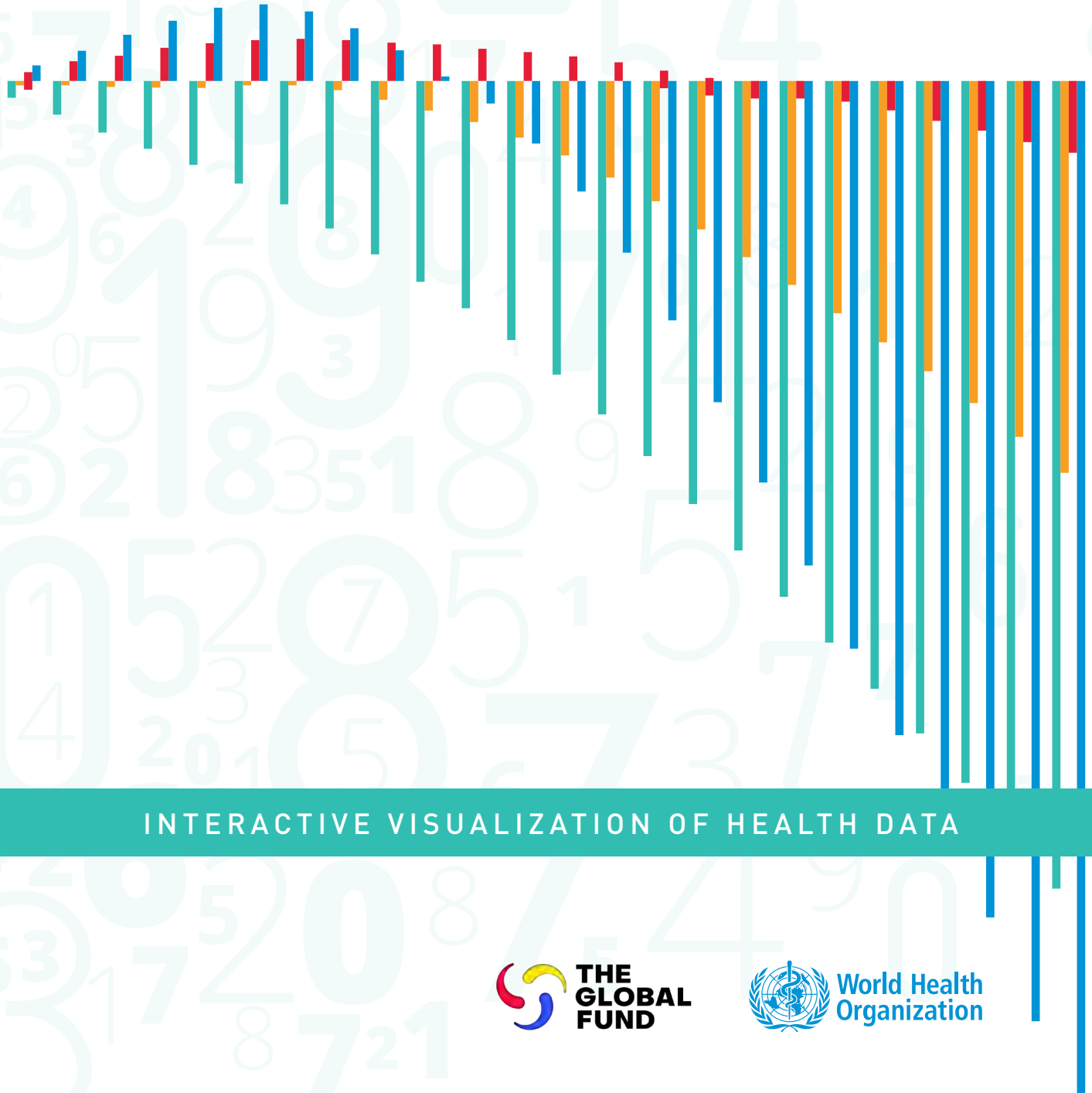
STATE OF INEQUALITY

HIV, tuberculosis and malaria



INTERACTIVE VISUALIZATION OF HEALTH DATA

THE GLOBAL FUND

World Health Organization

STATE OF INEQUALITY

HIV, tuberculosis and malaria

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ISBN 978-92-4-003944-5 (electronic version)
ISBN 978-92-4-003945-2 (print version)

Suggested citation. State of inequality: HIV, tuberculosis and malaria. Geneva: World Health Organization; 2021. Licence: CC BY-NC-SA 3.0 IGO.

