Indigenous and tribal peoples' health (*The Lancet*–Lowitja Institute Global Collaboration): a population study

Ian Anderson, Bridget Robson*, Michele Connolly*, Fadwa Al-Yaman*, Espen Bjertness*, Alexandra King*, Michael Tynan*, Richard Madden*, Abhay Bang*, Carlos E A Coimbra Jr*, Maria Amalia Pesantes*, Hugo Amigo, Sergei Andronov, Blas Armien, Daniel Ayala Obando, Per Axelsson, Zaid Shakoor Bhatti, Zulfiqar Ahmed Bhutta, Peter Bjerregaard, Marius B Bjertness, Roberto Briceno-Leon, Ann Ragnhild Broderstad, Patricia Bustos, Virasakdi Chongsuvivatwong, Jiayou Chu, Deji, Jitendra Gouda, Rachakulla Harikumar, Thein Thein Htay, Aung Soe Htet, Chimaraoke Izugbara, Martina Kamaka, Malcolm King, Mallikharjuna Rao Kodavanti, Macarena Lara, Avula Laxmaiah, Claudia Lema, Ana María León Taborda, Tippawan Liabsuetrakul, Andrey Lobanov, Marita Melhus, Indrapal Meshram, J Jaime Miranda, Thet Thet Mu, Balkrishna Nagalla, Arlappa Nimmathota, Andrey Ivanovich Popov, Ana María Peñuela Poveda, Faujdar Ram, Hannah Reich, Ricardo V Santos, Aye Aye Sein, Chander Shekhar, Lhamo Y Sherpa, Peter Skold, Sofia Tano, Asahngwa Tanywe, Chidi Ugwu, Fabian Ugwu, Patama Vapattanawong, Xia Wan, James R Welch, Gonghuan Yang, Zhaoqing Yang, Leslie Yap*

Summary

Background **International studies of the health of Indigenous and tribal peoples provide important public health insights. Reliable data are required for the development of policy and health services. Previous studies document poorer outcomes for Indigenous peoples compared with benchmark populations, but have been restricted in their coverage of countries or the range of health indicators. Our objective is to describe the health and social status of Indigenous and tribal peoples relative to benchmark populations from a sample of countries.**

Methods **Collaborators with expertise in Indigenous health data systems were identified for each country. Data were obtained for population, life expectancy at birth, infant mortality, low and high birthweight, maternal mortality, nutritional status, educational attainment, and economic status. Data sources consisted of governmental data, data from non-governmental organisations such as UNICEF, and other research. Absolute and relative differences were calculated.**

Findings **Our data (23 countries, 28 populations) provide evidence of poorer health and social outcomes for Indigenous peoples than for non-Indigenous populations. However, this is not uniformly the case, and the size of the rate difference varies. We document poorer outcomes for Indigenous populations for: life expectancy at birth for 16 of 18 populations with a difference greater than 1 year in 15 populations; infant mortality rate for 18 of 19 populations with a rate difference greater than one per 1000 livebirths in 16 populations; maternal mortality in ten populations; low birthweight with the rate difference greater than 2% in three populations; high birthweight with the rate difference greater than 2% in one population; child malnutrition for ten of 16 populations with a difference greater than 10% in five populations; child obesity for eight of 12 populations with a difference greater than 5% in four populations; adult obesity for seven of 13 populations with a difference greater than 10% in four populations; educational attainment for 26 of 27 populations with a difference greater than 1% in 24 populations; and economic status for 15 of 18 populations with a difference greater than 1% in 14 populations.**

Interpretation **We systematically collated data across a broader sample of countries and indicators than done in previous studies. Taking into account the UN Sustainable Development Goals, we recommend that national governments develop targeted policy responses to Indigenous health, improving access to health services, and Indigenous data within national surveillance systems.**

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*Writing and review group

The University of Melbourne, Melbourne, Australia (Prof I Anderson PhD, H Reich BA); **Te Rōpū Rangahau Hauora a Eru Pōmare, University of Otago, Dunedin, New Zealand** (B Robson PhD); **International Group on Indigenous Health Measurement, USA** (M Connolly MPH); **Indigenous and Children's Group, Australian Institute of Health and Welfare, Canberra, Australia** (F Al-Yaman PhD); **University of Oslo, Institute of Health and Society, Department of Community Medicine, Oslo, Norway** (Prof E Bjertness PhD, M B Bjertness MD, L Y Sherpa PhD, A S Htet MD); **Simon Fraser University, Burnaby, BC, Canada** (A King MD); **The Lowitja Institute, Melbourne, Australia** (M Tynan PhD); **The University of Sydney, Sydney, Australia** (Prof R Madden PhD); **Society for Education, Action and Research in Community Health, Gadchiroli, Maharashtra, India** (A Bang MD); **Escola Nacional de Saúde Pública, Fundação Oswaldo Cruz, Rio de Janeiro, Brazil** (Prof C E A Coimbra Jr PhD, Prof R V Santos PhD, Prof J R Welch PhD); **Salud Sin Límites Perú, Lima, Peru** (M A Pesantes PhD, C Lema MSc); **Center for Excellence in Chronic Diseases, Universidad Peruana Cayetano Heredia, Lima, Peru**

Introduction

International studies investigating health and social outcomes for Indigenous and tribal populations across two or more countries (hereafter referred to as Indigenous peoples) provide important insights into public health. Previous studies have revealed disparities for Indigenous populations relative to benchmark populations. However, these studies have been restricted in the number of countries examined and the range of health and social indicators reported. Reliable data are needed to monitor health outcomes and develop policy and service responses.

Peoples who are described as Indigenous, or who identify as such, are found in nearly all regions of the world. In 2009, a UN report estimated that there were Indigenous peoples in 90 countries worldwide.[1] The most recent published estimates put the total world population of Indigenous peoples at 302·45 million.[2] China and India have the largest total populations of Indigenous peoples of any single country, with estimates of 106·40 and 104 million, respectively.[2,3]

A policy definition developed by the International Labour Organisation in 1989 characterises Indigenous peoples as:

(M A Pesantes, Prof J J Miranda PhD); **Universidad de Chile, Santiago, Chile** (Prof H Amigo PhD, P Bustos MD, M Lara PhD); **Scientific Research Centre of the Arctic, Salekhard, Russia** (S Andronov PhD, A Lobanov MD, A I Popov PhD); **The Gorgas Memorial Institute for Health Studies, Universidad Interamericana de Panamá, Panama City, Panama** (B Armien MD); **Departamento Administrativo Nacional de Estadística, Bogotá, Colombia** (D Ayala Obando BS); **Centre for Sami Research, Umeå University, Umeå, Sweden** (P Axelsson PhD); **Department of Paediatrics and Child Health, The Aga Khan University, Karachi, Pakistan** (Z S Bhatti MSc); **Center of Excellence in Women and Child Health, The Aga Khan University, Karachi, Pakistan and SickKids Center for Global Child Health, Toronto, Canada** (Prof Z A Bhutta PhD); **National Institute of Public Health, University of Southern Denmark, Copenhagen, Denmark** (Prof P Bjerregaard MD); **LACSO, Social Science Laboratory, Central University of Venezuela, Caracas, Venezuela** (Prof R Briceno-Leon PhD); **Centre for Sami Health Research, Faculty of Health, UiT The Arctic University of Norway, Tromsø, Norway** (A R Broderstad MD, M Melhus MSc); **Epidemiology Unit, Faculty of Medicine, Prince of Songkla University, Hat Yai, Songkhla, Thailand** (Prof V Chongsuvivatwong PhD, T Liabsuetrakul PhD); **Institute of Medical Biology, Chinese Academy of Medical Sciences, Kunming, China** (Prof J Chu PhD, Prof Z Yang PhD); **Department of Preventive Medicine, Tibet University Medical College, Lhasa, Tibet, China** (Deji MSc); **International Institute for Population Sciences, Deemed University, Mumbai, India** (J Gouda MPhil, Prof F Ram PhD, Prof C Shekhar PhD); **National Institute of Nutrition, Indian Council of Medical Research, Hyderabad, India** (R Harikumar DPH, M R Kodavanti PhD, A Laxmaiah PhD, I Meshram MD, B Nagalla PhD, A Nimmathota MD); **Ministry of Health, Nay Pyi Taw, Myanmar**

Research in context

Search strategy

The objective of our search strategy for previous studies was to identify reports that included data for Indigenous health outcomes from two or more countries. We searched the PubMed database from Jan 1, 1982, to Dec 30, 2015, using the terms "population groups" OR "continental population groups" OR "indigenous" OR "aboriginal" OR "tribal" AND/OR "health outcome" OR "health outcomes" OR "health data" OR "health indicator" OR "health indicators" AND/OR "infant mortality" OR "maternal mortality" OR "life expectancy" OR "low birth weight" OR "high birth weight" OR "obesity" OR "educational attainment" OR "poverty" AND/OR "comparative study" [pt] AND "international" OR "cross-national" OR "cross-country" OR ("international") AND ("comparison" OR "comparative") AND/OR each of our contributor countries combined against each other. Our search was done in English and the literature identified spans 1982–2014, with a total of 39 journal articles and monographs identified and reviewed. As a quality measure we restricted our review to peer-reviewed journal articles and monographs with defined methods and health and social outcome data sources.

Added value of this report

Our study reports systematically collated health data from across a broader range of indicators and samples of Indigenous countries than in previous studies.

Implications of all the available evidence

These studies and our study report document evidence of poorer health and social outcomes for Indigenous populations than for benchmark populations, noting that there are exceptions in which health is better in Indigenous populations. Additionally, we document gaps in the availability of data. The geographical coverage of this report needs to be extended, as does the range of health indicators. Targeted policy responses are needed, including strategies to improve health-care access for Indigenous peoples and the availability of health data.

tribal peoples in independent countries whose social, cultural, and economic conditions distinguish them from other sections of the national community and whose status is regulated wholly or partly by their own customs or traditions or by special laws or regulations; and peoples in independent countries who are regarded as indigenous because of their descent from the populations who inhabited the country, or a geographical region to which the country belongs, at the time of conquest or colonisation or the establishment of present state boundaries and who, irrespective of their legal status, retain some or all of their own social, economic, cultural, and political institutions.[4]

In a similar way, the UN Permanent Forum on Indigenous Issues (UNPFII) sets out seven characteristics to guide the identification of Indigenous peoples (described below). We use these seven characteristics as inclusion criteria for this study.[5]

The Lancet–Lowitja Institute Global Collaboration for Indigenous and Tribal Health is a research partnership drawing contributors from 23 countries, covering all WHO global regions and including Indigenous populations with diverse socio-historical characteristics. Our objective is to describe the health and social status of Indigenous and tribal peoples relative to benchmark populations without any attempt to make comparisons between Indigenous populations. We consider the implication of our findings in relation to the implementation of the UN Sustainable Development Goals (SDGs).

Methods

Overview

The project had three phases. In the first phase, we tested the feasibility of our approach with a preliminary sample of countries. In the second phase, we extended both the sample of countries and the selection of indicators in our data sample. In the third phase, we reviewed and analysed the data submitted.

Preliminary country sample and indicators

We identified a preliminary sample of countries with Indigenous populations. Indigenous peoples included in this preliminary (and subsequent) sample had at least six of the seven following characteristics identified by the UNPFII:[5] self-identification as Indigenous peoples at the individual level and accepted by the community as a member; historical continuity with pre-colonial or pre-settler societies; strong link to territories and surrounding natural resources; distinct social, economic, or political systems; distinct language, culture, and beliefs; people from non-dominant groups of society; resolve to maintain and reproduce their ancestral environments and systems as distinctive peoples and communities.

For each country included in this project we identified key informants with expertise in Indigenous health and national data systems, and they were invited to join the research collaboration. The identification of local experts was a precondition for a country's inclusion in this report because of their ability to identify and negotiate access to data and to analyse data where this was required, and because of their knowledge of local Indigenous peoples.

To facilitate collaborative development of the project we convened two international meetings: one in New York (May 19–20, 2014) at the end of the first phase, and the other in London (Nov 24, 2014) during the second phase of the project.

The preliminary set of contributors was identified through the lead author's professional networks, established contacts of other colleagues working in

Indigenous health, and new contributors. This initial network included the following countries: Australia, Brazil, Canada, Chile, China, Georgia, India, Kenya, New Zealand, occupied Palestine territory, Pakistan, and the USA.

The indicators for the preliminary phase were selected taking into account our review of previous international studies (see Research in context) and international reviews of Indigenous health measurement.[6,7] We were also guided by the local knowledge of project authors. Our objective was to identify indicators for which data could be feasibly obtained across the broadest range of countries. In the first phase we gathered Indigenous and benchmark data for population, life expectancy at birth, maternal mortality ratio, infant mortality rate, low and high birthweight, educational attainment, and economic status.

Data collection and extension of sample

At the New York Working Group meeting collaborators reviewed the preliminary data to identify gaps in regional coverage and the diversity of Indigenous populations. It was agreed to extend the data items to include measures of nutritional status: child malnutrition, child obesity, and adult obesity.

Our preliminary sample lacked an Indigenous population in which Indigenous peoples had a majority status, and an ongoing political relation with non-Indigenous political institutions. Accordingly, we included the Inuit peoples of Greenland, who constitute 89% of the population in Greenland, a semi-autonomous country within the Kingdom of Denmark. Gaps in geographical coverage were identified in Africa, Asia, and Latin America.

We extended our country sample during the second phase using the same strategy, drawing upon our expanding network of collaborators. Contributors from occupied Palestine territory and Georgia withdrew at a late stage due to a change of work and personal circumstances and were unable to be replaced. The final country sample is listed in the appendix.

Collaborators sourced and provided data against the requested measures. The approach varied depending on the country context and data availability. Data were sourced from reports produced by governmental statistics and health data agencies, calculated from government data sources or from primary data collected by contributors for other purposes, or in some instances, supplemented by published academic research.

