Pérez-Bravo F, Carrasco E, Santos JL, Calvillán M, Larenas G, Albala C (2001) Prevalence of type 2 diabetes and obesity in rural Mapuche population from Chile. Nutrition 17(3):236–238. https://doi.org/10.1016/s0899-9007(00)00550-5
53. Colagiuri S, Colagiuri R, Na'ati S, Muimuiheata S, Hussain Z, Palu T (2002) The prevalence of diabetes in the kingdom of Tonga. Diabetes Care 25(8):1378–1383. https://doi.org/10.2337/diacare.25.8.1378
54. Dowse GK, Spark RA, Mavo B et al (1994) Extraordinary prevalence of non-insulin-dependent diabetes mellitus and bimodal plasma glucose distribution in the Wanigela people of Papua New Guinea. Med J Aust 160(12):767–774. https://doi.org/10.5694/j.1326-5377.1994.tb125945.x
55. Shmulewitz D, Auerbach SB, Lehner T et al (2001) Epidemiology and factor analysis of obesity, type II diabetes, hypertension, and dyslipidemia (syndrome X) on the Island of Kosrae, Federated States of Micronesia. Hum Hered 51(1–2):8–19. https://doi.org/10.1159/000022953
56. Lako JV (2001) Dietary trend and diabetes: its association among indigenous Fijians 1952 to 1994. Asia Pac J Clin Nutr 10(3):183–187. https://doi.org/10.1046/j.1440-6047.2001.00248.x
57. Simmons D, Gatland B, Fleming C, Leakehe L, Scragg R (1994) Prevalence of known diabetes in a multiethnic community. N Z Med J 107(979):219–222
58. Simmons D, Harry T, Gatland B (1999) Prevalence of known diabetes in different ethnic groups in inner urban South Auckland. N Z Med J 112(1094):316–319
59. Guest CS, O'Dea K, Hopper JL, Nankervis AJ, Larkins RG (1992) The prevalence of glucose intolerance in aborigines and Europids of south-eastern Australia. Diabetes Res Clin Pract 15(3):227–235. https://doi.org/10.1016/0168-8227(92)90029-q
60. Rowley KG, Gault A, McDermott R, Knight S, McLeay T, O'Dea K (2000) Reduced prevalence of impaired glucose tolerance and no change in prevalence of diabetes despite increasing BMI among Aboriginal people from a group of remote homeland communities. Diabetes Care 23(7):898–904. https://doi.org/10.2337/diacare.23.7.898
61. Wang Z, Hoy WE (2004) Body size measurements as predictors of type 2 diabetes in Aboriginal people. Int J Obes Relat Metab Disord 28(12):1580–1584. https://doi.org/10.1038/sj.ijo.0802771
62. Thompson PL, Bradshaw PJ, Veroni M, Wilkes ET (2003) Cardiovascular risk among urban Aboriginal people. Med J Aust 179(3):143–146. https://doi.org/10.5694/j.1326-5377.2003.tb05473.x
63. McDermott R, Rowley KG, Lee AJ, Knight S, O'Dea K (2000) Increase in prevalence of obesity and diabetes and decrease in plasma cholesterol in a central Australian aboriginal community. Med J Aust 172(10):480–484. https://doi.org/10.5694/j.1326-5377.2000.tb124071.x
64. Wang Z, Rowley K, Wang Z, Piers L, O'Dea K (2007) Anthropometric indices and their relationship with diabetes, hypertension and dyslipidemia in Australian Aboriginal people and Torres Strait Islanders. Eur J Cardiovasc Prev Rehabil 14(2):172–178. https://doi.org/10.1097/01.hjr.0000220580.34763.fb
65. McDonald SP, Maguire GP, Hoy WE (2003) Renal function and cardiovascular risk markers in a remote Australian Aboriginal community. Nephrol Dial Transplant 18(8):1555–1561. https://doi.org/10.1093/ndt/gfg199
66. Leonard D, McDermott R, Odea K et al (2002) Obesity, diabetes and associated cardiovascular risk factors among Torres Strait Islander people. Aust N Z J Public Health 26(2):144–149. https://doi.org/10.1111/j.1467-842x.2002.tb00907.x