Cataloguing-in-Publication (CIP) data. CIP data are available at http://apps.who.int/iris.

Design and layout by L'IV Com Sàrl, Switzerland

Contents

Figures

Tables

Annex tables

Foreword

Health equity is fundamental to achieving the Sustainable Development Goals (SDGs). In 2015, with the adoption of the United Nations Agenda for Sustainable Development, the world committed to end the epidemics of HIV, tuberculosis (TB) and malaria by 2030 as part of SDG 3 (target 3.3). Achieving this target means expanding HIV testing and treatment to make sure the vast majority of people living with HIV know their status, are accessing treatment and have suppressed viral loads. It also means accelerating the reduction of global TB incidence and deaths and building on the number of countries that have transitioned from being endemic for malaria to reporting fewer than 10 000 cases per year.

Although great strides have been made to expand health services and prevention efforts across the three diseases, progress to date has not been fast enough. The COVID-19 pandemic has disrupted essential health services in many countries, jeopardizing the gains we have made.

HIV, TB and malaria continue to take a disproportionally large toll on the poorest, least educated and most rural parts of society. Certain communities – including sexual and gender minorities, sex workers, people in prisons, people who inject drugs, migrants, refugees, displaced people and indigenous people – face stigma and discrimination, resulting in lower service access and higher disease risk. COVID-19 has further exposed these fault lines.

The World Health Organization and the Global Fund to Fight AIDS, Tuberculosis and Malaria are part of a group of agencies working together to accelerate progress towards the health-related SDGs through the Global Action Plan for Healthy Lives and Well-being for All. Understanding patterns of inequalities in these diseases is essential for taking strategic, evidence-informed action to realize our shared vision of ending the epidemics of HIV, TB and malaria.

This report presents the first comprehensive analysis of the magnitude and patterns of socioeconomic, demographic and geographic inequalities in disease burden and access to services for prevention and treatment.

The results confirm there have been improvements in service coverage and decreased disease burden at the national level over the past decade. But they also reveal an uncomfortable reality: unfair inequalities between population subgroups within countries are widespread and have remained largely unchanged over the past decade. For some disease indicators, inequalities are even worsening.

Moreover, the report points to the persistent lack of available data to fully understand inequality patterns in HIV, TB and malaria. Collecting data to improve the monitoring of inequalities in these diseases is vital to develop targeted responses for impact.

There are, encouragingly, isolated successes in reducing inequities. Change is possible when deliberate action is taken to reach disadvantaged populations.

Looking at global health challenges through an equity lens lies at the heart of the WHO road map to deliver on the Triple Billion targets and accelerate progress towards the SDGs.

The United Nations Secretary-General has called for a Decade of Action to deliver the SDGs. We know that achieving our common global goals will be impossible without timely, reliable, actionable and disaggregated data. We therefore call on all countries and partners to accelerate their support to build the health information systems in countries that can effectively identify and address health inequalities to leave no one behind.

I welcome the timely publication of this report and remain fully committed to working with countries and partners to end the epidemics of AIDS, TB and malaria for everyone, everywhere.

Dr Tedros Adhanom Ghebreyesus
Director-General
World Health Organization

Foreword

Pandemics thrive on inequalities and exacerbate inequities. We have learned this with HIV, tuberculosis (TB) and malaria, and we have seen it again with COVID-19. To defeat these pandemics, and leave no one behind, we must understand the inequalities that drive epidemiological patterns, and tackle the inequities that cause dramatically worse outcomes for specific communities. Understanding the inequalities requires careful collation and analysis of real-world data. Tackling the inequities requires a willingness to go beyond simple notions of equal access or one-size-fits-all to intentionally prioritize those most at risk – in other words, deliberately create "compensating inequalities" in service provision to focus resources on the most vulnerable and bring those who are last in line to the front.