Review and analysis

A data review group reviewed country contributions seeking, as necessary, clarification about data items, benchmark data, and data quality, and attempting where possible to standardise reporting. An independent statistician supported the group in this iterative process, with most country contributions being reviewed at least twice.

The following data definitions are used in this report (exceptions are noted in the Results and the appendix). Life expectancy at birth is defined as the average number of years that a group of newborn babies would be expected to live if current death rates remain unchanged (data for the calculation of life expectancy was generally derived from life tables). Infant mortality rate is defined as the number of infant deaths (<12 months of age) per 1000 livebirths. Maternal mortality ratio is defined as maternal deaths directly or indirectly relating to a pregnancy or its management, which occur during pregnancy, delivery, or within 42 days of giving birth. Ratios are maternal deaths per 100 000 livebirths. Low birthweight is defined as less than 2500 g. High birthweight is defined as 4500 g or more, unless otherwise indicated. We included three measures of nutritional status: child malnutrition, child obesity, and adult obesity. For child malnutrition, we report on stunting (ie, below minus 2 SDs from median height for age of reference population) according to WHO recommended guidelines.[8] If these data were unavailable we report underweight (ie, body-mass index [BMI] of child less than Cole's cutoff).[9] We defined child obesity using a range of measures. Adult obesity was defined as a BMI greater than 30·0 kg/m². Measures for educational attainment include measures of literacy (being able to read and write) and school completion (by qualification or years of schooling). Measures for economic status included household income and percentage of an individual's earnings below the national poverty line.

We report the most recently available data (all data included in this report are for the period Jan 1, 1997, until Dec 31, 2014). We provide an overview of Indigenous and benchmark measures that we include in this report by country and indicator (table 1). Information about the specific Indigenous populations and their legal status are described. Where Indigenous status is not recorded, a proxy measure such as language or geographical locale is used. Proxy measures are summarised in table 1.

Benchmark data are provided for the local and national non-Indigenous or total population. These measures also vary by region. Danish law, for example, does not allow for the collection of ethnicity data in Greenland, so accordingly we use Danish data as the benchmark population. In several countries Indigenous data and benchmark data are not available for the same period.

In our analysis, we do not make comparisons between Indigenous populations. Recent international studies of Indigenous data have shown that direct comparison between Indigenous populations is highly problematic. Comparisons are problematic because of inconsistencies in the measurement of Indigenous status, varying data collection methods, and the lack of standardisation of measures.[6,7]

(T T Htay MMedSc, A S Htet, T T Mu MD, A A Sein MSc); **Population Dynamics and Reproductive Health Program, African Population and Health Research Center, Nairobi, Kenya** (C Izugbara PhD); **Department of Native Hawaiian Health** (M Kamaka MD) **and Native Hawaiian Center of Excellence** (L Yap MPH), **John A Burns School of Medicine, University of Hawaii, Honolulu, HI, USA; CIHR—Institute of Aboriginal Peoples' Health, Simon Fraser University, Burnaby, BC, Canada** (Prof M King PhD); **Ministerio de Salud y Protección Social, Bogotá, Colombia** (A M León Taborda MA, A M Peñuela Poveda MHA); **Arctic Research Centre** (Prof P Skold PhD) **and School of Business and Economy** (S Tano PhD), **Umeå University, Umeå, Sweden; Cameroon Centre for Evidence-Based Health Care, Yaounde, Cameroon** (A Tanywe MA); **Department of Sociology/Anthropology, University of Nigeria, Nsukka, Nigeria** (C Ugwu MSc); **Department of Psychology, Federal University, Ndufu-Alike, Nigeria** (F Ugwu PhD); **Institute for Population and Social Research, Mahidol University Salaya, Phuttamonton, Nakhon Pathom, Thailand** (P Vapattanawong PhD); **and Institute of Basic Medical Sciences at Chinese Academy of Medical Sciences & School of Basic Medicine at Peking Union Medical College, Beijing, China** (X Wan PhD, Prof G Yang MD)

Correspondence to:
Prof Ian Anderson, The University of Melbourne, Level 4, Raymond Priestley Building, Parkville, VIC 3010, Australia
i.anderson@unimelb.edu.au

See **Online** for appendix

	Indigenous measures	Benchmark measures
Australia	AI: self-report	AI: non-Aboriginal and Torres Strait Islanders
Brazil	IMR: identified by a physician; LBW, AO, CM: self-report or residents of federally recognised Indigenous reserve; EA: self-report; ES: self-report or identified by another resident	IMR, BW, CM, AO: total population (Brazil); EA, ES: non-Indigenous population (Brazil)
Cameroon	AI: Baka communities	AI: total population (Cameroon)
Canada	E0, CO, AO, EA, ES: self-report; IMR, BW: government registry (First Nations status)	E0, IMR, BW, EA, ES: total population (Canada); CO, AO: non-Aboriginal population (Canada)
Chile	IMR: Indigenous surname and self-report; BW, CM, CO: Indigenous surname; EA, ES: self-report	IMR: total population (Chile); BW, CM, CO: non-Mapuche population (Chile); EA, ES: population excluding the Indigenous groups named
China (Dai)	AI: according to the ethnic information on their Residential Report Card	E0, BW, CM, CO, IMR, MMR, EA: Han (various geographical areas); ES: rural Han (Kunming)
China (Tibet)	E0, IMR, MMR, EA, ES: geographical proxy (TAR)*; BW, CM, CO, AO: self-report	E0, IMR, MMR, CO, AO, EA, ES: total population (China); BW: non-Tibetan (Lhasa); CM: Han (Lhasa)
Colombia	AI: self-report	IMR, MMR, BW: total population (Colombia); CM, CO, AO: non-Indigenous population (Colombia)
Greenland	EA, AO: self-report; E0, IMR, MMR, BW: birthplace proxy (born in Greenland); CO, CM: geographical proxy (total population of Greenland)†	All indicators except for CM: total population (Denmark); CM: benchmark excluded
India	AI: self-report	E0, IMR, EA, ES: non-Scheduled Tribes population (India); CM, OC, AO: rural population (India)
Kenya	AI: self-report	AI: total population (Kenya)
Myanmar	LBW, CO, CM, EA, ES: geographical proxy (Mon state‡); AO: self-report	AI: total population (Myanmar)
Nepal	E0: geographical proxy (Solukhumbu district§); MMR, BW, EA, ES: self-report	E0: total population (Nepal); MMR, BW: non-Indigenous population (Solukhumbu district); EA: Brahmin (Nepal); ES: non-Indigenous Brahmin and Chettri population (Hill region)
New Zealand	AI: self-report	AI: non-Māori (New Zealand)
Nigeria (Fulani)	AI: language, physical, and economic characteristics identified by investigators	AI: total population (Nigeria)
Nigeria (Ijaw)	E0: geographical proxy (south–south geopolitical zone); CM, CO, EA, ES: geographical proxy (Bayelsa state)	AI: total population (Nigeria)
Norway	E0: geographical proxy (Sami settlement areas¶); AO, EA: self-report	E0: total population (non-Sami settlement areas north of the Arctic Circle); AO, EA: non-Indigenous population (Norway)
Pakistan	AI: geographical proxy (population of the Federally Administered Tribal Areas)	AI: total population (Pakistan)
Panama	IMR, MMR, E0: geographical proxy (Indigenous regions); CM, EA, ES: self-report	IMR, MMR, E0, CM: population of Panama except those three Indigenous regions; EA: population of Panama except those Indigenous groups; ES: non-Indigenous (Panama)
Peru	IMR, BW, EA, ES: language proxy (Amazonian mother tongue); CM: geographical proxy (Amazonian region)‖	IMR, BW, EA, ES: language proxy (Spanish mother tongue); CM: all population (Lima/Metropolitan region)
Russia	AI: self-report, the definition of a doctor, language and residence in the territory of Yamal	AI: total population (Yamalo–Nenets Autonomous Okrug)
Sweden	AI: geographical proxy (Sami administrative areas)**	E0, IMR, EA, ES: population of Sweden excluding communities with high share of Sami; BW: outside of Sami administrative area in Sweden
Thailand	AI: language proxy (non-Thai-speaking population of Thailand)	AI: language proxy (Thai-speaking population of Thailand)
USA	AI, except AIAN E0: self-report; AIAN E0: enrolment on the tribal registry	E0, IMR (AIAN), BW, CO, EA, ES: total population (USA); IMR (NH), AO: non-Indigenous (Hawaii)
Venezuela	AI: self-report	AI: non-Indigenous population (Venezuela)

For Indigenous group information see the Results. AI=all indicators. IMR=infant mortality rate. LBW=low birthweight. AO=adult obesity. CM=child malnutrition. EA=educational attainment. ES=economic status. BW=birthweight. E0=life expectancy at birth. CO=child obesity. MMR=maternal mortality ratio. AIAN=American Indian and Alaska Natives. NH=Native Hawaiians in Hawaii. *About 90% of the population of the Tibet Autonomous Region (TAR) are Tibetan.[10] †About 90% of the population of Greenland are born in Greenland, proxy for Inuit.[11] ‡About 56% of the population of Mon State are Mon.[12] §About 70% of the population of the Solukumbu district are Indigenous.[13] ¶Proportion of Sami in the Sami Settlement areas ranges from 20% in some municipalities (Skånland and Evenes) to 90% in other municipalities (Karasjok and Kautokeino; based on unpublished data from the SAMINOR2 clinical study, UiT, the Artic University of Norway). ‖About 9% of the population of the Amazonian region are Indigenous. **Sami Administrative areas have between 9% and 13% of the population (18 years and older) registered for voting in the Sami Parliament.[14]

Table 1: **Summary of Indigenous and benchmark population measures and methods of identification**

	Indicators									Methods	Main sources
	E0	IMR	MMR	BW	CM	CO	AO	EA	ES		
Australia	✓	✓	✓	✓	✓	✓	✓	✓	✓	Reproduced, calculated (ES)	Australian Bureau of Statistics (E0, CM, CO, AO, EA, ES), Australian Institute of Health and Welfare (IMR, MMR, BW)
Brazil		✓		✓	✓		✓	✓	✓	Reproduced, calculated (EA)	Academic research (IMR, BW, CM, AO), Brazilian Ministry of Health (IMR, BW, CM, AO), Brazilian Public Health Association (BW), the Brazilian Institute of Geography and Statistics (EA, ES)
Cameroon	✓							✓		Reproduced	Academic research (E0, EA), WHO (E0), UNICEF (EA)
Canada	✓	✓		✓		✓	✓	✓	✓	Reproduced	Statistics Canada (E0, EA, ES), academic research (IMR, CO, AO), Health Canada (BW)
Chile		✓		✓	✓	✓		✓	✓	Reproduced	Pan American Health Organization (IMR), Ministry of Health and Department of Health Statistics and Information Chile (IMR), academic research (BW, CM, CO), Instituto Nacional de Estadísticas (EA), Ministerio de Desarrollo Social Chile (ES)
China (Dai)	✓	✓	✓	✓	✓	✓		✓	✓	Reproduced	National Bureau of Statistics of China (E0, EA), Yunnan Provincial Department of Health and Yunnan maternal and child care service centre (IMR, MMR, BW, CM, CO)
China (Tibet)	✓	✓	✓	✓	✓	✓	✓	✓	✓	Reproduced, calculated (MMR, CM)	National Bureau of Statistics of China (E0, IMR, EA), Tibet Centre for Disease Control (MMR), Ministry of Health of the People's Republic of China (MMR), academic research (BW, CM, CO, AO, ES), World Bank (ES)
Colombia		✓	✓	✓	✓	✓	✓			Calculated	Colombia National Statistics Department and Colombia Ministry of Health and Social Welfare (IMR, MMR, BW), Colombian Family Welfare Institute (CM, CO, AO)
Greenland	✓	✓		✓	✓	✓	✓	✓		Reproduced, calculated (AO, EA)	Danish Central Population Registry (E0), Statistics Greenland (E0, IMR, BW), Nordic Health Statistics, Nordisk Medicinalstatistik Komité (E0, IMR), Statistics Denmark (BW, EA), academic research (CM, CO, AO, EA)
India	✓	✓			✓	✓	✓	✓	✓	Calculated	Office of the Registrar General of India and Census Commissioner (E0, IMR), National Nutrition Monitoring Bureau, National Institute of Nutrition (CM, CO, AO), India Ministry of Statistics and Programme Implementation (EA, ES)
Kenya	✓		✓	✓	✓			✓		Reproduced	Academic research (E0, BW, CM), Kenya National Bureau of Statistics (E0, MMR, CM), UNICEF (BW), Nations Education, Scientific and Cultural Organization and the World Bank (EA)
Myanmar				✓	✓	✓	✓	✓	✓	Reproduced, calculated (AO)	Myanmar Ministry of National Planning and Economic Development and Ministry of Health (BW, CM, CO), WHO (AO), UN Development Programme, UN Children's Fund, Swedish International Development Cooperation Agency (EA, ES)
Nepal	✓		✓	✓				✓	✓	Reproduced, calculated (MMR, BW)	Nepal Central Bureau of Statistics (E0, EA, ES), Himalayan Health and Environmental Services (MMR, BW)
New Zealand	✓	✓	✓	✓	✓	✓	✓	✓	✓	Reproduced	Statistics New Zealand (E0, IMR, EA, ES), New Zealand Ministry of Health (IMR, BW, CM, CO, AO), Maternal Mortality Review Working Group of the Perinatal and Maternal Mortality Review Committee, Health Quality and Safety Commission (MMR)
Nigeria (Fulani)					✓		✓	✓		Reproduced	National Population Commission Nigeria and ICF International Macro (CM), the International Institute for Tropical Agriculture (AO), the World Bank (EA), academic research (EA)
Nigeria (Ijaw)	✓				✓	✓		✓	✓	Reproduced	Bayelsa state (E0, IMR, EA), UN Development Programme (E0, ES), National Population Commission Nigeria and ICF Macro (IMR, CM, CO, EA, ES), Central Intelligence Agency World Factbook (IMR)
Norway	✓						✓	✓		Reproduced, calculated (AO, EA)	Statistics Norway (E0), academic research (AO, EA)
Pakistan		✓	✓		✓		✓	✓		Reproduced	Government of Pakistan National institute of population studies (IMR, MMR), Government of Pakistan Planning Commission (CM, AO, EA)
Panama	✓	✓	✓		✓			✓	✓	Reproduced	Instituto Nacional de Estadística y Censo Contraloría General de la República de Panamá (LEAN, IMR, MMR, EA, ES), UNICEF (CM)