67. Johnson S, Martin D, Sarin C (2002) Diabetes mellitus in the First Nations population of British Columbia, Canada. Part 3. Prevalence of diagnosed cases. Int J Circumpolar Health 61(3):260–264. https://doi.org/10.3402/ijch.v61i3.17460
68. Horn OK, Jacobs-Whyte H, Ing A, Bruegl A, Paradis G, Macaulay AC (2007) Incidence and prevalence of type 2 diabetes in the First Nation community of Kahnawá:ke, Quebec, Canada, 1986–2003. Can J Public Health 98(6):438–443. https://doi.org/10.1007/BF03405434
69. Pioro MP, Dyck RF, Gillis DC (1996) Diabetes prevalence rates among First Nations adults on Saskatchewan reserves in 1990: comparison by tribal grouping, geography and with non-First Nations people. Can J Public Health 87(5):325–328
70. Harris SB, Gittelsohn J, Hanley A et al (1997) The prevalence of NIDDM and associated risk factors in native Canadians. Diabetes Care 20(2):185–187. https://doi.org/10.2337/diacare.20.2.185
71. Schraer CD, Adler AI, Mayer AM, Halderson KR, Trimble BA (1997) Diabetes complications and mortality among Alaska Natives: 8 years of observation. Diabetes Care 20(3):314–321. https://doi.org/10.2337/diacare.20.3.314
72. Jolly SE, Koller KR, Metzger JS et al (2015) Prevalence of hypertension and associated risk factors in western Alaska native people: the Western Alaska Tribal Collaborative for Health (WATCH) study. J Clin Hypertens (Greenwich) 17(10):812–818. https://doi.org/10.1111/jch.12483
73. Centers for Disease Control and Prevention (CDC) (1998) Prevalence of diagnosed diabetes among American Indians/Alaskan

Natives--United States, 1996. MMWR Morb Mortal Wkly Rep 47(42):901–904
74. Levin S, Mayer-Davis EJ, Ainsworth BE, Addy CL, Wheeler FC (2001) Behavioral and demographic correlates of diabetes, hypertension and overweight among the Catawba Indian Nation. Ethn Dis 11(2):241–250
75. Aminov Z, Haase R, Carpenter DO (2016) Diabetes in Native Americans: elevated risk as a result of exposure to polychlorinated biphenyls (PCBs). Rev Environ Health 31(1):115–119. https://doi.org/10.1515/reveh-2015-0054
76. Grandinetti A, Chang HK, Mau MK et al (1998) Prevalence of glucose intolerance among Native Hawaiians in two rural communities. Native Hawaiian Health Research (NHHR) Project. Diabetes Care 21(4):549–554. https://doi.org/10.2337/diacare.21.4.549
77. Will JC, Strauss KF, Mendlein JM, Ballew C, White LL, Peter DG (1997) Diabetes mellitus among Navajo Indians: findings from the Navajo Health and Nutrition Survey. J Nutr 127(10 Suppl):2106S-2113S. https://doi.org/10.1093/jn/127.10.2106S
78. Agrawal R, Singh G, Nayak K et al (2004) Prevalence of diabetes in camel-milk consuming raica rural community of north-west Rajasthan. Int J Diabetes Dev Ctries 24:109–114
79. Sachdev B (2012) Screening of type 2 diabetes mellitus and its associated risk factors among select tribes of Rajasthan. Int J Health Sci Res 2(1):33–44
80. Dajani R, Khader YS, Hakooz N, Fatahalla R, Quadan F (2013) Metabolic syndrome between two ethnic minority groups (Circassians and Chechens) and the original inhabitants of Jordan. Endocrine 43(1):112–119. https://doi.org/10.1007/s12020-012-9723-y
81. Bianchi ME, Farías EF, Bolaño J, Massari PU (2006) Epidemiology of renal and cardiovascular risk factors in Toba Aborigines. Ren Fail 28(8):665–670. https://doi.org/10.1080/08860220600925750
82. Meyerfreund D, Goncalves C, Cunha R, Pereira AC, Krieger JE, Mill JG (2009) Age-dependent increase in blood pressure in two different Native American communities in Brazil. J Hypertens 27(9):1753–1760. https://doi.org/10.1097/hjh.0b013e32832e0b2b