In everyday parlance, the terms "inequality" and "inequity" are often used interchangeably, but they do not have exactly the same meaning. Inequality can be used either as a neutral description of difference or as a normative term denoting a negative difference. By contrast, inequity is always normative, implying a difference that is in some way unwarranted. In this report, inequality is primarily used in its neutral sense to denote a measured difference in health between population subgroups, while inequity is used to describe a situation where the distribution of health is unjust, unfair or avoidable.

This linguistic distinction is helpful to frame the discussion, but it proves quite difficult to sustain in practice. The normative overtones of inequality interfere, even when the intent is to use the term as a purely neutral expression of difference.

In any case, developing a deep understanding of the measured differences (or inequalities) in disease burden and service provision is crucial to maximizing impact against pandemics such as HIV, TB and malaria. Unless we know who is most at risk, we cannot know how to prioritize resources. Unless we know where there are gaps in service provision, we cannot know what to rectify.

In analysing these inequalities, we must distinguish between differences that are intrinsic to human biology and pathogens, those that are a function of broader socioeconomic and political factors, and those derived from the health system. Where people face intrinsic inequalities in vulnerability to disease, the answer can be to create deliberate inequalities in service provision to compensate. For example, the increased malaria mortality risk of young children and pregnant women demands a focus of efforts on protecting these groups specifically; and the higher case fatality rates among elderly people due to COVID-19 demand that they be prioritized for vaccination. In these instances, providing equal access is not sufficient, as this would create or perpetuate an inequity. We must compensate for intrinsic inequalities in vulnerability with deliberate inequalities in service provision.

A similar logic applies to inequalities created by socioeconomic and political factors. With HIV and TB, people most at risk of infection and death are typically those in communities that face a range of human rights and gender-related barriers to accessing health services – gay men and other men who have sex with men, people who use drugs, transgender people, people in prisons and other closed settings, adolescent girls and women, displaced people and refugees. Providing equal access to health services is a key first step in addressing these acute inequities.

But equal access is, in many cases, not enough. To offset the inequities resulting from poverty, marginalization and discrimination requires intentional prioritization and tailoring of interventions for such key populations. This is the logic of differentiated service provision in the HIV arena. We must be prepared to prioritize resources and deliver unequal services to compensate for underlying inequities.

This has been the underlying philosophy of the Global Fund to Fight AIDS, Tuberculosis and Malaria (Global Fund) since its creation 20 years ago. Since 2002, the Global Fund has disbursed more than US$ 50 billion across more than 155 countries, with a particular focus on investing to help communities most in need. The Global Fund provides 25% of all international financing for HIV, 77% of all international financing for TB, and 56% of all international financing for malaria. The investment strategy and funding model deliberately prioritize investments in countries with higher burdens of disease and lower economic capacity, while accounting for populations disproportionately affected by HIV, TB and malaria.

This is a data-driven report, including hundreds of household surveys. It represents an important step forward in understanding how inequalities across population subgroups within countries hinder the fight against the three diseases. By revealing the inequalities by country and subnational area, we can avoid dangerous generalizations and design targeted interventions to tackle the inequities. In a context where there will never be enough resources, and the impact of every dollar spent must be maximized, more granular and frequent data collection and more sophisticated analyses will be essential to addressing health inequities and defeating HIV, TB and malaria. The Global Fund is committed to working with partners to strengthen data systems and processes in countries to improve the availability and quality of data on inequalities.

Identifying and tackling the inequities that limit progress against HIV, TB and malaria is a key component of the Global Fund's new strategy for 2023–2028. Together with the World Health Organization and other partners, the Global Fund invites engagement and action to deepen understandings of health inequalities and corresponding inequities to maximize impact. This report provides an invaluable evidence base to inform efforts to deliver a future free from HIV, TB and malaria, and to build a better, more equitable, healthier world for all.

Peter Sands
Executive Director
The Global Fund to Fight AIDS, Tuberculosis and Malaria

Acknowledgements

This report was envisioned through a cross-organization collaboration between the World Health Organization (WHO, Geneva, Switzerland) and the Global Fund to Fight AIDS, Tuberculosis and Malaria (Geneva, Switzerland).