(Table 2 continues on next page)

	Indicators									Methods	Main sources
	E0	IMR	MMR	BW	CM	CO	AO	EA	ES		
(Continued from previous page)											
Peru		✓		✓	✓			✓	✓	Reproduced	National Institute of Statistics and Information (IMR), UNICEF (BW, CM, ES), National Institute of Statistics and Information Peru (EA)
Russia		✓	✓					✓		Reproduced	Territorial body of Federal state statistics service and Health Department of the Yamalo–Nenets Autonomous Okrug (all)
Sweden	✓	✓		✓				✓	✓	Reproduced, calculated (IMR, EA, ES)	Statistics Sweden (E0, IMR, EA, ES), National Board of Health and Welfare in Sweden (BW)
Thailand		✓						✓	✓	Reproduced, calculated (IMR)	National Statistical Office of Thailand (all indicators)
USA	✓	✓		✓		✓	✓	✓	✓	Reproduced, calculated (EA, ES)	Centers for Disease Control and Prevention (E0, IMR, BW, CO, AO), Indian Health Service (E0), academic research (CO, E0 for Native Hawaiians in Hawaii), Hawaii Data Warehouse (IMR, BW), US Bureau of the Census (EA, ES)
Venezuela		✓						✓	✓	Reproduced	Comisión Económica para América Latina y el Caribe (IMR), Venezuela National Statistics Institute (EA, ES)

See the appendix for all data references. ES=economic status. E0=life expectancy at birth. CM=child malnutrition. CO=child obesity. AO=adult obesity. EA=educational attainment. IMR=infant mortality rate. MMR=maternal mortality ratio. BW=birthweight.

Table 2: **Summary of data sources for measures**

Data sources and exclusions

Data sources are summarised by country and indicator (table 2). We draw on 148 sources for Indigenous and benchmark data. References for data sources and notes about indicators are provided in the appendix.

Maternal mortality ratio and birthweight for Nepal were calculated from data produced by the Himalayan Health and Environmental Services, Solukhumbu Safer Motherhood, and NewBornCare Project (unpublished data). Data were obtained through the Nepalese Government's comprehensive home visitation programme, which provided antenatal care and birthing support for all pregnant women from 33 Village Development Committees (local areas) out of a total of 34 (one being too remote for care delivery). The Norwegian data for adult obesity and education were calculated from data obtained through the SAMINOR 2 survey programme[15,16] that provides data based on self-reported ethnicity. The methodology for SAMINOR replicates the methodology of SAMINOR 1, which has been previously reported.[15,16]

Data were excluded at review on the advice of contributors and the Data Review Group because of concerns about data quality (Cameroon, infant mortality rate; Colombia, educational attainment and economic status; Kenya, educational attainment and infant mortality rate; USA, maternal mortality ratio; Pakistan, child obesity; Nigeria Fulani, infant mortality rate; and Nigeria Ijaw, maternal mortality ratio). Further details are provided in the appendix.

Statistical analysis

Rate differences were calculated for all reported indicators, as were rate ratios, except for life expectancy at birth. The percentage difference was calculated for life expectancy at birth as a relative measure (benchmark life expectancy at birth minus Indigenous life expectancy at birth divided by benchmark life expectancy at birth $\times 100$). To calculate rate differences the benchmark rate (or prevalence) was subtracted from the Indigenous rate.

Indigenous, benchmark data, and rate differences for life expectancy at birth and infant mortality rate are also analysed by level of country income. The purpose of this analysis was to explore the relation between these data and country income status, not to make comparisons between Indigenous populations.

Rates were calculated from data sources described in table 2 in those instances in which measures were not available from published sources. Calculations were made for: Australia, economic status; Brazil, educational attainment and economic status; China (Tibet), maternal mortality ratio; Colombia, infant mortality rate, maternal mortality ratio, low and high birthweight, child malnutrition, child obesity, adult obesity, educational attainment, economic status; Myanmar, adult obesity; Nepal, infant mortality rate, maternal mortality ratio, birthweight; New Zealand, low and high birthweight; and Norway, adult obesity, economic status.

Contributors provided CIs when they were available. For some indicators, for which CIs were not provided but numerator data were available, the log transformation method was used to estimate 95% CIs on rates and rate ratios for infant mortality rate, maternal mortality ratio, and low and high birthweight.[17] These should be interpreted as indicative only. For proportions, for SEs that were provided, 95% CIs were calculated on the assumption of a normal distribution (adult obesity in Australia and economic status in India).

	WHO region	World Bank income level	Indigenous legal status	Indigenous population measured in indicators	Benchmark population measured in indicators	Population of Indigenous group in this report	Total population of country	Indigenous population as percentage of total
Australia	Western Pacific	High income	Working definition from the Department of Aboriginal Affairs (1981)	Aboriginal and Torres Strait Islanders	Non-Aboriginal and Torres Strait Islanders	669 881 (2011)	22 340 024 (2011)	3·00%
Brazil	Region of the Americas	Upper-middle income	See Brazil Indian statute	Indigenous peoples (multiple groups)	Total population of Brazil (IMR, BW, CM, AO), non-Indigenous population of Brazil (EA, ES)	817 963 (2010)	190 755 799 (2010)	0·43%
Cameroon	African	Lower-middle income	None	Baka	Total population of Cameroon	40 000 (2005, estimation)	17 463 836 (2005)	0·23%
Canada	Region of the Americas	High income	Canadian Constitution Act of 1982 Part II: Rights of the Aboriginal Peoples of Canada	First Nations, Inuit, and Métis	Total population of Canada (E0, IMR, BW, EA, ES), non-Aboriginal Canadians (CO, AO)	851 560 (First Nations, 2011), 451 795 (Metis 2011), 59 445 (Inuit 2011)	33 476 688 (2011)	2·54% (First Nations), 1·35% (Metis), 0·18% (Inuit)
Chile	Region of the Americas	High income	Chile's Indigenous Law	Mapuche in Araucania (IMR), Mapuche (BW, CM, CO), Alacalufe (Kawaskar), Atacameño, Aymara, Colla, Mapuche, Quechua, Rapanui, or Yámana/Yagán (EA), Aymara, Rapanui, Quechua, Mapuche, Atacameño, Coya, Kawesqár, Yagan, Diaguita (ES)	Total population of Chile (IMR), non-Mapuche population of Chile (BW, CM, CO), population excluding those Indigenous groups (EA, ES)	692 192 (2002)	15 116 435 (2002)	4·58%
China (Dai)	Western Pacific	Upper-middle income	Chinese Government document: The ethnic nations of China	Dai in Yunnan province (E0, BW, CM, CO), Dai in Dehong Dai-Jinpo Autonomous Prefecture and in Dehong Xishuangbanna dai Autonomous Prefecture (IMR, MMR), Dai in China (EA), Rural Dai in Dehong Dai-Jinpo Autonomous Prefecture and in Dehong Xishuangbanna dai Autonomous Prefecture (ES)	Han in Yunnan (E0, BW, CM, CO), Han in Kunming (IMR, MMR), Han in China (EA), rural Han in Kunming (ES)	1 261 311 (total Dai in China, 2010)	1 332 810 869	0·09%
China (Tibet)	Western Pacific	Upper-middle income	Chinese Government document: The ethnic nations of China	Tibetan Autonomous Region (E0, IMR, MMR, EA, ES), Tibetan in Lhasa (BW, CM, CO), urban and rural Lhasa (AO)	Total population of China (E0, IMR, MMR, CO, AO, EA, ES), non-Tibetan in Lhasa (BW), Han in Lhasa (CM)	3 002 166 (2010)	1 332 810 869 (2010)	0·22%
Colombia	Region of the Americas	Upper-middle income	Colombian Government 1991 law	Indigenous peoples (multiple groups)	Total population of Colombia (IMR, MMR, BW), non-Indigenous population of Colombia (CM, CO, AO)	1 392 623 (2005)	41 468 384 (2005)	3·36%
Greenland	European	High income	None	Inuit	Denmark	49 975 (2015)	55 984 (2015)	89·27%
India	Southeast Asia	Lower-middle income	Constitution of India	Scheduled Tribes (E0, IMR, EA, ES), tribal population (CM, CO, AO)	Non-Scheduled Tribes population of India (E0, IMR, EA, ES), rural population (CM, CO, AO)	104 281 034 (2011)	1 210 569 573 (2011)	8·61%
Kenya	African	Lower-middle income	None identified	Maasai	Total population of Kenya	841 622 (2009)	38 610 097 (2009)	2·18%
Myanmar	Southeast Asia	Lower-middle income	1982 Myanmar Citizenship Law	Mon	Total population of Myanmar	2 054 393 (2014)	51 486 253 (2014)	3·99%
Nepal	Southeast Asia	Low income	Nepalese Government Indigenous Act 2002	All population in Solukhumbu district (E0), Sherpa, Rai, Magar, Tamang in Solukhumbu district (MMR, BW), Sherpa in Nepal (EA), all Indigenous population living in the Hill and Mountain regions (ES)	Total population of Nepal (E0), non-Indigenous population in Solukhumbu district (MMR, BW), Brahmin in Nepal (EA), non-Indigenous Hill Brahmin and Chettri population (ES)	4 160 513 (total Sherpa, Rai, Magar, Tamang in Nepal 2011)	26 494 504 (2011)	15·70%

(Table 3 continues on next page)

	WHO region	World Bank income level	Indigenous legal status	Indigenous population measured in indicators	Benchmark population measured in indicators	Population of Indigenous group in this report	Total population of country	Indigenous population as percentage of total
(Continued from previous page)								
New Zealand/ Aotearoa	Western Pacific	High income	Treaty of Waitangi	Māori	Non-Māori population of New Zealand	598 605 (2013)	4 471 100 (2013)	14·90%
Nigeria (Fulani)	African	Lower-middle income	None identified	Fulani	Total population of Nigeria	5 300 000 (2007)	140 431 790 (2006)	3·77%
Nigeria (Ijaw)	African	Lower-middle income	None identified	Ijaw	Total population of Nigeria	14 828 429 (2007)	140 431 790 (2006)	10·56%
Norway	European	High income	The Sami Act	Sami	Population of non-Sami settlement areas north of the Arctic Circle (E0), non-Indigenous population of Norway (AO, EA)	55 652 (2013)	5 051 275 (2013)	1·105%
Pakistan	Eastern Mediterranean	Lower-middle income	Federal Administered Tribal Areas recognised in Pakistan Constitution	Federal Administered Tribal Areas	Total population of Pakistan	3 176 331 (1998)	132 352 279 (1998)	2·40%
Panama	Region of the Americas	Upper-middle income	Panama Constitution and laws creating reservations	Kuna Yala, Emberá-Wounaan, Ngäbe Buglé (IMR, MMR, E0, CM), Kuna, Ngäbe Buglé, Teribe/Naso, Bokota, Emberá, Wounaan, and Bri Bri (EA, ES)	Population of Panama except Kuna Yala, Emberá-Wounaan, Ngäbe Buglé regions (E0, IMR, MMR, CM), population of Panama except Kuna, Ngäbe Buglé, Teribe/Naso, Bokota, Emberá Wounaan and Bri Bri (EA), non-Indigenous (ES)	199 857 (2010)	3 405 813 (2010)	5·95%
Peru	Region of the Americas	Upper-middle income	Peru Law of previous consultation for Indigenous people	Indigenous people from the Amazonian region (IMR, BW, EA, ES), all Amazonian region (CM)	Spanish mother tongue	300 000 (2003 estimate)	27 103 457 (2003)	1·11%
Russia	European	High income	The Constitution of the Russian Federation	Nenets in the Yamalo–Nenets Autonomous Okrug	Total population of the Yamalo–Nenets Autonomous Okrug	29 772 (2010)	142 900 000 (2010)	0·02%
Sweden	European	High income	Sami Parliament Act	Sami	Population of Sweden excluding communities with high share of Sami (E0, IMR, EA, ES), outside of Sami administrative area in Sweden (BW)	20 000 (2014, estimate)	9 747 355 (2014)	0·21%
Thailand	Southeast Asia	Upper-middle income	None identified	Ethnic minorities	Thai-speaking population of Thailand	1 901 468 (2010)	65 981 659 (2010)	2·88%
USA	Region of the Americas	High income	USA federal regulations	American Indians and Alaska Natives (AIAN), Native Hawaiians in Hawaii (NH; E0, IMR, BW, AO, EA, ES), Native Hawaiians and other Pacific Islanders (NHPI; EA, ES)	Total population of USA (E0, AIAN IMR, BW, CO, EA, ES), non-Indigenous Hawaiians (NH IMR, BW)	5 220 579 (AIAN 2010), 1 225 195 (NHPI 2010)	308 745 538 (2010)	1·69%(AIAN), 0·40% (NHPI)
Venezuela	Region of the Americas	High income	See Venezuela Constitution	Indigenous peoples (multiple groups)	Non-Indigenous population of Venezuela	724 592 (2011)	27 227 930 (2011)	2·66%

IMR=infant mortality rate. BW=birthweight. CM=child malnutrition. AO=adult obesity. E0=life expectancy at birth. EA=educational attainment. ES=economic status. CO=child obesity. MMR=maternal mortality ratio. AIAN=American Indian and Alaska Natives. NHPI=Native Hawaiians and Pacific Islanders. NH=Native Hawaiians in Hawaii.

