

Revised WHO standard population for calculating age-standardized rates

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Acknowledgments

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Background

In global health monitoring, comparing population-level health indicators—such as incidence, prevalence, mortality, and coverage—across populations or over time is both common and essential. These comparisons are often performed using aggregated, rather than sex- or age-disaggregated, data. One of the most frequently used metrics is the crude rate, defined as the total count of the indicator of interest (e.g. deaths or prevalent cases) for the selected sex and age categories divided by the corresponding total mid-year population.¹

While crude rates provide a summary measure specific to a population at a particular time, they can be misleading when used to compare different populations or time periods. This is because populations usually differ in their age structures, and most health indicators vary considerably by age. Consequently, even if two populations have identical age-specific rates (e.g. mortality rates), differences in age composition—such as having a larger share of older versus younger people—can lead to markedly different crude rates.¹

To overcome this challenge, epidemiological and demographic analyses often rely on age-standardized rates. These express what the overall rate would have been if the observed age-specific rates were applied to a reference (or “standard”) population age structure.^{1,2} The calculation is expressed as:

$$S_k = \sum r_{ik} \left(\frac{p_i}{\sum p_i} \right)$$

where p_i is the population in the i th age group of the standard population, r_{ik} is the rate of interest (e.g. mortality, prevalence, or incidence) for the i th age group in population k , and S_k is the resulting age-standardized rate for population k . As such, $\frac{p_i}{\sum p_i}$ indicates the share of population of the i th age group in the standard population, and can be viewed as a weight for calculating the weighted average of the rate of interest across all age groups.

In this regard, if the age-specific rates are relatively constant from one age group to another, different weight schemes, or choice of standard populations, would not lead to substantial change in the resulting age-standardized rates. However, because this is rarely the case, age-standardized rates—and comparisons based on them—are influenced by the selection of the standard population.

Proposing a new WHO Standard Population

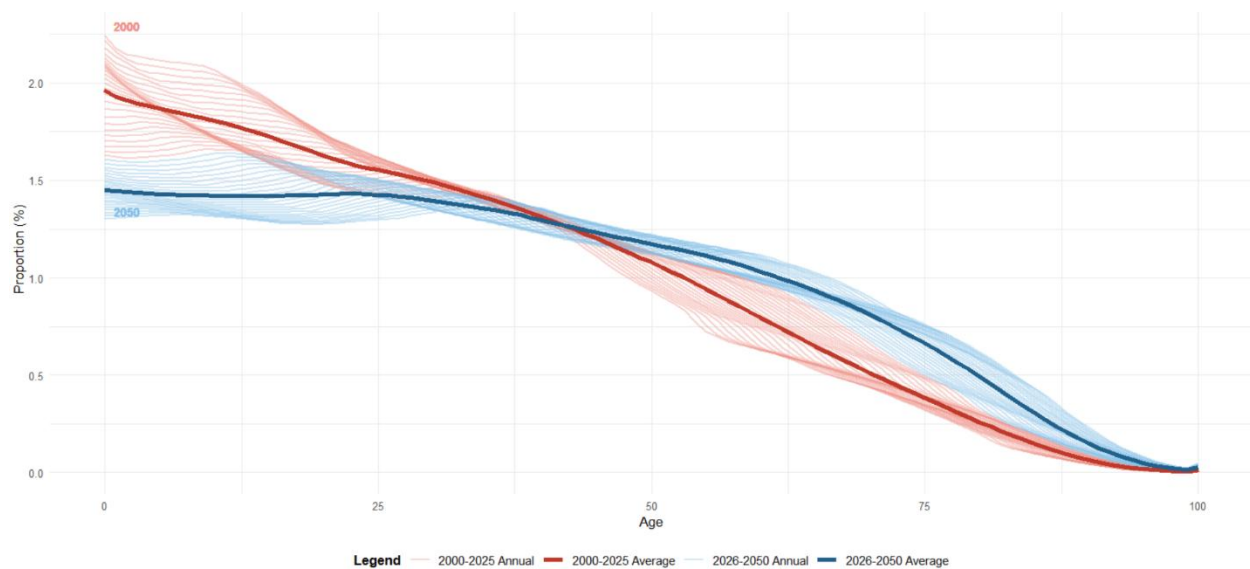
The choice of a standard population is inherently arbitrary; no single standard is universally superior. For this reason, rather than adopting the age structure of any particular population, WHO proposed a world standard population in 2001 that reflected the global average age distribution for 2000–2025, the period when the standard population was planned to be used². This standard was derived from the UN World Population Prospects 1998, the most recent comprehensive population assessment available at the time³. The United Nations' Population Division publishes in World Population Prospects the comprehensive assessment of population by country and territory, sex, and age with projections up to the year 2100 every two years.