83. Dal Fabbro AL, Franco LJ, da Silva AS et al (2014) High prevalence of type 2 diabetes mellitus in Xavante Indians from Mato Grosso, Brazil. Ethn Dis 24(1):35–40
84. Murdock D, Salit J, Stoffel M et al (2013) Longitudinal study shows increasing obesity and hyperglycemia in micronesia. Obesity (Silver Spring) 21(9):E421–E427. https://doi.org/10.1002/oby.20041
85. Halim AA, Basu A, Kirk R (2019) The prevalence of body mass index-associated chronic diseases in diverse ethnic groups in New Zealand. Asia Pac J Public Health 31(1):84–91. https://doi.org/10.1177/1010539518822438
86. Joshy G, Porter T, Le Lievre C, Lane J, Williams M, Lawrenson R (2009) Prevalence of diabetes in New Zealand general practice: the influence of ethnicity and social deprivation. J Epidemiol Community Health 63(5):386–390. https://doi.org/10.1136/jech.2008.078873
87. Winnard D, Wright C, Jackson G et al (2012) Gout, diabetes and cardiovascular disease in the Aotearoa New Zealand adult population: co-prevalence and implications for clinical practice. N Z Med J 126(1368):53–64
88. Coppell KJ, Mann JI, Williams SM et al (2013) Prevalence of diagnosed and undiagnosed diabetes and prediabetes in New Zealand: findings from the 2008/09 Adult Nutrition Survey. N Z Med J 126(1370):23–42
89. Tipene-Leach D, Pahau H, Joseph N et al (2004) Insulin resistance in a rural Maori community. N Z Med J 117(1207):U1208
90. Sundborn G, Metcalf P, Scragg R et al (2007) Ethnic differences in the prevalence of new and known diabetes mellitus, impaired glucose tolerance, and impaired fasting glucose. Diabetes Heart and Health Survey (DHAH) 2002-2003, Auckland New Zealand [published correction appears in N Z Med J. 2007;120(1264):U2797]. N Z Med J 120(1257):U2607
91. Brimblecombe J, Mackerras D, Garnggulkpuy J et al (2006) Leanness and type 2 diabetes in a population of indigenous Australians. Diabetes Res Clin Pract 72(1):93–99. https://doi.org/10.1016/j.diabres.2005.09.014
92. O'Dea K, Cunningham J, Maple-Brown L et al (2008) Diabetes and cardiovascular risk factors in urban Indigenous adults: Results from the DRUID study. Diabetes Res Clin Pract 80(3):483–489. https://doi.org/10.1016/j.diabres.2008.02.008
93. Hoy WE, Kondalsamy-Chennakesavan S, Wang Z et al (2007) Quantifying the excess risk for proteinuria, hypertension and diabetes in Australian Aborigines: comparison of profiles in three remote communities in the Northern Territory with those in the AusDiab study. Aust N Z J Public Health 31(2):177–183. https://doi.org/10.1111/j.1753-6405.2007.00038.x
94. Arnold LW, Hoy WE, Sharma SK, Wang Z (2016) The Association between HbA1c and Cardiovascular Disease Markers in a Remote Indigenous Australian Community with and without Diagnosed Diabetes. J Diabetes Res 2016:5342304. https://doi.org/10.1155/2016/5342304
95. Brown A, Carrington MJ, McGrady M et al (2014) Cardiometabolic risk and disease in Indigenous Australians: the heart of the heart study. Int J Cardiol 171(3):377–383. https://doi.org/10.1016/j.ijcard.2013.12.026
96. McGorrian C, Daly L, Fitzpatrick P et al (2012) Cardiovascular disease and risk factors in an indigenous minority population. The All-Ireland Traveller Health Study. Eur J Prev Cardiol 19(6):1444–1453. https://doi.org/10.1177/1741826711428059
97. Jørgensen ME, Borch-Johnsen K, Witte DR, Bjerregaard P (2012) Diabetes in Greenland and its relationship with urbanization. Diabet Med 29(6):755–760. https://doi.org/10.1111/j.1464-5491.2011.03527.x