Table 3: **Population information by country**

Indirect methods were used to calculate life expectancy at birth and infant mortality rate (Colombia, India, Thailand, and Tibet) if death data were not disaggregated by Indigenous status or were of questionable quality. Indirect methods estimate deaths by analysis of changes in population cohorts. However, bias might be introduced through migration or changes in the identification status of individuals.

	Measure	Indigenous population		Benchmark population		Indigenous rate or prevalence	Benchmark rate or prevalence	Difference	Ratio
		Time period	n/N	Time period	n/N				
Australia									
E0	Years*	2010–12	..	2010–12	..	Males 69·1 (67·8–70·4); females 73·7 (72·5–74·9); total 71·4 (70·2–72·7)	Males 79·7; females 83·1; total 81·4	−10·0	12·3†
IMR	Deaths of children aged <1 year per 1000 livebirths	2009–13	502/79 672	2009–13	3714/1 003 783	6·3 (5·8–6·9)‡	3·7 (3·6–3·8)‡	2·6	1·70 (1·55–1·87)‡
MMR	Maternal deaths per 100 000 women who gave birth	2008–12	8/57 971	2008–12	94/1 428 138	13·8 (6·9–27·6)‡	6·6 (5·4–8·1)‡	7·2	2·09 (1·02–4·30)‡
LBW	Children with birthweight <2500 g (%)	2012	1450/12 314	2012	17 793/297 547	11·8% (11·2–12·5)‡	6·0% (5·9–6·1)‡	5·8	1·97 (1·86–2·08)‡
HBW	Children with birthweight ≥4500 g (%)	2012	197/12 314	2012	5060/297 547	1·6% (1·4–1·8)‡	1·7% (1·7–1·7)‡	−0·1	0·94 (0·82–1·09)‡
CM	Underweight children aged 2–14 years (Cole's cutoff, %)[9]	2012–13	12 100/151 900	2012–13	134 900/2 802 200	8·0% (SE 0·656)	4·8% (SE 0·384)	3·2	1·67
CO	Obese children aged 2–14 years (Cole's cutoff, %)§[9]	2012–13	15 400/151 900	2012–13	182 600/2 802 200	10·2% (SE 0·796)	6·5% (SE 0·488)	3·7	1·57
AO	Adults aged 15 years and over with BMI ≥30 kg/m² (%)§	2012–13	128 100/342 800	2012–13	3 920 600/14 854 900	41·0% (39·4–42·6)	26·2% (25·4–27·0)	14·8	1·56
EA	Adults aged 20–24 years who attained year 12 qualification equivalent (%)	2012–13	34 154/58 386	2013	1 307 121/1 518 984	58·5% (53·9–63·1)	86·1% (83·5–88·7)	−27·6	0·68
ES	Households with equivalised incomes less than US$420 per week (Australian minimum wage, %)	2011	99 487/178 159	2011	2 550 210/6 753 657)	55·8%	37·8%	18·0	1·51
Brazil									
IMR	Deaths of children aged <1 year per 1000 livebirths	2009–10	705/17 373	2009–10	45 574/2 988 419	40·6 (37·7–43·7)‡	15·3 (15·2–15·4)‡	25·3	2·65 (2·46–2·86)‡
LBW	Children with birthweight <2500 g (%)	2008–09	298/3955	2006	320/4697	7·5% (6·5–8·6)‡	6·8% (6·1–7·6)‡	0·7	1·10 (0·92–1·32)‡
CM	Children aged <5 years with stunting (WHO/NCHS standard,[8] %)	2008–09	1545/6011	2006	305/4363	25·7%	7·0%	18·7	3·67
AO	Females aged 15–49 years with BMI ≥30 kg/m² (%)	2008–09	903/5714	2006	2382/14 782	15·8%	16·1%	−0·3	0·98
EA	Adults aged 25–59 years who attained year 12 qualification equivalent (%)	2009–10	66 708/301 821	2009–10	36 105 016/89 418 135	22·1%	40·3%	−18·2	0·54
ES	Households with income below Brazilian minimum salary (R$510 [US$283] per month, %)	2009–10	136 549/215 590	2009–10	23 763 551/57 228 413	63·3%	41·5%	21·8	1·53
Cameroon									
E0	Years*	2001	..	2013	..	Males 35; females 36; total 35·5	Males 56; females 58; total 57·0	−21·5	37·7†
EA	Children aged 5–19 years attending primary and secondary school (%)	2001	..	2005	2 741 727/4 924 319	33·0%	55·7%	−22·7	0·59
Canada									
E0	Years								

(Table 4 continues on next page)

	Measure	Indigenous population		Benchmark population		Indigenous rate or prevalence	Benchmark rate or prevalence	Difference	Ratio
		Time period	n/N	Time period	n/N				
(Continued from previous page)									
	First Nations	2017¶	..	2017¶	..	Males 73·0 (ME 0·4); females 78·0 (ME 0·4); total 75·5 (ME 0·4)	Males 79·0 (ME <0·1); females 83·0 (ME <0·1); total 81·0 (ME <0·1)	−5·5	6·8†
	Inuit	2017¶	..	2017¶	..	Males 64·0; females 73·0; total 68·5	Males 79·0 (ME <0·1); females 83·0 (ME <0·1); total 81·0 (ME <0·1)	−12·5	15·4†
	Métis	2017¶	..	2017¶	..	Males 74·0 (ME 0·9); females 80·0 (ME 0·9); total 77·0 (ME 0·9)	Males 79·0 (ME <0·1); females 83·0 (ME <0·1); total 81·0 (ME <0·1)	−4·0	4·9†
IMR	Deaths of children aged <1 year per 1000 livebirths (First Nations)	1997–2007	..	1997–2007	..	10·7	5·7	5·0	1·87
LBW	Children with birthweight <2500 g (First Nations, %)	2001–02	550/9650	2001–02	7347/131 200	5·7% (5·0–6·4)	5·6% (5·4–5·8)	0·1	1·02
HBW	Children with birthweight >4000 g (First Nations, %)	2001–02	2007/9650	2001–02	8630/131 200	20·8% (19·5–22·1)	14·2% (13·9–14·5)	6·6	1·46
CO	Obese children aged 2–17 years (WHO standard;[8] First Nations off-reserve, Métis, and Inuit, %)	2004	93/589	2004	945/11 816	15·8% (SE 0·5)	8·0% (SE 0·1)	7·8	1·98
AO	Adults aged ≥18 years with BMI ≥30 (Aboriginal, %)	2004	275/727	2004	3103/13 728	37·8% (SE 0·8)	22·6% (SE 0·1)	15·2	1·67
EA	Adults aged 18–44 years who attained year 12 qualification equivalent (%)								
	First Nations	2008–12	10 864/16 461	2011	‖	66·0% (60·0–72·0)	89·0%	−23·0	0·74
	Inuit	2012	1032/2457	2011	‖	42·0%	89·0%	−47·0	0·47
	Métis	2012	3686/4787	2011	‖	77·0%	89·0%	−12·0	0·87
ES	Individuals earning less than CAN$10 000 (US$7460) per year (First Nations, %)	2009	3589/11 043	2008–10	‖	32·5%	16·6%	15·9	1·96
Chile									
IMR	Deaths of children aged <1 year per 1000 livebirths (%)	2011	174/20 035	2011	1742/227 323	8·7 (8·3–9·1)	7·7 (7·6–7·8)	1·0	1·13 (0·96–1·33)
LBW	Children with birthweight <2500 g (%)	2004	791/15 273	2004	12 109/215 079	5·2% (4·8–5·6)	5·6% (5·5–5·7)	−0·5	0·92 (0·85–0·99)
HBW	Children with birthweight ≥4000 g (%)	2004	1642/15 273	2004	19 594 /215 079	10·8% (10·3–11·3)	9·1% (9·0–9·2)	1·6	1·18 (1·11–1·78)
CM	Children aged 6–7 years with stunting (WHO/NCHS standard,[8] %)	2005	82/2212	2005	4295/165 196	3·7% (2·9–4·5)	2·6% (2·5–2·7)	1·1	1·42 (1·12–1·78)
CO	Obese children aged 6–7 years (NCHS/CDC 2002,[24] %)	2005	389/2229	2005	30 828/165 742	17·5% (15·9–19·1)	18·6% (18·4–18·8)	−1·1	0·94 (0·84–1·05)
EA	Literacy rate of individual aged >10 years (%)	2002	529 758/577 323	2002	11 586 396/12 071 438	91·8% (91·7–91·9)	96·0% (95·99–96·01)	−4·2	0·96 (0·95–0·96)
ES	Individuals earning below the Chilean poverty line ($72 098 [US$106] per month, %)	2011	260 217/1 369 563	2011	2 175 407/15 538 622	19·0% (18·90–19·06)	14·0% (13·98–14·02)	5·0	1·36 (1·35–1·36)

(Table 4 continues on next page)

	Measure	Indigenous population		Benchmark population		Indigenous rate or prevalence	Benchmark rate or prevalence	Difference	Ratio
		Time period	n/N	Time period	n/N				
(Continued from previous page)									
China (Dai)									
E0	Years	2000	..	2000	..	Males 64·5; females 69·9; total 67·2	Males 67·0; females 69·9; total 68·5	−1·3	1·8†
IMR	Deaths of children aged <1 year per 1000 livebirths	2010	..	2010	..	13·2	8·1	5·1	1·63
MMR	Maternal deaths per 100 000 women who gave birth	2010	..	2010	..	64·0	40·4	23·6	1·60
LBW	Children with birthweight <2500 g (%)	2013	192/2691	2013	58/1284	7·1% (6·2–8·2)‡	4·5% (3·5–5·8)‡	2·6	1·58 (1·18–2·12)‡
CM	Children aged 0–7 years with stunting (WHO/NCHS standard,[8] %)	2013	399/2970	2013	145/1416	13·4%	10·2%	3·2	1·31
CO	Obese children aged 0–7 years (WHO standard,[8] %)	2013	81/2970	2013	47/1417	2·7%	3·3%	−0·6	0·82
EA	Individuals >6 years who attained year 9 qualification equivalent (%)	2010	210 510/908 620	2010	411 111 077/933 993 066	25·4%	42·3%	−16·9	0·60
ES	Individuals earning less than China's poverty line (2300 Yuan [US$360] per year, %)	2014	..	2014	..	0·6%	7·1%	−6·5	0·08
China (Tibet)									
E0	Years	2010	..	2010	..	Males 70·4; females 74·8; total 72·6	Males 72·4; females 77·4; total 74·8	−2·2	2·9†
IMR	Deaths of children aged <1 year per 1000 livebirths	2010	..	2012	..	19·0	10·3	8·7	1·84
MMR	Maternal deaths per 100 000 women who gave birth	2009	3/2789	2009	..	107·6 (34·7–333·6)‡	31·9	75·7	3·37
LBW	Children with birthweight <2500 g (%)	2005	236/1939	2005	109/601	12·2% (10·74–13·66)	18·1% (15·02–21·18)	−5·9	0·67
CM	Children aged 9–10 years with stunting (WHO/NCHS standard,[8] %)	2005	4/405	2005	13/403	1·0% (0·13–1·97)	3·2% (1·48–4·92)	−2·2	0·31
CO	Obese children aged 9–10 years*§ (Cole's cutoff,[9] %)	2005	4/405	2005	2/403	1·0% (0·37–2·61)	0·5% (0·12–1·97)	0·5	2·00
AO	Adults aged 30–70 years (IN) and >18 years (BM) with BMI ≥30 kg/m² (%)§	2006	47/1020	2002	5646/98 658	4·6% (3·32–5·90)	5·7% (5·58–5·86)	−1·1	0·81
EA	Individuals aged >6 years who attained year 12 qualification equivalent (%)	2010	29 6351/2 705 849	2010	305 021 762/1 242 546 122	10·9% (10·86–10·94)	24·5% (24·5–24·5)	−13·6	0·44
ES	Individuals earning less than China's poverty line (2300 Yuan [US$360] per year, %)	2010	103 2688/3 002 000	2010	166 000 000/1 332 811 000	34·4% (34·35–34·45)	12·5% (12·45–12·46)	21·9	2·75
Colombia									
IMR	Deaths of children aged <1 year per 1000 livebirths	2012	450/13 867	2012	8220/676 835	32·5	12·1	20·4	2·69

(Table 4 continues on next page)