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From the Global Fund to Fight AIDS, Tuberculosis and Malaria, the following supported development of the report by providing ongoing input: Lize Aloo (Specialist, Data Use for Action, Gender), Melanie Brooks (Manager, Executive and Operational Communications), Michael Byrne (Head, Technical Advice and Partnerships Department), Kalipso Chalkidou (Head, Health Finance Department), Siobhan Crowley (Head of HIV, Technical Advice and Partnerships), Heather Doyle (Senior Technical Coordinator, Community Rights and Gender), Patrick Drake (Associate Specialist, Strategic Information), Celeste Gracia Edwards (Disease Advisor, Tuberculosis/HIV, Technical Advice and Partnerships), Maisoon Elbukhari Ibrahim (Senior Specialist, Malaria), Harley Feldbaum (Head, Strategy and Policy Hub), Scott Filler (Head of Malaria, Technical Advice and Partnerships), Richard Grahn (Senior Policy Analyst, Strategic Information), Hannah Grant (Senior Strategy and Policy Advisor), Markus Haacker (Consultant, Strategic Information), Mehran Hosseini (Manager, Programmatic Results and Impact), Johannes Hunger (Head, Strategic Information Department), Suman Jain (Senior Specialist, Norms, Monitoring and Evaluation), Karen Kelley (Senior Disease Advisor, Technical Advice and Partnerships), Erica Kufa (Associate Specialist, Strategic Information), Osamu Kunii (Head, Strategy, Investment and Impact Division), Benjamin Loevinsohn (Senior Technical Coordinator, Maternal, Newborn and Child Health and Health Systems Strengthening), Jack Macallister (Senior Technical Advisor, COVID-19 Policy and Strategy), Sussann Nasr (Senior Disease Advisor, Malaria), Nnamdi Nwaneri (Specialist, Impact and Evaluation), Michael Olszak-Olszewski (Manager, Key Performance Indicator Reporting, Monitoring and Performance), Maria Petro Brunal (Technical Analyst, Resilient and Sustainable Systems for Health), Kate Thomson (Head, Community Rights and Gender Department), David Traynor (Senior Technical Coordinator, Policy and Strategy), Ernest Waititu (Lead, Executive Communications), Eliud Wandwalo (Head of Tuberculosis, Technical Advice and Partnerships), Mohammed Yassin (Senior Disease Advisor, Tuberculosis), Shufang Zhang (Senior Advisor, Value for Money), Jinkou Zhao (Senior Specialist, Monitoring and Evaluation), Nathalie Zorzi (Senior Manager, Monitoring Evaluation and Country Analysis).

The report benefited from technical review by staff from the Joint United Nations Programme on HIV/AIDS (UNAIDS, Geneva, Switzerland), Suvanand Sahu (STOP TB Partnership, Geneva, Switzerland) and Melanie Renshaw (Roll Back Malaria Partnership to End Malaria, Geneva, Switzerland). UNAIDS staff also facilitated access to certain HIV data.

The following WHO staff provided technical advice or reviewed drafts of the report (all based in Geneva, Switzerland, unless otherwise noted): John J. Aponte (Epidemiologist, Global Malaria Programme), Michel Beusenberg (Information

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Colette Holden provided copy-editing services and Philippa May proofread the document. Christine Boylan prepared the index. The maps were produced by the WHO GIS Centre for Health.

Funding for the project was provided by the Global Fund to Fight AIDS, Tuberculosis and Malaria.

Abbreviations

AIDS	acquired immunodeficiency syndrome
AIS	AIDS Indicator Surveys
BCG	bacille Calmette-Guérin
DHS	Demographic and Health Surveys
Global Fund	Global Fund to Fight AIDS, Tuberculosis and Malaria
HEAT	Health Equity Assessment Toolkit
HIV	human immunodeficiency virus
IPTp	intermittent preventive treatment in pregnancy
MDG	Millennium Development Goal
MDR-TB	multidrug-resistant TB
MDR/RR-TB	multidrug- or rifampicin-resistant TB
MICS	Multiple Indicator Cluster Surveys
MIS	Malaria Indicator Surveys
PAR	population attributable risk
RBM Partnership	Roll Back Malaria Partnership to End Malaria
RHS	Reproductive Health Surveys
RR-TB	rifampicin-resistant TB
SDG	Sustainable Development Goal
TB	tuberculosis
UNAIDS	Joint United Nations Programme on HIV/AIDS
UNDP	United Nations Development Programme
UNICEF	United Nations Children's Fund
WHO	World Health Organization