98. Loria A, Arroyo P, Fernandez V, Pardio J, Laviada H (2020) Prevalence of obesity and diabetes in the socioeconomic transition of rural Mayas of Yucatan from 1962 to 2000. Ethn Health 25(5):679–685. https://doi.org/10.1080/13557858.2018.1442560
99. Bruce SG, Riediger ND, Lix LM (2014) Chronic disease and chronic disease risk factors among First Nations, Inuit and Métis populations of northern Canada. Chronic Dis Inj Can 34(4):210–217
100. Pelletier C, Dai S, Roberts KC, Bienek A, Onysko J, Pelletier L (2012) Report summary. Diabetes in Canada: facts and figures from a public health perspective. Chronic Dis Inj Can 33(1):53–54
101. Egeland GM, Cao Z, Young TK (2011) Hypertriglyceridemic-waist phenotype and glucose intolerance among Canadian Inuit: the International Polar Year Inuit Health Survey for Adults 2007–2008. CMAJ 183(9):E553–E558. https://doi.org/10.1503/cmaj.101801
102. Ralph-Campbell K, Oster RT, Connor T et al (2009) Increasing rates of diabetes and cardiovascular risk in Métis Settlements in northern Alberta. Int J Circumpolar Health 68(5):433–442. https://doi.org/10.3402/ijch.v68i5.17382
103. Oster RT, Grier A, Lightning R, Mayan MJ, Toth EL (2014) Cultural continuity, traditional Indigenous language, and diabetes in Alberta First Nations: a mixed methods study. Int J Equity Health 13:92. https://doi.org/10.1186/s12939-014-0092-4
104. Shah BR, Cauch-Dudek K, Pigeau L (2011) Diabetes prevalence and care in the Metis population of Ontario, Canada. Diabetes Care 34(12):2555–2556. https://doi.org/10.2337/dc11-0945

105. Johnson JA, Vermeulen SU, Toth EL et al (2009) Increasing incidence and prevalence of diabetes among the Status Aboriginal population in urban and rural Alberta, 1995–2006. Can J Public Health 100(3):231–236. https://doi.org/10.1007/BF03405547
106. Bruce SG, Riediger ND, Zacharias JM, Young TK (2010) Obesity and obesity-related comorbidities in a Canadian First Nation population. Chronic Dis Can 31(1):27–32
107. Bruce SG, Young TK (2008) Prevalence and risk factors for neuropathy in a Canadian First Nation community. Diabetes Care 31(9):1837–1841. https://doi.org/10.2337/dc08-0278
108. Narayanan ML, Schraer CD, Bulkow LR et al (2010) Diabetes prevalence, incidence, complications and mortality among Alaska Native people 1985–2006. Int J Circumpolar Health 69(3):236–252. https://doi.org/10.3402/ijch.v69i3.17618
109. Daw J (2017) Contribution of four comorbid conditions to racial/ethnic disparities in mortality risk. Am J Prev Med 52(1S1):S95–S102. https://doi.org/10.1016/j.amepre.2016.07.036
110. Carter EA, MacCluer JW, Dyke B et al (2006) Diabetes mellitus and impaired fasting glucose in Alaska Eskimos: the Genetics of Coronary Artery Disease in Alaska Natives (GOCADAN) study. Diabetologia 49(1):29–35. https://doi.org/10.1007/s00125-005-0071-9
111. Blue Bird Jernigan V, Duran B, Ahn D, Winkleby M (2010) Changing patterns in health behaviors and risk factors related to cardiovascular disease among American Indians and Alaska Natives. Am J Public Health 100(4):677–683. https://doi.org/10.2105/AJPH.2009.164285
112. Subica AM, Agarwal N, Sullivan JG, Link BG (2017) Obesity and associated health disparities among understudied multiracial, pacific islander, and American Indian adults. Obesity (Silver Spring) 25(12):2128–2136. https://doi.org/10.1002/oby.21954
113. McNeely MJ, Boyko EJ (2004) Type 2 diabetes prevalence in Asian Americans: results of a national health survey. Diabetes Care 27(1):66–69. https://doi.org/10.2337/diacare.27.1.66