	Measure	Indigenous population		Benchmark population		Indigenous rate or prevalence	Benchmark rate or prevalence	Difference	Ratio
		Time period	n/N	Time period	n/N				
(Continued from previous page)									
MMR	Maternal deaths per 100 000 women who gave birth	2012	33/13 867	2012	446/676 835	237·9 (169·1–334·6)‡	65·8 (60·0–72·2)‡	172·1	3·62 (2·54–5·15)‡
LBW	Children with birthweight <2500 g (%)	2012	967/12 588	2012	60 472/673 201	7·7% (7·2–8·2)‡	8·9% (8·8–9·0)‡	−1·2	0·86 (0·81–0·92)‡
HBW	Children with birthweight ≥4000 g (%)	2012	434/12 588	2012	22 379/673 201	3·4% (3·1–3·7)‡	3·3% (3·3–3·3)‡	0·1	1·02 (0·94–1·13)‡
CM	Children aged <5 years with stunting (WHO/NCHS standard,[8] %)	2010	823/2353	2010	1857/15 343	29·5% (25·3–34·1)	12·3% (11·6–13·1)	17·2	2·40
CO	Obese children aged 0–4 years (WHO standard,[8] %)§	2010	135/2353	2010	757/15 343	6·8% (5·2–8·8)	5·1% (4·7–5·6)	1·7	1·33
AO	Adults aged 18–64 years with BMI ≥30 kg/m² (%)§	2010	1085/8554	2010	14 258/80 610	15·1% (13·8–16·5)	16·6% (16·2–16·9)	−1·5	0·91
Greenland									
E0	Years*	2009–13		2012		Males 67·3; females 73·3; total 70·3	Males 77·3; females 81·6; total 79·5	−9·2	11·5†
IMR	Deaths of children aged <1 year per 1000 livebirths	2005–11	91/6000	2010	63 411**	15·2 (12·4–18·7)‡	3·4 (3·0–3·9)‡	11·8	4·47 (3·50–5·71)‡
LBW	Children with birthweight <2500 g (%)	2005–10	220/4600	2010	3252/63 103	4·8% (4·2–5·5)‡	5·2% (5·0–5·4)‡	−0·4	0·92 (0·81–1·06)‡
CM††	Children aged 3–5* years with stunting (WHO/NCHS standard,[8] %)	1997–2005	..	..	658	1·8%	..	..	..
CO	Children aged 3–5 years (IN), 6–8 years (BM; Cole's cutoff,[9] %)	1997–2005	..	2003	..	10·5%	4·1%	6·4	2·56
AO	Adults aged >18 years (IN), 18–69 years (BM) with BMI ≥30 kg/m² (%)‡‡	2005–10	3056**	2006–08	3471**	23·1%	16·1%	7·0	1·43
EA	Individuals aged 10–69 years (IN), 15–69 years (BM) who attained year 12 qualification equivalent (%)	2005–10	..	2014	..	46·0%	62·0%	−16·0	0·74
India									
E0	Years	2011	..	2011	..	Males 62·6; females 65·3; total 63·9	Males 65·7; females 68·3; total 67·0	−3·1	4·6†
IMR	Deaths of children aged <1 year per 1000 livebirths	2008	..	2008	..	74·3	61·7	12·6	1·20
CM	Children aged <5 years with stunting (WHO/NCHS standard,[8] %)	2008–09	7454/14 587	2011–12	3787/8787	51·1% (50·3 – 51·9)	43·1% (42·1–44·1)	8·0	1·19
CO	Obese children aged 14–17 years (WHO standard,[8] %)	2008–09	7/7084	2011–12	24/5945	0·1% (0·03–0·17)	0·4% 0·24–0·56)	−0·3	0·29
AO	Adults aged ≥18 years with BMI ≥30 kg/m² (%)*	2008–09	141/70 525	2011–12	1016/56 425	0·2% (0·17–0·23)	1·7% (1·69–1·91)	−1·5	0·12
EA	Adults aged ≥18 years who attained year 12 qualification equivalent (%)	2011–12	2753/41 091	2011–12	36 598/265 200	6·7% (SE 0·003)	13·8% (SE 0·002)	−7·1	0·49

(Table 4 continues on next page)

	Measure	Indigenous population		Benchmark population		Indigenous rate or prevalence	Benchmark rate or prevalence	Difference	Ratio
		Time period	n/N	Time period	n/N				
(Continued from previous page)									
ES	Individuals earning less than India's poverty line (Rs 816 [US$12·40] in villages and Rs 1000 [US$15·20] in cities per month, %)	2011–12	26 432/65 103	2011–12	81 958/399 797	40·6% (38·1–43·1)	20·5% (19·7–21·3)	20·1	1·98
Kenya									
E0	Years*	2001	..	1999	..	Males 42·0; females 45·0; total 43·5	Males 52·8; females 60·4; total 56·6	−13·1	23·1†
MMR	Maternal deaths per 100 000 livebirths	2008–09	..	2008–09	..	500·0	488·0	12·0	1·02
LBW	Children with bodyweight <2500 g (%)	2011	..	2013	..	16·4%	8·0%	8·4	2·05
CM	Children aged <5 years underweight (WHO international ref pop,[8] %)	2011–12	..	2009	..	20·7%	16·4%	4·3	1·26
EA	Literacy rate of individuals aged >15 years (%)	2007	..	2010	..	48·0%	87·4%	−39·4	0·55
Myanmar									
LBW	Children with birthweight <2500 g (%)	2009–10	21/230	2009–10	518/6028	9·1% (6·0–14·0)‡	8·5% (7·8–9·2)‡	0·68	1·08 (0·67–1·67)‡
CM	Children aged <5 years with stunting (WHO/NCHS standard,[8] %)	2009–10	202/679	2009–10	5385/15 342	29·7% (26·3–33·1)	35·1% (34·3–35·9)	−5·4	0·85
CO	Obese children aged <5 years (WHO standard,[8] %)	2009–10	10/674	2009–10	385/14 821	1·5% (0·6–2·4)	2·6% (2·3–2·9)	−1·1	0·58
AO	Adults aged 15–64 years with BMI ≥30 kg/m^2 (%)	2009–10	35/445	2009–10	472/7352	8·0% (5·4–10·5)	6·4% (5·8–7·0)	1·6	1·25
EA	Net enrolment rates for secondary education of children aged 10–16 years (%)	2010	..	2010	..	63·4% (60·3–66·5)	52·5% (50·3–54·7)	10·9	1·21
ES	Individuals earning less than the Myanmar poverty line (376 151 Kyat [US$292] per year, %)	2010	..	2010	..	16·3% (13·4–19·2)	25·6% (22·9–28·3)	−9·3	0·64
Nepal									
E0	Years	2011	..	2011	..	Males 68·4; female 65·0; total 66·7	Males 67·9; females 65·6; total 66·6	0·1	−0·2†
MMR	Maternal deaths per 100 000 livebirths	2009–10	11/1703	2009–10	3/531	645·9 (357·7–1166·3)‡	565·0 (182·2–1751·9)‡	80·9	1·14 (0·32–4·10)‡
LBW	Children with birthweight <2500 g (%)	2009–10	44/1703	2009–10	12/531	2·6% (1·8–3·3)	2·3% (1·0–3·5)	0·3	1·15
EA	Individuals aged <20 years with up to 12 years of education (%)	2011	..	2011	..	24·5%	45·4%	−20·9	0·54
ES	Households with per capita expenditure below Nepal poverty line (Rs 19 261 [US$183] per year, %)	2010	..	2010	..	23·7%	17·7%	6·0	1·34
New Zealand/Aotearoa									
E0	Years*	2012–14	..	2012–14	..	Males 73·0 (72·7–73·3); females 77·1 (76·8–77·5); total 75·1	Males 80·3 (80·2–80·4); females; 83·9 (83·8–84·0); total 82·1	−7·0	8·5†

(Table 4 continues on next page)

	Measure	Indigenous population		Benchmark population		Indigenous rate or prevalence	Benchmark rate or prevalence	Difference	Ratio
		Time period	n/N	Time period	n/N				
(Continued from previous page)									
IMR	Deaths of children aged <1 year per 1000 livebirths	2009–11	408/55 397	2009–11	606/134 761	7·4 (6·7–8·2)	4·5 (4·1–4·8)	2·9	1·64 (1·45–1·86)‡
MMR	Maternal deaths per 100 000 pregnancies	2006–12	35/103 116	2006–12	42/342 827	33·9 (24·3–47·2)‡	12·3 (9·1–16·6)‡	21·7	2·76 (1·76–4·32)‡
LBW	Children with birthweight <2500 g (%)	2011–13	2151/131 839	2011–13	4434/78 100	6·8% (6·5–7)	5·7% (5·6–5·8)	1·1	1·19 (1·15–1·24)‡
HBW	Children with birthweight ≥4500 g (%)	2011–13	723/31 839	2011–13	1998/78 100	2·3% (2·1–2·4)	2·6% (2·5–2·6)	−0·3	0·89 (0·82–0·97)‡
CM	Children aged 2–14 years underweight (Cole's cutoff,[9] %)	2012–13	..	2012–13	..	3·4% (2·0–5·5)	4·0% (3·0–5·2)	−0·6	0·89 (0·51–1·56)‡
CO	Obese children aged 5–14 years (Cole's cutoff,[9] %)§§	2013–14	..	2013–14	..	17·9% (14·5–21·9)	8·4% (6·8–10·4)	9·5	2·13 (1·58–2·87)
AO	Adults aged ≥15 years with BMI ≥30 kg/m² (%)§§	2013–14	..	2013–14	..	44·7% (43·8–50·6)	24·7% (23·6–25·9)	20·0	1·76 (1·65–1·87)
EA	Adults aged ≥15 years who attained year 12 qualification equivalent (%)	2013	178 845/359 286	2013	1 803 498/2 641 347	49·8%	68·3%	−18·5	0·73
ES	Households with equivalised disposable income <60% of the median, after housing costs (fixed line, %)	2012–13	..	2012–13	..	24·0%	12·0%	12·0	2·00
Nigeria (Fulani)									
CM	Children aged <5 years with stunting (WHO/NCHS standard,[8] %)	2003–04	..	2003	..	38·7%	41·3%	−2·6	0·94
AO	Females aged 15–49 years with BMI ≥25·0 kg/m² (%)	2001	..	2001–03	..	17·4%	19·6%	−2·2	0·89
EA	Literacy rate of individuals aged >15 years (%)	2008	..	2008	..	2·0%	51·1%	−49·1	0·04
Nigeria (Ijaw)									
E0	Years	2000	..	2000	..	Total 46·8	Total 46·9	−0·1	0·3†
CM	Children aged <5 years with stunting (WHO/NCHS standard,[8] %)	2013	..	2013	..	18·3%	36·8%	−18·5	0·50
CO	Obese children aged <5 years (WHO standard,[8] %)	2013	..	2013	..	4·5%	4·0%	0·5	1·13
EA	Literacy rate of individuals aged >15 years (%)	2000–06	..	2013	..	57·0%	70·5%	−13·5	0·81
ES	Individuals earning less than the international poverty line (US$1·25 per day, %)	2004	..	2013	..	42·9%	54·0%	−11·2	0·79
Norway									
E0	Years*	2010–12	..	2012	..	Males 77·1; females 82·4; total 79·8	Males 79·2; females 83·6; total 81·4	−1·6	2·0†
AO	Adults aged 40–79 years with BMI ≥30 kg/m² (%)	2012–14	1029/3184	2012–14	705/2706	32·3% (30·7–34·0)	26·1% (24·4–27·7)	6·2	1·24
EA	Adults aged 18–69 years who attained year 12 qualification equivalent (%)	2012	2654/3866	2012	5259/7498	68·6% (67·2–70·1)	70·1% (69·1–71·1)	−1·5	0·98

(Table 4 continues on next page)

	Measure	Indigenous population		Benchmark population		Indigenous rate or prevalence	Benchmark rate or prevalence	Difference	Ratio
		Time period	n/N	Time period	n/N				
(Continued from previous page)									
Pakistan									
IMR	Deaths of children aged <1 year per 1000 livebirths	2007	..	2006–07	..	86·0	78·0	8·0	1·10
MMR	Maternal deaths per 100 000 livebirths	2007	..	2006–07	..	380·0	276·0	104·0	1·38
CM	Children aged <5 years with stunting (WHO/NCHS standard,[8] %)	2011	477/805	2011	11 976/28 020	57·6% (51·0–64·0)	43·3% (42·3–44·3)	14·3	1·33
AO	Females aged 15–49 years with BMI ≥30 kg/m² (%)	2011	89/879	2011	2744/23 422	10·0% (7·2–13·6)	11·3% (10·6–12·0)	−1·3	0·88
EA	Literacy rate of individuals aged >10 years (%)	2011	1207/2495	2011	73 446/122 858	49·3% (43·5–55·1)	58·6% (57·4–59·8)	−9·3	0·84
Panama									
E0	Years	2012	..	2012	..	Males 67·4; females 71·9; total 69·7	Males 74·2; females 80·3; total 77·3	−7·6	9·8†
IMR	Deaths of children aged <1 year per 1000 livebirths	2013	140/6760	2013	966/67 044	20·7 (17·5–24·4)	14·4 (13·4–15·3)	6·3	1·44 (1·20–1·72)
MMR	Maternal deaths per 100 000 live births	2013	16/6760	2012–13	25/67 044	236·7 (145·0–386·3)	37·3 (25·2–55·2)	199·4	6·35 (3·39–11·89)
CM	Children aged <5 years with stunting (WHO/NCHS standard,[8] %)	2008	..	2008	..	62·0%	19·1%	42·9	3·25
EA	Individuals aged >16 years who attained year 12 qualification equivalent (%)	2010	30 007/359 837	2010	1 014 869/2 760 982	8·3%	36·8%	−28·5	0·23
ES	Households with income <US$400 (2010) per month (%)	2010	256 498/406 368	2010	786 669/2 940 117	63·1%	26·8%	36·3	2·35
Peru									
IMR	Deaths of children aged <1 year per 1000 livebirths	2007	..	2007	..	49·2	18·5	30·7	2·66
LBW	Children with birthweight <2500 g (%)	2007	..	2007	38 612/603 318	8·0%	6·4%	1·6	1·25
CM	Children aged <5 years with stunting[8] (%)	2009	59 636**	2007	..	22·0%	5·0%	17·0	4·40
EA	Individuals >15 years who attained year 12 qualification equivalent (%)	2007	68 605/174 859	2007	20 113 018/25 810 331	39·0% (38·9–39·5)	78·0% (77·9–78·0)	−39·0	0·5
ES	Poverty (based on basic needs, %)	2007	..	2007	..	81·0%	29·0%	52·0	2·79
Russia									
IMR	Deaths of children aged <1 year per 1000 livebirths	2012	33/691	2012	55/8274	47·8 (34·0–67·2)‡	6·6 (5·1–8·7)‡	41·2	7·18 (4·67–11·06)‡
MMR	Maternal deaths per 100 000 livebirths	2013	1/683	2013	2/8179	146·4 (20·6–1039·4)‡	24·5 (6·1–97·8)‡	122·0	5·99 (0·54–66·03)‡
EA	Adults aged >18 years who attained year 12 qualification equivalent (%)	2012	17 785/19 709	2012	422 979/424 872	90·2% (SE 0·42)	99·6% (SE 0·08)	−9·4	0·91
Sweden									
E0	Years*	2013	..	2013	..	Males 79·2 (78·3–80); females 83·2 (83·3–83·9); total 81·2 (79·6–82·8)	Males 79·5 (79·4–79·4); females 83·4 (83·3–83·5); total 81·5 (81·3–81·6)	−0·3	0·3†