Over the past 25 years, global population age structures have changed substantially. And data of improved availability and quality as well as more advanced methods were applied by the UN to derive updated population estimates and projections that supersede those from previous publications. Consequently, there is renewed need for WHO to adopt a standard population that reflects the expected global average age distribution during the next period of use, based on the latest UN projections.

The most recent iteration of World Population Prospects 2024 (WPP2024) provides population estimates and projections by single-year age groups up to age 100+.⁴ Using these data, WHO has constructed a new world standard population based on the projected population age structure for **2026–2050**, using single-year age groups with an open-ended age group of 100 years and older. This new standard will replace the current WHO standard for 2000–2025.

Importantly, age-standardized rates based on the new WHO 2026 standard population are **not comparable** with those based on the previous WHO standard or any other existing standards. As the global population is projected to become substantially older in 2026–2050 compared with 2000–2025 (Figure 1), age-standardized rates calculated using the WHO 2026 standard will generally differ from historical estimates.

Figure 1. Annual population age-distribution 2000-2050



To ensure consistency in analysis across geographical locations and over time, WHO age-standardized rates produced following the release of this paper will use this updated standard population. This WHO 2026 standard population is intended for use over the next 25 years (2026-2050). However, it may be revised if emerging evidence indicates that the actual population age structure deviates from the projections based on WPP2024.

Comparison with other major standard populations

A major limitation of age-standardized rates is that they depend on the arbitrary choice of a standard population, and different choices can lead to different summary rates.

Understanding the differences among standard populations—and how they compare with the new WHO standard—shed light on the interpretation of resulting age-standardized rates (Table 1).

Table 1. Age-distributions for different standard populations (%)

Age group	WHO2026	WHO2021	Segi	Scandinavian	European2013
0-4	7.21	8.86	12.00	8.00	5.00
5-9	7.13	8.69	10.00	7.00	5.50
10-14	7.11	8.60	9.00	7.00	5.50
15-19	7.12	8.47	9.00	7.00	5.50
20-24	7.15	8.22	8.00	7.00	6.00
25-29	7.08	7.93	8.00	7.00	6.00
30-34	6.89	7.61	6.00	7.00	6.50
35-39	6.66	7.15	6.00	7.00	7.00
40-44	6.35	6.59	6.00	7.00	7.00
45-49	6.04	6.04	6.00	7.00	7.00
50-54	5.75	5.37	5.00	7.00	7.00
55-59	5.41	4.55	4.00	6.00	6.50
60-64	4.97	3.72	4.00	5.00	6.00
65-69	4.43	2.96	3.00	4.00	5.50
70-74	3.77	2.21	2.00	3.00	5.00
75-79	2.98	1.52	1.00	2.00	4.00
80-84	2.08	0.91	0.50	1.00	2.50
85+	1.89	0.63	0.50	1.00	2.50

Proposed by Segi in 1960, the “world” standard population (referred as Segi standard hereafter) is based on the pooled population of 46 countries.⁵ It represents a much younger age profile than the one of today or in the coming decades, with those under 30 years of age accounting for 56% while those 60 years and over accounting for only 11% of the whole population. Also developed in the 1960s, another standard population drew on the experience of the Scandinavian populations at that time and was considered reasonably comparable with populations in Western Europe (referred as Scandinavian standard hereafter).⁶ The Scandinavian standard represents a moderately older population structure compared to the Segi standard (43% under 30 years old and 16% 60 years and older).

A European standard population was introduced in 1976 for age-standardizing for the European countries. Eurostat has recognised the need for an update for the standard to adapt to the changes in population structure in the past decades. Based on the average of the population projections over the period 2011-2030 in EU27 plus EFTA countries, a new European standard population has been created in 2013 (referred as European2013 standard) and is currently in use in the EU.⁷ The European2013 standard is considerably older than the Segi or Scandinavian standards: only 33.5% under 30 and 25.5% aged 60 and older.