114. Cabassa LJ, Blanco C, Lopez-Castroman J, Lin KH, Lui SM, Lewis-Fernández R (2011) Racial and ethnic differences in diabetes mellitus among people with and without psychiatric disorders: results from the National Epidemiologic Survey on Alcohol and Related Conditions. Gen Hosp Psychiatry 33(2):107–115. https://doi.org/10.1016/j.genhosppsych.2010.11.011
115. Holm JE, Vogeltanz-Holm N, Poltavski D, McDonald L (2010) Assessing health status, behavioral risks, and health disparities in American Indians living on the northern plains of the U.S. Public Health Rep 125(1):68–78. https://doi.org/10.1177/003335491012500110
116. Harjo TC, Perez A, Lopez V, Wong ND (2011) Prevalence of diabetes and cardiovascular risk factors among California Native American adults compared to other ethnicities: the 2005 California Health Interview Survey. Metab Syndr Relat Disord 9(1):49–54. https://doi.org/10.1089/met.2010.0043
117. Reid JL, Morton DJ, Wingard DL et al (2010) Sex and age differences in the association of obesity and smoking with hypertension and type 2 diabetes in Southern California American Indians, 2002–2006. Ethn Dis 20(3):231–238
118. Centers for Disease Control and Prevention (CDC) (2003) Diabetes prevalence among American Indians and Alaska Natives and the overall population--United States, 1994-2002. MMWR Morb Mortal Wkly Rep 52(30):702–704
119. Oser CS, Harwell TS, Strasheim C et al (2005) Increasing prevalence of cardiovascular risk factors among American Indians in Montana. Am J Prev Med 28(3):295–297. https://doi.org/10.1016/j.amepre.2004.12.014
120. Chiem B, Nguyen V, Wu PL, Ko CM, Cruz LA, Sadler GR (2006) Cardiovascular risk factors among Chamorros. BMC Public Health 6:298. https://doi.org/10.1186/1471-2458-6-298
121. Wu PL, Sadler GR, Nguyen V et al (2005) Diabetes management in San Diego's Chamorro community. Diabetes Educ 31(3):379–390. https://doi.org/10.1177/0145721705276579
122. Barnes PM, Adams PF, Powell-Griner E (2010) Health characteristics of the American Indian or Alaska Native adult population: United States, 2004–2008. Natl Health Stat Report 20:1–22
123. Hodge FS, Cantrell BG, Kim S (2011) Health status and sociodemographic characteristics of the morbidly obese American Indians. Ethn Dis 21(1):52–57
124. Ganie MA, Sahar T, Rashid A et al (2020) Prevalence of diabetes and prediabetes in tribal population of Kashmir: Lessons for the future. Diabetes Res Clin Pract 169:108457–108457. https://doi.org/10.1016/j.diabres.2020.108457
125. Purohit K, Rathore HS, Köhler-Rollefson I (2017) Increased risk of type 2 diabetes mellitus in the Maru Raika community of Rajasthan: a cross-sectional study. Int J Diabetes Dev Ctries 37(4):494–501. https://doi.org/10.1007/s13410-016-0529-y
126. Madhu B, Prathyusha K, Prakruthi P, Srinath KM (2019) Comparison of prevalence of life style risk factors and 10 year risk of CVD event among rural and tribal population of Kollegal Taluk, Chamrajanagar district, South India. Diabetes Metab Syndr 13(5):2961–2966. https://doi.org/10.1016/j.dsx.2019.07.056
127. Mungreiphy NK, Kapoor S (2014) Efficacy of obesity indices and age in predicting diabetes: study on a transitional tribe of Northeast India. Ethn Dis 24(3):342–348
128. Sathiyanarayanan S, Muthunarayanan L, Devaparthasarathy TA (2019) Changing perspectives in tribal health: rising prevalence of lifestyle diseases among tribal population in India. Indian J Community Med 44(4):342–346. https://doi.org/10.4103/ijcm.IJCM_40_19