(Table 4 continues on next page)

	Measure	Indigenous population		Benchmark population		Indigenous rate or prevalence	Benchmark rate or prevalence	Difference	Ratio
		Time period	n/N	Time period	n/N				
(Continued from previous page)									
IMR	Deaths of children aged <1 year per 1000 livebirths	2009–13	2/705	2009–13	246/113 055	2·8 (0·9–4·8)	2·2 (2·0–2·3)	0·7	1·30
LBW	Children with birthweight <2500 g (%)	2012	216/5269	2012	3283/104 460	4·1% (3·1–5·1)	4·1% (3·8–4·3)	0	1·00
HBW	Children with birthweight >4500 g (%)	2012	190/5269	2012	3970/104 460	3·6% (3·1–4·2)	3·8% (3·6–4·0)	−0·2	0·95
EA	Individuals aged >16 years who attained year 12 qualification equivalent (%)	2013	8492/11 961	2013	5 679 086/7 887 616	71·0% (69·8–72·5)	72·0% (71·5–72·6)	−1·0	0·99
ES	Individuals earning <SEK100 000 (US$12 138) in annual earned income (%)	2012	1360/11 430	2012	839 949/7 367 977	11·9% (11·8–12·0)	11·4% (11·1–11·8)	0·5	1·04
Thailand									
IMR	Deaths of children aged <1 year per 1000 livebirths	2010	..	2010	..	6·6 (5·4–7·7)	4·1 (3·9–4·4)	2·5	1·61
EA	Adults aged >24 years attained year 12 qualification equivalent (%)	2010	..	2010	..	19·0%	36·6%	−17·6	0·52
ES	Households with household wealth index in the lowest quintile (%)	2010	..	2010	..	49·4%	18·6%	30·8	2·66
USA									
E0	Years								
	American Indian and Alaska Natives	2007–09	..	2009	..	Total 73·7	Males 76·0; females 80·9; total 78·5	−4·8	6·1†
	Native Hawaiians in Hawaii	2000	..	2000	..	Males 71·5; females 77·1; total 74·3	Males 74·3; females 79·3; total 76·8	−2·5	3·3†
IMR	Deaths of children aged <1 year per 1000 livebirths								
	American Indian and Alaska Natives	2010	387/46 760	2010	24 572/3 999 386	8·3 (7·5–9·2)‡	6·1 (4·9–7·7)‡	2·2	1·36 (1·23–1·50)‡
	Native Hawaiians in Hawaii	2013	40/6844	2013	24 572/3 999 386	5·8 (4·3–7·9)‡	6·1 (4·9–7·7)‡	−0·3	0·95 (0·65–1·40)‡
LBW	Children with birthweight <2500 g (%)								
	American Indian and Alaska Natives	2010	3578/46 670	2010	326 801/3 999 386	7·7% (7·5–8·0)‡	8·2% (8·2–8·2)‡	−0·5	0·94 (0·91–0·97)‡
	Native Hawaiians in Hawaii	2010	419/5064	2010	326 801/3 999 386	8·3% (7·5–9·1)‡	8·2% (8·2–8·2)‡	0·1	1·01 (0·92–1·11)‡
HBW	Children with birthweight ≥4500 g (%)								
	American Indian and Alaska Natives	2010	775/46 670	2010	40 945/3 999 386	1·7% (1·7–1·7)‡	1·0% (1·0–1·0)*	0·7	1·70 (1·65–1·75)‡
	Native Hawaiians in Hawaii	2013	46/5103	2013	124/13 779	0·9%	0·9%	0	1·00
CO	Obese children aged 12–19 years (CDC 2000;[8] American Indian and Alaska Natives, %)	2008	..	2007–08	..	31·0%	18·1%	12·9	1·71
AO	Adults aged >18 years with BMI >30 kg/m² (Native Hawaiians in Hawaii, %)	2013	43 300/111 200	2013	175 200/915 000	39·0% (34·7–43·4)	19·2% (17·7–20·7)	19·8	2·03

(Table 4 continues on next page)

	Measure	Indigenous population		Benchmark population		Indigenous rate or prevalence	Benchmark rate or prevalence	Difference	Ratio
		Time period	n/N	Time period	n/N				
(Continued from previous page)									
EA	Adults aged >25 years who attained year 12 qualification equivalent (%)								
	American Indian and Alaska Natives	2012	..	2012	..	78·8% (78·3–79·3)	86·4% (ME 0·1)	–7·6	0·91
	Native Hawaiians and Pacific Islanders	2012	..	2012	..	85·4%	86·4% (ME 0·1)	–1·0	0·99
ES	Individuals earning less than USA 2012 poverty line (%)								
	American Indian and Alaska Natives	2012	..	2012	..	29·1% (28·5–29·7)	15·9%	13·2	1·83
	Native Hawaiians and Pacific Islanders	2012	..	2012	..	21·3%	15·9%	5·4	1·34
Venezuela									
IMR	Deaths of children aged <1 year per 1000 livebirths	2001	..	2001	..	44·1	19·6	24·5	2·25
EA	Individuals aged >10 years who attained year 9 qualification equivalent (%)	2011	..	2011	..	35·0%	60·0%	–25·0	0·58
ES	Households with income below poverty line (those who do not have income to cover the costs of a selected group of essential food and priority health services and education, %)	2011	437 945/628 084	2011	6 677 579/24 385 620	69·7% (69·5–69·9)‡	27·4% (27·4–27·4)‡	42·3	2·55

Where available, 95% CIs are shown for rate, prevalence, and ratio data, unless indicated otherwise. E0=life expectancy at birth. IMR=infant mortality rate. MMR=maternal mortality ratio. LBW=low birthweight. HBW=high birthweight. CM=child malnutrition. CO=child obesity. AO=adult obesity. BMI=body-mass index. NCHS=National Center for Health Statistics. EA=educational attainment. ES=economic status. IN=Indigenous population. BM=benchmark population. BW=birthweight. SEK=Swedish Kroner. ME=margin of error. *Total result achieved by averaging male and female result. †Absolute gap as percent of BM E0. ‡CIs were calculated by the authors. §Data are age standardised. ¶Projected from 2010 data. ||Numerator not available, based on about 4·5 million responses. **Numerator data not available. ††BM data for CM has been excluded due to too large a variation in age groups. ‡‡Indigenous datum is age standardised. §§Age adjusted.

Table 4: **Indicator measures by country**

For India, life expectancy at birth and infant mortality rate were calculated drawing on census data for 2011. Infant mortality rate was indirectly calculated from the number of self-reported children ever born and surviving to each cohort of women aged between 15–19 years and 45–49 years. The model variant Brass Trussell[18] was applied to estimate the cumulative probability of dying from birth to age X for children born to women in each cohort of women (5 year groups). Estimates of life expectancy at birth were derived from women aged 20–34 years. The Coale and Demeny South Asia model[19,20] was used to generate mortality levels from chances of dying.

For Tibet, indirect methods were used to calculate infant mortality rate drawing on census data for 1982, 1990, and 2000, which provided information about child survival and child death in women aged 15–49 years. China undertakes a census every 10 years and a survey of 1% of the total Chinese population every 5 years to investigate the quality of routine reporting. Infant deaths for 2010 were adjusted by the national under-reporting rate in 2000.[21] Life expectancy at birth was calculated with indirect methods drawing on census data.

The Thailand infant mortality rate was indirectly calculated from the number of self-reported children ever born and surviving with a Trussell version of the Brass indirect method.[18] The West family of the Coale and Demeny regional model was used to convert the chances of dying to a mortality level.[18,19] Infant mortality rate estimates were derived from women aged 30–34 years.[18,19] SEs for estimates were calculated with the simple variance estimate method.[22]

The Indigenous infant mortality rate in Colombia was indirectly calculated from the number of self-reported children ever born and surviving to women aged 15 years or older. The model variant Brass Trussell was applied to

estimate the cumulative probability of dying from birth to age X for each cohort of women (5 year groups). On the basis of this information, the West family of the Coale and Demeny model[23] was used to convert chances of dying to a mortality level.

Role of the funding source

MT was employed as a Senior Research Fellow at the Lowitja Institute and he contributed to the development of the study and provided support in project implementation and coordination. The Lowitja Institute provided funding for meetings and had no role in study design, data collection, data analysis, data interpretation, or writing of the report. The corresponding author (IA) had full access to all the data in the study and had final responsibility for the decision to submit for publication.

Results

Our sample of 23 countries (of a total of 90 countries with Indigenous populations) covers all WHO global regions. We had data for 28 populations, which encompass many distinct tribal or ethnic groups (tables 3, 4, appendix). We report systematically gathered health and social data from a total Indigenous population of 154 million people, constituting about 50% of an estimated global population of 302·45 million.[2] Ten countries included are classified by the World Bank as high income, six upper-middle income, six lower-middle income, and one low income.

Most Indigenous populations in this report are minorities relative to the total population of their country—the proportionally largest minorities are Sherpa, Rai, Tamang, and Magar of Nepal (15·7%) and Māori in New Zealand (14·9%)—with the exception of Greenland where the Inuit population is 89% of the population.

Indigenous and benchmark data were taken from a total of 148 data sources—115 from government statistics and health data agencies, 11 from other agencies (including UN, World Bank, and WHO), and 22 from academic research publications. Indigenous status was recorded in data for 104 (68%) of 152 measures, and in government data sources for 15 of 23 countries (table 1). If Indigenous status was not recorded, language or geographical proxy measures were used for 48 (32%) of 152 measures.

If Indigenous status was obtained, self-report (otherwise referred to as self-identification) was the main report method (91 [88%] of 104 measures). The instances in which Indigenous status was not reported through self-report were physician identification of Indigenous status and Indigenous status recorded with an administrative measure such as a residential card (China) or tribal enrolment database (life expectancy at birth for American Indian and Alaska Natives; table 1).

Data were available for all indicators in Australia, China (Tibet), and New Zealand. China (Dai) provided data for eight of nine indicators. By contrast, we were able to source data for only two indicators from Cameroon, and three from Nigeria (Fulani), Norway, Russia, Thailand, and Venezuela. We tabulate our data by country with our narrative organised by indicators (tables 3, 4). Summary tables organised by indicators are presented in the appendix.

Data for life expectancy at birth were provided for 14 of 23 countries and 18 populations (appendix). Indigenous populations had a lower life expectancy at birth in which the size of the rate difference was greater than one in 15 of 18 instances. Our data show that the difference from benchmark data for Sweden was not significant (appendix). A gap in life expectancy at birth (ie, lower in Indigenous than non-Indigenous populations) of more than 5 years was recorded for Indigenous populations in Australia, Cameroon, Canada (First Nations and Inuit), Greenland, Kenya, New Zealand, and Panama. A gap of 2 years or less was shown for Indigenous populations in China (Dai), Nigeria (Ijaw), Norway, and Sweden. Populations with a percentage difference greater than 10% were documented in Australia, Cameroon, Canada (Inuit), Kenya, and Greenland.

Countries with an Indigenous life expectancy at birth of lower than 65 years were in the lower-middle-income band (Cameroon, India, Kenya, Nigeria [Ijaw]; figure 1). High-income countries had an Indigenous life expectancy at birth greater than 70 years with the exception of Canada (Inuit, 68·5 years); in China (Tibet), an upper-middle-income country, it was of 72·6 years. Rate differences did not seem to be associated with country income status (figure 1). The largest differences are found in both lower-middle-income countries (Baka in Cameroon with a gap of –21·5 and Maasai in Kenya with a gap of –13·1) but similarly large differences are also found in high-income countries (Inuit in Canada with a gap of –12·5 and Aboriginal and Torres Strait Islanders in Australia with a gap of –10·0).

Infant mortality rates were provided for 17 of 23 countries and 19 populations (appendix). Indigenous populations had a rate difference of greater than one in 16 populations. Our data show that the differences from benchmark data were not significant in the USA (Native Hawaiians in Hawaii), Chile, and Sweden (appendix). A rate ratio greater than 2 was recorded for Brazil (2·65), Colombia (2·69), Greenland (4·47), Peru (2·66), Russia (7·18), and Venezuela (2·25).

Countries with an Indigenous infant mortality rate of less than 50 per 1000 were in the upper-middle-income to high-income band, with the exception of Nepal, which is low income (figure 2). Those with an Indigenous infant mortality rate of greater than 50 per 1000 were all in the lower-middle-income band (India, Pakistan, and Nigeria). Rate differences did not seem to be associated with country income status (figure 2). The biggest gaps are found in both upper-middle-income countries (Amazonian Indigenous group in Peru with a rate difference of 30·7) and high-income countries (Nenets in Russia with a rate

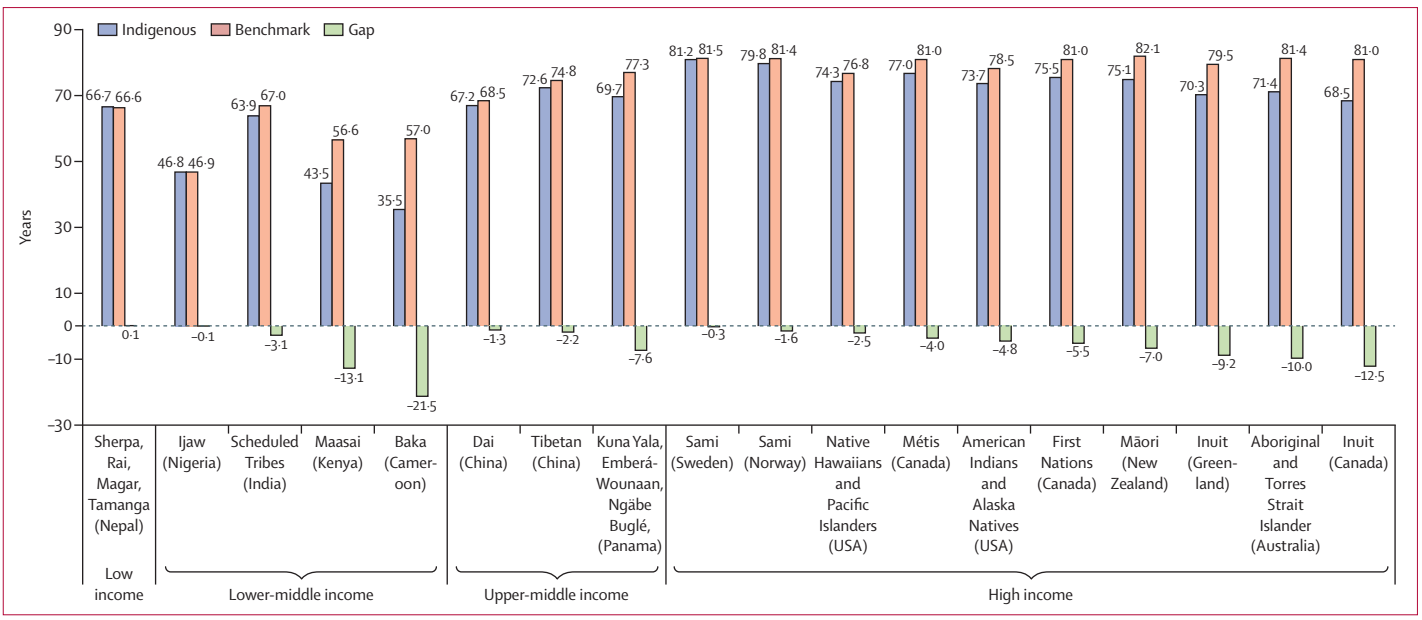

Figure 1: **Life expectancy at birth by World Bank income level**
The figure shows the relation between country income status and life expectancy, but is not a comparison between Indigenous populations.

difference of 41·2). However, there is no clear trend across income status.