Executive summary

HIV, tuberculosis (TB) and malaria are diseases of poverty and marginalization, with a heavy toll among populations that are chronically disadvantaged. Although remarkable progress has been made in reducing the overall burden of each disease over the past decade, certain population groups have persistently higher disease mortality and morbidity and lower access to life-saving interventions.

Existing inequities have been widely acknowledged as barriers to achieving global and national goals and targets in HIV, TB and malaria programmes. These inequities have become even more pressing amidst the uncertainty of the COVID-19 pandemic. Yet, the magnitude and extent of health inequalities remain poorly documented and understood. This is the first monitoring report devoted to systematically assessing the global state of inequality in the three diseases, quantifying the latest situation of inequalities within countries and change over time. The report is timely due to the renewed emphasis on equity in prominent global initiatives and plans, including the United Nations 2030 Agenda for Sustainable Development, and global strategies to end AIDS, TB and malaria.

MONITORING HEALTH INEQUALITIES (MEASURED DIFFERENCES IN HEALTH ACROSS POPULATION SUBGROUPS) HELPS TO INFORM DIFFERENTIATED POLICY AND PROGRAMME RESPONSES THAT CONTRIBUTE TO TACKLING HEALTH INEQUITIES (UNJUST, UNFAIR, AND AVOIDABLE OR REMEDIABLE HEALTH INEQUALITIES).

The novelty of this report lies in its comprehensive and systematic approach to presenting the state of inequality across the three diseases. Using the latest available global data for 32 health indicators[1] (addressing the burden of disease; knowledge, attitudes and practices; detection; prevention; testing and treatment; and social protection) and up to 186 countries, the report quantifies within-country inequalities by sex, economic status, education, place of residence and age.[2] Where data are available, it includes an assessment of how the current level of inequality (2011–2020) compares with that a decade

[1] Indicators for each disease were selected with consideration of data availability, data quality and relevance. Notably, a lack of available data suitable for inequality analyses limited the extent of results reported for TB and, to a lesser extent, malaria.

[2] The inclusion of these dimensions of inequality depended on the availability of disaggregated data. For TB catastrophic costs, an additional inequality dimension (TB drug resistance status) was applied.

Box E1. Overview of analysis details for assessing the state of inequality in HIV, TB and malaria

Across the three diseases, the latest situation of inequality was assessed using difference or ratio summary measures of inequality for the most recent available data from 2011–2020. Change in inequality over time was assessed by comparing difference or ratio summary measures of inequality between two time points, 2001–2010 and 2011–2020.

The HIV analysis covers 13 indicators for up to 141 countries, with data sourced from AIDS Indicator Surveys (AIS), Demographic and Health Surveys (DHS), and the Joint United Nations Programme on HIV/AIDS, the United Nations Children's Fund and the World Health Organization (UNAIDS/UNICEF/WHO). Data are disaggregated by up to five dimensions of inequality. Indicators related to knowledge, attitudes and practices and testing and treatment are double disaggregated, first by sex and then by economic status, education, place of residence and age.

The TB analysis covers 10 indicators for up to 186 countries for TB burden indicators (although there was limited data availability for other indicators). Data sources include country-reported data, DHS, Multiple Indicator Cluster Surveys (MICS), Reproductive Health Surveys (RHS), TB patient cost surveys, TB prevalence surveys and WHO. Data are disaggregated by up to six dimensions of inequality. Indicators related to knowledge and attitudes are double disaggregated, first by sex and then by economic status, education, place of residence and age.