129. Kapoor D, Bhardwaj AK, Kumar D, Raina SK (2014) Prevalence of diabetes mellitus and its risk factors among permanently settled tribal individuals in tribal and urban areas in northern state of Sub-Himalayan region of India. Int J Chronic Dis 2014:380597. https://doi.org/10.1155/2014/380597
130. Ningombam SS, Rajkumari S, Chhungi V et al (2019) Type 2 diabetes and FTO rs9939609 gene polymorphism: a study among the two tribal population groups of Manipur, North East India. Int J Diabetes Dev Ctries 39:60–65. https://doi.org/10.1007/s13410-018-0634-1
131. Deo MG, Pawar PV, Kanetkar SR, Kakade SV (2018) Multicentric study on prevalence and risk factors for hypertension and diabetes in tribal communities in Western and Northern Maharashtra. J Postgrad Med 64(1):23–34. https://doi.org/10.4103/jpgm.JPGM_245_17
132. Negi PC, Chauhan R, Rana V, Vidyasagar, Lal K (2016) Epidemiological study of non-communicable diseases (NCD) risk factors in tribal district of Kinnaur, HP: A cross-sectional study. Indian Heart J 68(5):655–662. https://doi.org/10.1016/j.ihj.2016.03.002
133. Deo MG, Pawar PV, Kanetkar SR, Kakade SV (2017) Prevalence and risk factors of hypertension and diabetes in the Katkari tribe of coastal Maharashtra. J Postgrad Med 63(2):106–113. https://doi.org/10.4103/0022-3859.194204
134. Shah A, Afzal M (2013) Prevalence of diabetes and hypertension and association with various risk factors among different Muslim populations of Manipur, India. J Diabetes Metab Disord 12(1):52. https://doi.org/10.1186/2251-6581-12-52
135. Devi K, Jibonkumar S (2020) Food habit and risk of pre diabetes and type2 diabetes among the Meiteis of Manipur, India. Indian J Public Health Res Dev 11:380–387. https://doi.org/10.37506/ijphrd.v11i10.11202
136. Kufe NC, Ngufor G, Mbeh G, Mbanya JC (2016) Distribution and patterning of non-communicable disease risk factors in indigenous Mbororo and non-autochthonous populations in Cameroon: cross sectional study. BMC Public Health 16(1):1188. https://doi.org/10.1186/s12889-016-3837-8

137. Eltom MA, Babiker Mohamed AH, Elrayah-Eliadarous H et al (2018) Increasing prevalence of type 2 diabetes mellitus and impact of ethnicity in north Sudan. Diabetes Res Clin Pract 136:93–99. https://doi.org/10.1016/j.diabres.2017.11.034
138. Li Y, Teng D, Shi X et al (2020) Prevalence of diabetes recorded in mainland China using 2018 diagnostic criteria from the American Diabetes Association: national cross sectional study. BMJ 369:m997. https://doi.org/10.1136/bmj.m997
139. Furusawa T, Pitakaka F, Gabriel S, Sai A, Tsukahara T, Ishida T (2021) Health and well-being in small island communities: a cross-sectional study in the Solomon Islands. BMJ Open 11(11):e055106. https://doi.org/10.1136/bmjopen-2021-055106
140. McDonald PAJ, Montenegro GJA, Cruz GCE, Moreno de Rivera AL, Cumbrera OA (2013) Prevalence, sociodemographic distribution, treatment and control of diabetes mellitus in Panama. Diabetol Metab Syndr 5(1):69. https://doi.org/10.1186/1758-5996-5-69
141. Campbell JA, Walker RJ, Dawson AZ, Egede LE (2019) Prevalence of diabetes, prediabetes, and obesity in the indigenous Kuna population of Panamá. J Racial Ethn Health Disparities 6(4):743–751. https://doi.org/10.1007/s40615-019-00573-0
142. Steinbrook E, Flood D, Barnoya J, Montano CM, Miller AC, Rohloff P (2022) Prevalence of hypertension, diabetes, and other cardiovascular disease risk factors in two indigenous municipalities in rural Guatemala: a population-representative survey. Glob Heart 17(1):82. https://doi.org/10.5334/gh.1171