Maternal mortality ratios are provided for nine of 23 countries (appendix). A ratio of greater than 100 per 100 000 livebirths was recorded for Indigenous groups in China (Tibet; 107·6 per 100 000), Colombia (237·9 per 100 000), Kenya (500 per 100 000), Nepal (645·9 per 100 000), Pakistan (380 per 100 000), Panama (236·7 per 100 000), and Russia (146·4 per 100 000). Indigenous populations had rate ratios of between 1·02 (Kenya) and 6·35 (Panama). Maternal deaths were infrequent in many countries, with numbers too small to provide reliable rates, especially for small populations. We had variability data for six of ten populations. In our sample, the differences in Indigenous and benchmark ratios were significant in Australia, Colombia, New Zealand, and Panama. The rate in Australia was based on small numbers but the differential has been stable for the past 15 years.[25]

Data for low birthweight were provided for 14 of 23 countries and high birthweight for seven of 23 countries (appendix). The proportion of low birthweight babies ranged from 16·4% in Kenya (Massai) to 2·6% in Nepal (Sherpa, Rai, Magar, and Tamang). In Australia, China (Tibet), and Kenya the proportion of low birthweight babies was greater than 10%, and for all other countries it was less than 10% (appendix). We had variability data for 14 of 16 populations. Among those populations in which the proportion of Indigenous low birthweight was higher than that for non-Indigenous, rate differences ranged from 8·4 (Kenya) to 0·1 for Canada (First Nations) and USA (Native Hawaiians in Hawaii). Of these, differences from benchmark data were significant in Australia (rate ratio 1·97, 95% CI 1·86–2·08), China (Dai; 1·58, 1·18–2·12), and New Zealand (1·19, 1·15–1·24). In those countries in which the proportion of low birthweights was lower among Indigenous groups, the rate difference ranged from –5·9 in China (Tibet) to –0·5 for Chile and USA (American Indian and Alaska Natives). Of these, the differences from benchmark data were significant in Chile, China (Tibet), Colombia, and the USA (American Indian and Alaska Natives; appendix).

We documented poorer outcomes in Indigenous peoples than in benchmark populations for high birthweight in Canada (First Nations, rate difference 6·6), Chile (1·6), Colombia (0·1), and the USA (American Indian and Alaska Natives, 0·7). The difference was significant for Canada, Chile, and the USA, but not for Colombia (appendix). The proportions of high birthweights were lower among Indigenous populations than benchmark populations in Australia (–0·1), New Zealand (–0·3), and Sweden (–0·2). Differences from benchmark data were significant for New Zealand, but not for Australia and Sweden (appendix).

Data for child malnutrition, child obesity, and adult obesity were included for 14 of 23, 11 of 23, and 13 of 23 countries, respectively (appendix). High proportions of child malnutrition, child obesity, and adult obesity were documented in ten of 16, eight of 12, and six of 13 populations, respectively. In Indigenous populations with a high proportion of child malnutrition the rate differences ranged from 1·1 in Chile to 42·9 in Panama. In this group, rate differences greater than 10 were documented in Pakistan, Peru, Brazil, Colombia, and Panama. India, Pakistan, and Panama reported rates of

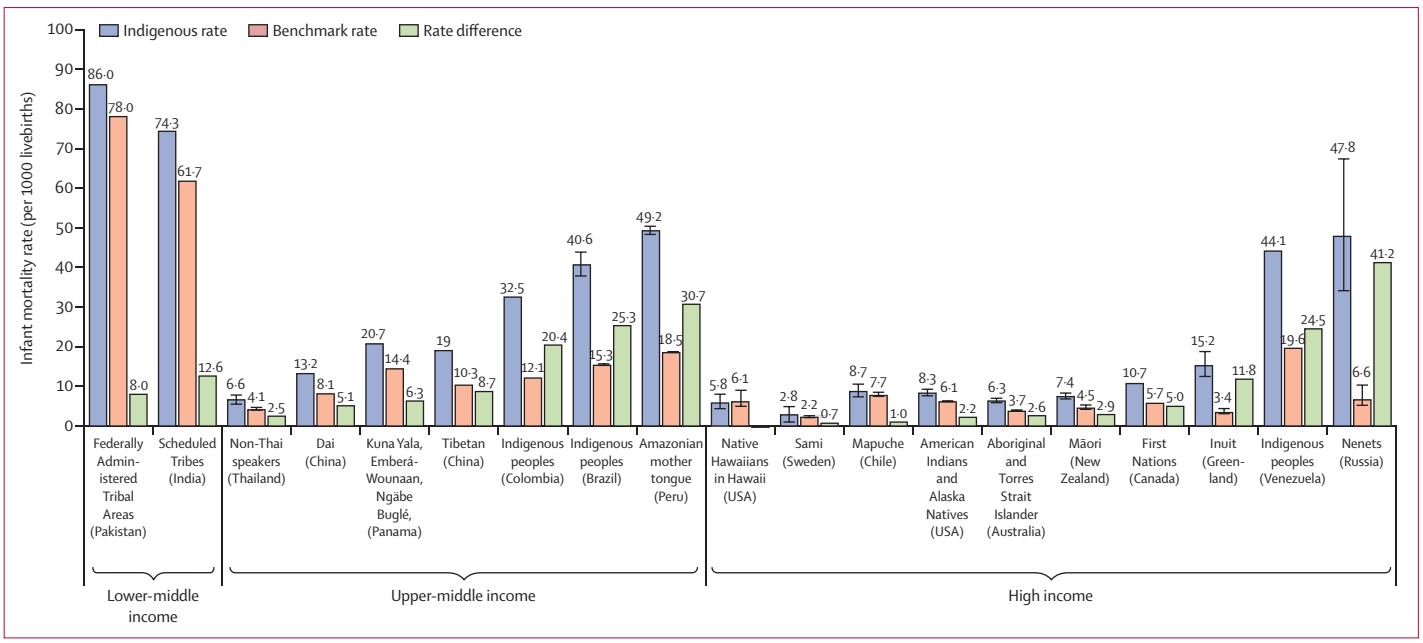

***Figure 2*: Infant mortality rate by World Bank income level**
This figure shows the relation between country income status and infant mortality rate, but is not a comparison between Indigenous populations.

child malnutrition above 50%. Indigenous populations with low rates of child malnutrition include those in China (Tibet –2·2), Myanmar (–5·4), New Zealand (–0·6), and Nigeria (Ijaw –18·5; Fulani –2·6). Child malnutrition rates were significantly higher for Indigenous populations compared with benchmark data for Australia, Brazil, China (Dai), Chile, Colombia, India, and Pakistan but not for China (Tibet) or in New Zealand (appendix).

Among Indigenous populations with a higher proportion of child obesity than seen in non-Indigenous populations, the rate differences ranged from 0·5 for Nigeria (Ijaw) to 12·9 for USA (American Indian and Alaska Natives). In this group, rate differences greater than 5 were documented in Canada (7·8), Greenland (6·4), and the USA (12·9). Indigenous populations with lower prevalence of child obesity included Chile (rate difference –1·1), China (Dai –0·6), India (–0·3), and Myanmar (–1·1). Among the countries for which we have variability measures (Australia, Canada, Chile, China [Dai and Tibet], Colombia, India, Myanmar, and New Zealand), Australia, Canada, and New Zealand showed the prevalence of obesity was significantly higher for Indigenous than for benchmark populations.

For Indigenous populations with a high rate of adult obesity, rate differences ranged from 1·6 (Myanmar) to 19·8 (USA Native Hawaiians and Pacific Islanders). In this group, rate differences greater than 10 were documented for Indigenous populations in Australia (14·8), Canada (15·2), New Zealand (20·0), and USA (19·8). In those Indigenous populations with a lower prevalence of adult obesity than that of non-Indigenous populations, rate differences ranged from –0·3 in Brazil to –2·2 in Nigeria (Fulani) females. Among the countries for which we have measures of variance, obesity was significantly more prevalent among Indigenous than benchmark populations in Australia, Canada, New Zealand, Norway, and USA (Native Hawaiians in Hawaii; appendix).

A higher prevalence of Indigenous child obesity than that from non-Indigenous populations is documented in middle-to-high-income countries, with rate differences in the range of 3·7 in Australia to 7·8 in Canada (appendix). The exception was Chile in which the difference for child obesity was –1·1. We found a lower prevalence of adult obesity in lower-to-upper-middle-income countries (Brazil, China Tibet, Colombia, India, and Nigeria). By contrast, we showed a higher prevalence of adult obesity in Indigenous data from upper-middle-income to high-income countries (Australia, Canada, New Zealand, and Norway; appendix).

Some Indigenous populations have high rates of child malnutrition, child obesity, and adult obesity (eg, Australia). In Brazil, adult obesity in Indigenous women (15·8%) is nearly as high as that in the national population (16·1%), whereas the prevalence of child under-nutrition is much higher among Indigenous children (25·7%) as compared with the national figure (7·0%; appendix).

Data for measures of relative education were identified for 22 of 23 countries and 27 populations (appendix). Of the 26 populations with poor outcomes in the measures of educational attainment, 24 populations had a rate difference greater than 1. Rate differences ranged from –49·1 in Nigeria (Fulani) to –1·0 in USA (Native

Hawaiians and Pacific Islanders) and Sweden. By contrast, in Myanmar we documented net enrolment rates for secondary education in the Mon state of 63·4% compared with 52·5% for the benchmark population (rate difference 10·9). CIs for the Swedish and Norwegian data did not differ from benchmark data (appendix).

Data for measures of poverty or relative income were identified for 16 of 23 countries and 18 populations (appendix). Table 4 shows the specific measures. Of the 15 Indigenous populations with poorer outcomes against measures of economic status, 14 populations had a rate difference greater than 1. Better outcomes were documented for the Ijaw in Nigeria (with 42·9% living below the international poverty line compared with 54·0% of the benchmark); the Mon in Myanmar (with 16·3% of individuals living below the Myanmar poverty line compared with 25·6% of the benchmark), and the Dai in China (with 0·6% of individuals earning less than the poverty line compared with 7·1% of the benchmark). Poverty was significantly more common among Indigenous populations in Australia, Canada, Chile, China (Tibet), India, Panama, and Venezuela.

Discussion

A 2005 commentary published by *The Lancet* posed the question: "Indigenous peoples' health—why are they behind everyone, everywhere?".[26] Against available evidence this was a reasonable question. However, our findings require a more nuanced interpretation. First, although our data provide evidence of poorer health and social outcomes for Indigenous populations than their respective benchmark populations, this is not uniformly the case. For example, relative to their respective benchmark populations, life expectancy at birth was 5 or more years lower for Indigenous populations in Australia, Cameroon, Canada (First Nations and Inuit), Greenland, Kenya, New Zealand, and Panama; infant mortality rates were at least twice as high in Brazil, Colombia, Greenland, Peru, Russia, and Venezuela; and high proportions of child malnutrition, child obesity, and adult obesity were documented in at least half of the populations for which we have data. By contrast, relative to benchmark populations, the Mon of Myanmar fared better in educational attainment and economic status and low birthweight data were significantly better among the Indigenous populations of Colombia and the USA (American Indian and Alaska Natives). Second, differences where documented, varied in size, with some of the most striking differences relative to benchmark data for life expectancy at birth (eg, Cameroon), infant mortality (eg, Russia), maternal mortality ratio (eg, Panama), child obesity (eg, USA [American Indian and Alaska Natives]), and economic status (eg, Peru).

Compared with previous studies it is a strength that we draw more comprehensively on health and social data from government health statistical agencies. We achieve a broader reach compared with some earlier studies, with our networks extending to Latin America, Asia, Africa, Russia, and Scandinavia. The inclusion of data from Scheduled Tribes in India for the first time is an important development in view of their population size.

Our method also included the identification of contributors with local knowledge of country-specific health data sources. This inclusion was invaluable to the implementation of the project (noting that there might be a few instances of untapped data). Our systematic approach to data collation provides crucial insights into gaps in data availability and quality. For example, from our sample there appears to be few data available on high birthweight, maternal mortality ratio, and child obesity (with only seven, nine, and 11 countries reporting, respectively).