The WHO 2001 standard population falls between the Segi and Scandinavian standards in age composition. The WHO 2026 standard population, meanwhile, lies between the Scandinavian and European2013 standards, with its younger age share for under 30 more closely aligned with the Scandinavian standard (Table 2).

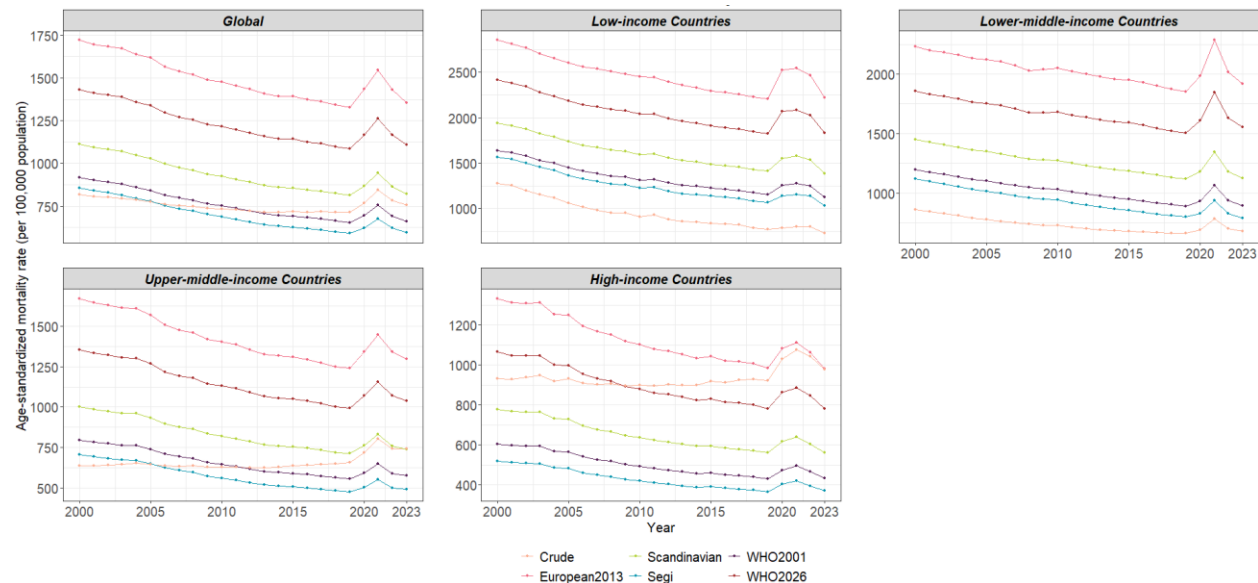
Table 2. Distribution of older and younger age groups, by type of standard population

	Segi	Scandinavian	European 2013	WHO2021	WHO2026
% Under 30 years	56	43	33.5	50.8	42.8
% 60 years and over	11	16	25.5	12	20.1

Applying these standard populations to WHO’s time-series estimates of all-cause mortality (2000–2023)⁸ by World Bank income group⁹ shows consistent trends regardless of standard choice (Figure 2). Across all income groups and years, age-standardized rates based on the WHO 2026 standard population consistently rank second highest, just below those based on European 2013, except for high-income countries. In contrast, the 2021 WHO standard yields the second-lowest age-standardized rates, slightly higher only than those produced using the Segi standard.

Globally, age-standardized all-cause mortality rates based on the WHO 2001 standard are close to the crude rates, while those based on the WHO 2026 standard are substantially higher—reflecting the pronounced ageing of the world population. In low- and lower-middle-income countries, crude death rates remain lower than all age-standardized rates. And in upper-middle-income countries, the crude death rates are close to the age-standardized rates based on the WHO 2001 standard population. In contrast, crude death rates in high-income countries align more closely with age-standardized rates based on the new WHO standard and are converging toward those based on the European2013 standard which represents the oldest age structure among all the standards.