143. Barbosa CC, Sacuena ESR, Pinto AM, Cardoso-Costa GL, Guerreiro JF (2019) Anthropometric and metabolic profile of a Brazilian Amerindian group: The Xikrin (Mebengôkre). Am J Hum Biol 31(4):e23255. https://doi.org/10.1002/ajhb.23255
144. Oliveira GF, Oliveira TR, Ikejiri AT et al (2014) Prevalence of hypertension and associated factors in an indigenous community of central Brazil: a population-based study. PLoS One 9(1):e86278. https://doi.org/10.1371/journal.pone.0086278
145. Gomes HLM, Sombra NM, Cordeiro EDO et al (2021) Glycemic profile and associated factors in indigenous Munduruku, Amazonas. PLoS One 16(9):e0255730. https://doi.org/10.1371/journal.pone.0255730
146. Franco LJ, Dal Fabbro AL, Martinez EZ et al (2014) Performance of glycated haemoglobin (HbA1c) as a screening test for diabetes and impaired glucose tolerance (IGT) in a high risk population–the Brazilian Xavante Indians. Diabetes Res Clin Pract 106(2):337–342. https://doi.org/10.1016/j.diabres.2014.08.027
147. Tafuna'i M, Turner R, Matalavea B et al (2022) Results of a community-based screening programme for chronic kidney disease and associated risk factors, (obesity, diabetes and hypertension) in a Samoan cohort. BMJ Open 12(4):e056889. https://doi.org/10.1136/bmjopen-2021-056889
148. Hare MJL, Zhao Y, Guthridge S et al (2022) Prevalence and incidence of diabetes among Aboriginal people in remote communities of the Northern Territory, Australia: a retrospective, longitudinal data-linkage study. BMJ Open 12(5):e059716. https://doi.org/10.1136/bmjopen-2021-059716
149. Jeffries-Stokes CA, Stokes AM, McDonald L, Evans S, Anderson Deceased L, Robinson PM (2020) Risk factors for renal disease and diabetes in remote Australia - findings from The Western Desert Kidney Health Project. Rural Remote Health 20(2):5440. https://doi.org/10.22605/RRH5440
150. Viskum ES, Pedersen ML (2016) Prevalence of diagnosed diabetes and quality of care among Greenlanders and non-Greenlanders in Greenland. Diabetes Res Clin Pract 121:91–98. https://doi.org/10.1016/j.diabres.2016.09.006
151. Jimenez-Corona A, Nelson RG, Jimenez-Corona ME et al (2019) Disparities in prediabetes and type 2 diabetes prevalence between indigenous and nonindigenous populations from Southeastern Mexico: The Comitan Study. J Clin Transl Endocrinol 16:100191. https://doi.org/10.1016/j.jcte.2019.100191
152. Mendoza-Catalán G, Parra-Torres NM, Almonte-Becerril M (2022) Risk of chronic diseases in indigenous Totonacs from Mexico short running title: Risk of chronic diseases in indigenous Totonacs. Appl Nurs Res 63:151543. https://doi.org/10.1016/j.apnr.2021.151543
153. Pacheco LS, Hernández-Ontiveros DA, Iniguez-Stevens E et al (2018) Prevalence and correlates of diabetes and metabolic syndrome in a rural indigenous community in Baja California, Mexico. BMC Public Health 18(1):1397. https://doi.org/10.1186/s12889-018-6276-x
154. Dyck RF, Karunanayake C, Janzen B et al (2015) Do discrimination, residential school attendance and cultural disruption add to individual-level diabetes risk among Aboriginal people in Canada?. BMC Public Health 15:1222. https://doi.org/10.1186/s12889-015-2551-2
155. Chan BTB, Sodhi SK, Mecredy GC, Farrell T, Gordon J (2021) Diabetes prevalence and complication rates: In individual First Nations communities in the Sioux Lookout region of Ontario. Can Fam Physician 67(8):601–607. https://doi.org/10.46747/cfp.6708601
156. Avery L, Maddox R, Abtan R et al (2022) Modelling prevalent cardiovascular disease in an urban Indigenous population. Can J Public Health. https://doi.org/10.17269/s41997-022-00669-x