The malaria analysis covers 9 indicators for up to 38 countries, representing 72–94% of the global malaria burden of cases and deaths. Data sources include DHS and Malaria Indicator Surveys (MIS). Data are disaggregated by up to five dimensions of inequality.

earlier (2001–2010) (Box E1). The findings of this report are situated alongside an extensive literature review. This offers background context about situations of inequality and inequities across settings, and insights into the challenges faced by key and underserved populations that experience a higher epidemiological burden of disease alongside reduced access to services. The data used in the analyses are available for further exploration in accompanying interactive visuals and data (see https://www.who.int/data/health-equity/report_2021_hiv_tb_malaria).

DIMENSIONS OF INEQUALITY ARE THE CATEGORIZATION UPON WHICH POPULATION SUBGROUPS ARE FORMED FOR HEALTH INEQUALITY MONITORING. DIMENSIONS OF INEQUALITY FEATURED THROUGHOUT THIS REPORT INCLUDE SEX, ECONOMIC STATUS, EDUCATION, PLACE OF RESIDENCE AND AGE.

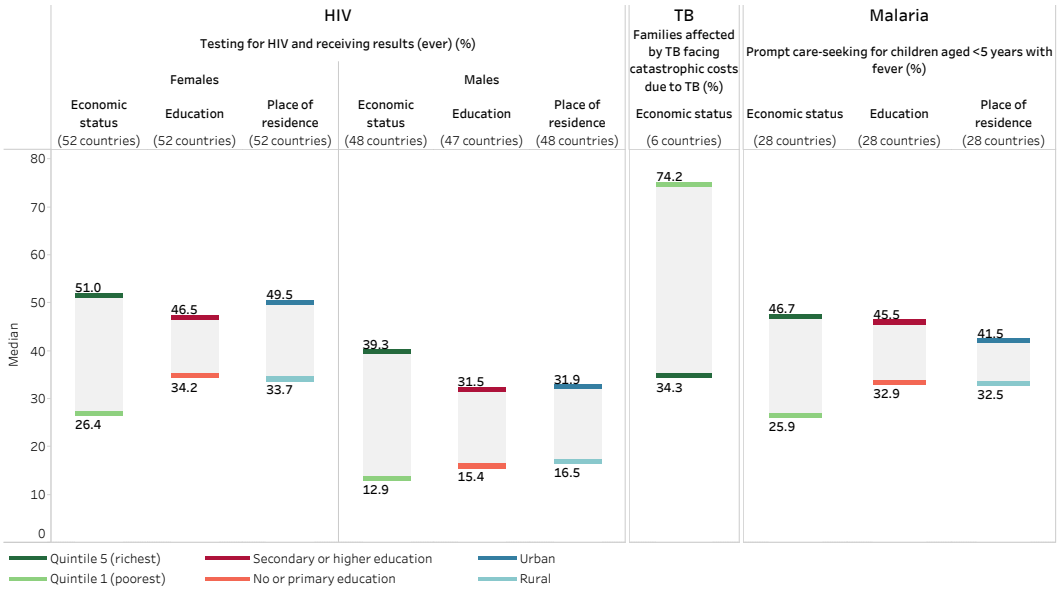
The intended impact of this report is to serve as an evidence base for further action, informing the development and implementation of differentiated policy and programme responses that are equity oriented. The key findings identify areas of potential concern, where inequalities in HIV, TB and malaria are high and unchanged or worsening, and where certain groups may be less likely to access or benefit from key services and interventions. The findings of the report also reveal situations where certain interventions benefit the poorest, least educated and rural communities. Taking this into account, the report indicates where more or better-quality data are required for strengthened inequality monitoring. Specific examples of equity-oriented policies and programmes are provided, while also acknowledging that an important next step is to initiate in-depth discussions of how the report findings can be translated into effective action to tackle inequities.

Where are inequalities high?

The poorest, least educated and rural subgroups were at a disadvantage across most HIV, TB and malaria indicators. For nearly every indicator, at least one country reported high inequality[1] by economic status, education

[1] High inequality was considered a difference of at least 20 percentage points between two subgroups of a particular dimension of inequality (absolute inequality).