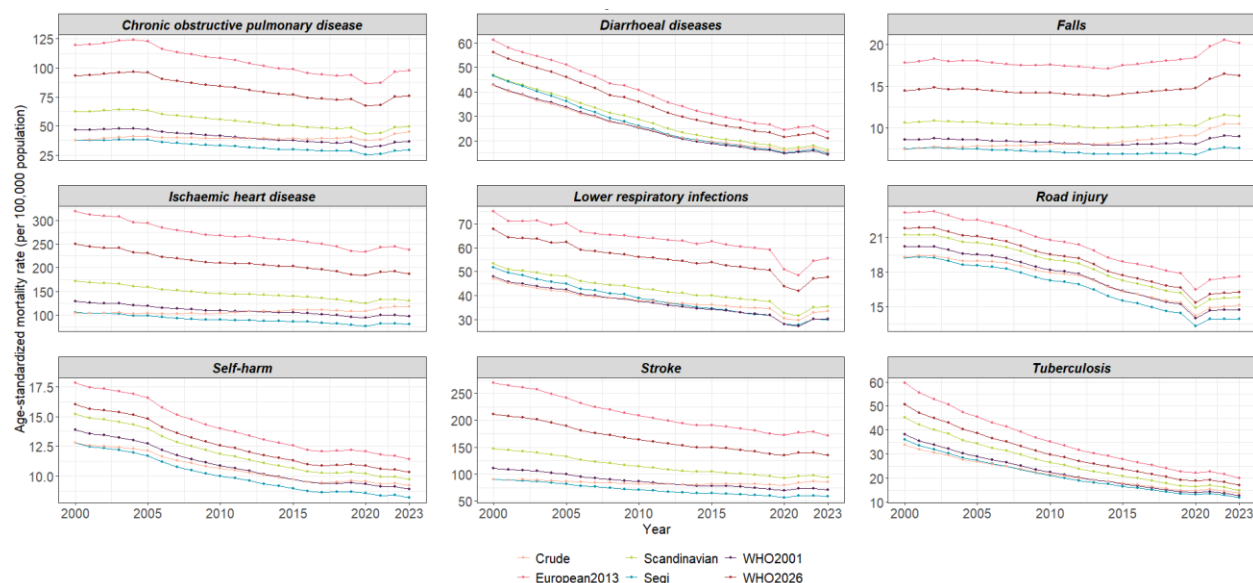
Figure 2. Age-standardized all-cause mortality rates by different standard populations and crude rates, by World Bank income groups, 2000-2023



Reviewing the age-standardized mortality rates at global level, by different standard populations, due to the most prominent communicable diseases, non-communicable diseases and injuries,⁸ the conclusions are also quite evident. At the global level, age-standardized mortality rates show consistent ranking across standard populations for different cause groups: the WHO 2026 standard population produces the second-highest estimates. The WHO 2001 standard generally produces the second-lowest, except for diarrhoeal diseases and lower respiratory infections, where high child mortality elevates rates calculated using the younger Segi standard above those using the WHO 2001 standard.

A notable crossover occurred between 2010 and 2015, when crude death rates surpassed age-standardized rates based on the WHO 2001 standard for many causes. This indicates that the global population is already older than the age structure assumed in the WHO 2001 standard, underscoring the need for adoption of an updated standard. The proposed WHO 2026 standard population is expected to meet this need in the coming decades.

Figure 3. Age-standardized mortality rates globally by different standard populations and crude rates, for selected causes, 2000-2023



Discussion

For global monitoring and evaluation of population health, it is essential to compare health statistics across countries and over time in ways that are independent of differences in age structure. Age-standardization remains one of the most effective and widely used methods for achieving such comparability.

The WHO world standard population introduced in the early 2000s has supported the organization's calculation of age-standardized rates for 2000–2025. However, given the rapidly ageing global population, an updated standard is necessary to reflect the expected age structure of the world's population in the coming decades.

Accordingly, we propose a new WHO standard population representing the average age distribution of the global population over the period 2026–2050, when this standard is expected to be used, based on the latest UN population projections. The standard population is intended mainly as an internationally comparable weighting system for calculating age-standardized rates and therefore does not need to be synchronized with the reference year of the indicator data. Thus, although many of the estimates currently being produced are for 2024–2025, we propose to adopt a standard population reflecting the projected global age structure for 2026–2050, which represents the best available evidence of the global average population age structure over the next 25 years. This

approach ensures that the standard remains relevant throughout its intended period of use while allowing consistent comparisons of indicators based on data from different reference years. Therefore, WHO will adopt this new standard population for all future calculations of age-standardized rates and encourage global users to transition from the previous WHO standard population to this updated version.

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