Nevertheless, there are geographical gaps in our coverage, particularly in China, Africa, and Latin America. The most important gap is in China, where Dai and Tibetan populations constitute only 4% of Chinese ethnic minorities. Low-income countries are under-represented in this report (we have only one low-income and six low-to-middle-income countries) mainly because of difficulties in identifying countries in this income range that had data for Indigenous peoples. Indigenous populations in low-income countries are likely to have poorer health in absolute terms. However, as we have shown (in Myanmar for instance), relative differences cannot be assumed.

We drew on our review of previous studies and the local knowledge of project contributors to select a suite of indicators that could feasibly be reported across participating countries. This selection did not include indicators of morbidity (including mental health) and a broader range of health determinants such as exposure to racism.[27] In this report we include social data for descriptive not explanatory purposes. Data availability is a key issue, particularly for countries outside North America and Oceania. A further limitation is that we rely on national level data, obscuring internal diversity and providing a fragmented picture for Indigenous populations crossing international borders. Our ability to draw inferences was restricted by the availability in published estimates of sufficient information to undertake analyses of variance, particularly for data such as maternal mortality ratio or where rate differences were small.

Data quality is also a limitation of this study. The issues with data fall in two overlapping thematic clusters. In our sample, 15 of 23 countries record Indigenous status in government data. Some experts have identified the recording of Indigenous identity using self-report as the gold standard.[28,29] However, this alone is insufficient to ensure high-quality data. In these contexts, the issues of concern are data definitions, ascertainment bias, and the method of obtaining and analysing data.

The second cluster of issues is in countries (eight of 23 of our sample) that rely on language or geographical proxy measures instead of recording Indigenous status in the data (table 1). Proxy measures have policy value by guiding service development with potential flow-on

benefits to Indigenous peoples. However, caution is required in the use of proxy measures to make inferences on Indigenous health status.

This approach is especially the case for Sweden where the geographical proxies are Sami Administrative Areas, with a Sami population 18 years and older of 9–13% of the total population. At this population density, we have concerns about the accuracy of this picture of Sami health status, in view of reports of increased rates of morbidity and mortality due to suicide, accident, and injury.[30–35] Sweden's inability to disaggregate data by ethnicity means that it is unable to monitor the health status of its Indigenous population and respond accordingly through policy and service delivery.

We do not make direct comparisons of data between Indigenous populations. The reasons are many. Countries vary in how they define Indigenous status in data collection or how they use proxy measures. Countries also vary in data collection methods, the ascertainment bias in their Indigenous data, and the coverage of Indigenous populations. There is also a lack of standardisation of some measures (eg, measures of education and economic status). For these measures there are a broader range of available measurement options. Variation might also reflect different policy priorities. Countries also vary in the definition of benchmark populations.

Definitional and methodological factors combine for some measures. For example, a comparative study of the measurement of Indigenous life expectancy data showed that:

> "New Zealand, Australia, and the USA have adopted an 'inclusive' definition of indigenous; but death data are not of sufficient quality to calculate life tables in several Australian states, or in the USA as a whole. Instead the USA calculates life expectancy from data derived from the Indian Health Service. Canada recognises several indigenous subgroups, but they are not identified in the full Census or in the death statistics system, and special studies are used to estimate the life expectancy of some of these groups.[6]"

The social determinants of health have been used to explain the patterns of Indigenous health in specific populations.[36–41] These social determinants include the conditions of daily living—aspects of birth, growth, education, living, and working; use of health care; and structural factors such as socioeconomic policy that shape the conditions of daily living.[42] Reading and Wien[40] propose a life-course model for Aboriginal Canadians with proximal determinants (health behaviours, physical environments, employment and income, education, food security); intermediate determinants (health-care systems, educational systems, community infrastructure, resources and capacities, environmental stewardship, cultural continuity); and distal determinants (colonialism, racism and social exclusion, self-determination).

Other accounts have also highlighted the effect of ecological change on the health of some Indigenous populations. Explanatory models are required that also account for those circumstances in which Indigenous populations have better outcomes (such as the Mon in Myanmar) than the benchmark population. How the social determinants impact on the health of Indigenous peoples will vary according to their particular socio-historical context. A comprehensive account for each country is beyond the scope of this study.

In highlighting the importance of local analysis we do not discount the importance of global economic relations. There is a well established ecological relation between life expectancy at birth and infant mortality rate and per capita income for countries.[43,44] This relation is likely to also affect absolute life expectancy at birth and infant mortality rate for Indigenous populations.

Our study reports systematically collated health data from across a broader range of health indicators and sample of Indigenous countries than did previous international studies of Indigenous health. We identified 39 previous peer-reviewed studies (see Research in context), of which 33 included data from Australia, Canada, New Zealand, or USA (three included one of these countries, ten included two, six included three, and 12 included all four).[2,45–76] Seven reports had a circumpolar focus that included data from Greenland (four publications) and Russia (three publications) in addition to Canada and the USA.[41,51,52,55,63,75,76] Five publications included data from South America,[59,71,77–79] one from Latin America,[80] two from Asia,[69,73] and three from Africa.[63,81,82]

A World Bank project provides a greater breadth of coverage across low-to-middle-income countries than does our report, but its objective is to analyse Indigenous socioeconomic status. As such, it includes some measures of child mortality and malnutrition, but not other health indicators such as life expectancy at birth, maternal mortality ratio, or birthweight.[2,78] Earlier reports published by *The Lancet* have reported a range of measures of Indigenous peoples' health, drawing mainly on the academic literature.[39,83] The health indicators covered in reports included: life expectancy at birth (13 reports);[41,47–49,53–55,57,64,65,68,72,78] infant and child mortality (11);[2,45,48,57,68,70,71,78–81] birthweight (four);[45,67,69,70] nutritional measures (12);[2,44,51,52,58,63,66,67,75,77–79] social determinants (eight);[2,45,49,55,60,68,78,81] cancer (five);[50,61,62,73,82] cardiovascular risk, diabetes, and kidney disease (four);[46,48,74,76] oral health (one);[59] and self-harm and suicide (one).[56] In October, 2015, the UN General Assembly agreed to a 15 year sustainable development agenda with 17 goals and 169 targets.[84] Our data are directly relevant to five of these goals—poverty, nutrition, health, education, and inequality within countries. Although specific reference to Indigenous peoples is made in only three of the goals (goal 2: end hunger, achieve food security and improved nutrition and promote sustainable agriculture; goal 4: ensure inclusive and equitable quality education and

promote lifelong learning opportunities for all; goal 17: strengthen the means of implementation and revitalise the global partnership for sustainable development), Indigenous issues are relevant across the sustainable development agenda. Here we use the SDGs to frame our recommendations with particular focus on SDG 3 (which includes targets for universal health coverage); data systems development; and the revitalisation of global partnerships.

Indigenous and tribal health policies are recommended to address both the specific health targets in SDG 3 and the inequalities that have been documented in this report. For example, Australia and New Zealand have framed their Indigenous health policy using life-course and ecological approaches,[85,86] whereas a 2013 report of the socioeconomic, health, and educational status of Scheduled Tribes is now informing the development of the first specific policy and guidelines for tribal health in India.[87] SDG 3 includes targets in relation to universal health coverage, ensuring access to high-quality essential health services, medicines, and vaccines. Our findings reinforce the need for consideration of Indigenous peoples in the implementation of the SDG health projects.

We have not systematically reviewed issues in relation to Indigenous health care for this project, but illustrate some service issues that might require consideration. The overall level of health system development affects health care for some Indigenous peoples. In Tanzania, for example, the delivery of health services to remote areas in which Indigenous peoples live is difficult because of poor infrastructure, low population density, and migratory patterns. Reliance on services provided by non-government organisations and faith-based agencies is high in these regions.[88] High-income countries, such as Canada and Australia, have considerable challenges in health service delivery to remote regions with high Indigenous populations.

Health workforce strategies have been developed in some countries, including for the training of Indigenous health professionals.[85] In Latin America inter-cultural health initiatives have attempted to incorporate traditional Indigenous health practices and practitioners into primary health care.[89–91] Strategies might be needed to improve Indigenous access to health and prevention services (such as primary care programmes, vaccination programmes, antenatal care, chronic diseases management, mental health services, and cancer services). For example, in Nepal, health services data show that 34% of Indigenous mothers receive antenatal care (compared with 44% of the total population), whereas for India a third of Scheduled Tribeswomen receive prenatal care (compared with 49% of the total population).[88] In some countries there is also an emerging focus on wellness-based health interventions, family-centred models of care, and primary health-care services that are managed and delivered by Indigenous communities.[38,88]

Comprehensive, consistent, and coherent health data are crucial for decision making across the health sector for all populations, including Indigenous peoples.[92,93] Accordingly, we recommend action against four interrelated priorities for Indigenous data development. Action on these recommendations is also needed to strengthen the monitoring of the SDGs, and to extend the coverage of Indigenous populations and health indicators in future international studies such as this. These priorities are: the development of data systems in resource-poor countries; measures of Indigenous status to enable the disaggregation of data by Indigenous status across all countries; strategies and methods to ensure high-quality data across all countries and data sources; and the inclusive engagement of Indigenous peoples in the development of data systems across all countries.

The SDGs have a specific target to enable developing countries to provide "high-quality timely and reliable data disaggregated by income, gender, age, race, ethnicity, migratory status, disability, geographic local and other characteristics relevant in national contexts".[84] This statement aligns with our recommendations. However, we go further and recommend action across all country contexts.

Indigenous data identifiers are required to disaggregate data by Indigenous status in their national data systems (an issue for eight of 23 countries in our sample). Proxy measures can be used only with caution to draw inferences on Indigenous health status. We are especially concerned that some countries with highly developed statistical systems—including Denmark, Norway, and Sweden—have legislative prohibitions against the collection of ethnicity data.[94] This issue needs to be addressed to enable countries to monitor the health status of their Indigenous populations.

15 of 23 countries in our sample record Indigenous status in our data collection. Action is required to ensure the development of robust, consistent Indigenous data definitions, data collection methods, and strategies to ensure comprehensive coverage of Indigenous populations. Ascertainment bias (usually under-reporting of Indigenous status) is a key issue that has been shown through data linkage, although the extent of this problem might vary between databases.[27–29,93–98] Consistent and comparable data definitions of Indigenous status present a challenge that needs to be addressed. Internationally, Indigenous data definitions based on social identity have increasingly replaced questions based on ancestry, with an international survey of census questionnaires[99] (from 1994 to 2008) documenting the variability in the recording of Indigenous status. The survey showed that two-thirds of the questionnaires framed questions in terms of specific tribal populations, whereas a third used aggregate categories such as Aboriginal or Indigenous peoples.[99]

Legal definitions of Indigenous peoples have been developed in some countries to regulate access to treaty rights, services, or voting rights (appendix). Indigenous

social identities are affected by these legal constructs but also shaped by lived experiences of family, place, culture, and broader community attitudes. Consequently, data definitions might not be in alignment with legal definitions. In the USA, for example, data definitions based on self-reported social identity are more inclusive than the complex and restrictive legal definitions.

Changes over time in the recording of Indigenous status in data systems affect the interpretation of trends. In 1986, Statistics Canada changed the census question from one based on ancestry to one based on social identity, resulting in a shift in the social characteristics and demographics of the enumerated population.[100] The willingness of Indigenous individuals to be identified in government data might also change over time in response to several factors such as fear of discrimination, perceived benefits, increasing pride in Indigenous status, or a changing understanding of the value of data.[98,101] However, it might be difficult to disentangle the effect of this change in attitude from changes to definitions and data collection methods.

We recommend that the development of Indigenous data systems be done in close collaboration with Indigenous peoples, so as to ensure that Indigenous values, health concepts, and priorities are reflected in them. This approach includes the development of priorities for data creation, interpretation and reporting, and of measures that draw on Indigenous notions of wellbeing and health.[102]

Political sensitivities about Indigenous and ethnic minorities exist that are relevant to the development of Indigenous data. For example, the San people of southern Africa are recognised by global bodies as Indigenous, but not by their governments.[81,103] Nevertheless, if the SDGs are to revitalise the partnership for global development, strategies are required to ensure that processes are inclusive of Indigenous and tribal peoples. The previous UN Millennium Development Goals programmes were criticised for their failure to engage effectively with Indigenous peoples and issues.[104]

Meaningful Indigenous engagement in a revitalised global partnership for development is needed to address the shortcomings in global health governance, and to counter political marginalisation within home countries thereby fostering stronger national accountability mechanisms.[105] Strengthening global networks that draw together Indigenous health leaders, academics, and policy makers can potentially provide the impetus needed to develop Indigenous data systems. The International Indigenous Health Measurement Group, which is supported by the statistical agencies in Canada, USA, New Zealand, and Australia is an example of such an international collaboration.[7]

We recommend further international studies with extended coverage of Indigenous populations' health issues, such as morbidity, mental health, and burden of disease. Comparative studies of Indigenous health measurement are required to support the development of Indigenous data quality and address the issues of data comparability that we identified. National governments should develop targeted policies for Indigenous and tribal health that address issues of health service delivery and the development of high-quality Indigenous data systems. Implementation of SDGs should foster Indigenous inclusion in a revitalised global partnership and leverage the development of strategies to improve Indigenous outcomes.

Contributors

IA, BR, MC, FA-Y, EB, AK, MT, RM, AB, CEAC, and MAP were collectively the senior authors. IA conceived the overall study, provided general guidance in its implementation, and prepared the first draft. BR led the review group, which consisted of FA-Y, EB, MC, AK, and RM. IA finalised the draft based on comments from other authors and reviewer feedback. MT contributed to the development of the study and provided support in project implementation and coordination. BR, FA-Y, EB, MC, and AK reviewed the data provided by the contributors. RM provided independent statistical support throughout the process. All other authors provided data, developed models, reviewed results, provided guidance on methodology, and reviewed the manuscript. AB, CEAC, and MAP gave detailed feedback and contributed to the draft. EB and PA also provided comments on drafts. All other authors provided and analysed data and reviewed and provided feedback on the manuscript.

Declaration of interests

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