157. Walker JD, Slater M, Jones CR et al (2020) Diabetes prevalence, incidence and mortality in First Nations and other people in Ontario, 1995-2014: a population-based study using linked administrative data [published correction appears in CMAJ 2021 Jan 18;193(3):E105]. CMAJ 192(6):E128–E135. https://doi.org/10.1503/cmaj.190836
158. Batal M, Chan HM, Fediuk K et al (2021) Associations of health status and diabetes among First Nations Peoples living on-reserve in Canada. Can J Public Health 112(Suppl 1):154–167. https://doi.org/10.17269/s41997-021-00488-6
159. Marushka L, Batal M, David W et al (2017) Association between fish consumption, dietary omega-3 fatty acids and persistent organic pollutants intake, and type 2 diabetes in 18 First Nations in Ontario, Canada. Environ Res 156:725–737. https://doi.org/10.1016/j.envres.2017.04.034
160. Uchima O, Wu YY, Browne C, Braun KL (2019) Disparities in diabetes prevalence among native Hawaiians/other pacific islanders and Asians in Hawai'i. Prev Chronic Dis 16:E22. https://doi.org/10.5888/pcd16.180187
161. Karter AJ, Schillinger D, Adams AS et al (2013) Elevated rates of diabetes in Pacific Islanders and Asian subgroups: The Diabetes Study of Northern California (DISTANCE). Diabetes Care 36(3):574–579. https://doi.org/10.2337/dc12-0722
162. Kirtland KA, Cho P, Geiss LS (2015) Diabetes among Asians and native Hawaiians or other pacific islanders--United States, 2011-2014. MMWR Morb Mortal Wkly Rep 64(45):1261–1266. https://doi.org/10.15585/mmwr.mm6445a2
163. Towne SD, Bolin J, Ferdinand A, Nicklett EJ, Smith ML, Ory MG (2017) Assessing diabetes and factors associated with foregoing medical care among persons with diabetes: disparities facing American Indian/Alaska native, black, Hispanic, low income, and southern adults in the U.S. (2011-2015). Int J Environ Res Public Health 14(5):464. https://doi.org/10.3390/ijerph14050464
164. Love CV, Taniguchi TE, Williams MB et al (2018) Diabetes and obesity associated with poor food environments in American Indian communities: the Tribal Health and Resilience in Vulnerable Environments (THRIVE) study. Curr Dev Nutr 3(Suppl 2):63–68. https://doi.org/10.1093/cdn/nzy099
165. Santos JL, Pérez-Bravo F, Carrasco E, Calvillán M, Albala C (2001) Low prevalence of type 2 diabetes despite a high average body mass index in the Aymara natives from Chile. Nutrition 17(4):305–309. https://doi.org/10.1016/s0899-9007(00)00551-7

166. Harris SB, Tompkins JW, TeHiwi B (2017) Call to action: a new path for improving diabetes care for Indigenous peoples, a global review. Diabetes Res Clin Pract 123:120–133. https://doi.org/10.1016/j.diabres.2016.11.022
167. O'Dea K (1984) Marked improvement in carbohydrate and lipid metabolism in diabetic Australian aborigines after temporary reversion to traditional lifestyle. Diabetes 33(6):596–603. https://doi.org/10.2337/diab.33.6.596
168. Schulz LO, Bennett PH, Ravussin E et al (2006) Effects of traditional and western environments on prevalence of type 2 diabetes in Pima Indians in Mexico and the U.S. Diabetes Care 29(8):1866–1871. https://doi.org/10.2337/dc06-0138
169. Wicklow BA, Sellers EAC, Sharma AK et al (2018) Association of gestational diabetes and type 2 diabetes exposure in utero with the development of type 2 diabetes in First Nations and non-First Nations offspring. JAMA Pediatr 172(8):724–731. https://doi.org/10.1001/jamapediatrics.2018.1201

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