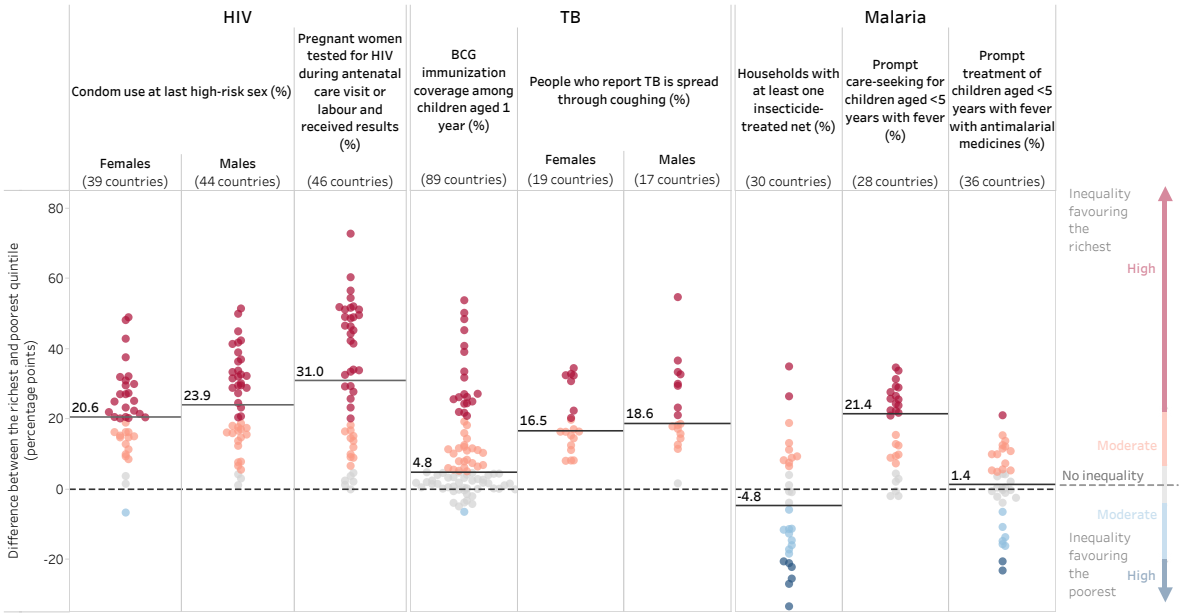
FIG. E1. Selected HIV, tuberculosis (TB) and malaria indicators with high levels of inequality, disaggregated by economic status, education and place of residence: latest situation (2011–2020)



Horizonal lines represent the median value across countries for each subgroup.
Grey shading represents the difference between the median values.
Note the HIV indicator does not account for HIV incidence, which may vary across population subgroups and is important to contextualize the results.

Source: AIDS Indicator Surveys, Demographic and Health Surveys, Malaria Indicator Surveys and TB patient cost surveys.

FIG. E2. Selected HIV, tuberculosis (TB) and malaria indicators with variable levels of absolute economic-related inequality: latest situation (2011–2020)



BCG: bacille Calmette-Guérin.
Circles indicate countries.
Solid horizontal lines indicate the median value across all countries with data.
The dashed horizontal line indicates the difference value of no inequality (0).

Source: AIDS Indicator Surveys, Demographic and Health Surveys, Malaria Indicator Surveys, Multiple Indicator Cluster Surveys and Reproductive Health Surveys.

or place of residence. Figure E1 shows the situation of inequality for three indicators. In many countries, testing for HIV was much lower among the poorest, least educated or rural subgroups. Fifty-six per cent of countries (27 of 48) reported high inequality in at least one of these dimensions of inequality for HIV testing among males. High economic-related inequalities in catastrophic total costs[1] for TB patients and their households were evident in all countries with available data,[2] where the proportion of families affected by TB facing catastrophic costs was 20–63 percentage points higher among the poorest population subgroups than the richest. For malaria, children aged under 5 years who were part of the poorest, least educated and rural subgroups reported lower prompt care-seeking when febrile. There was high inequality in more than half of countries (16 of 28) for this indicator.

Figure E2 shows the range of economic-related inequality for selected indicators across countries with available data. For condom use and HIV testing among pregnant women, the poorest subgroup consistently reported lower levels than the richest subgroup in almost all countries. A difference of at least 20 percentage points between the richest and the poorest was reported in more than half of countries for these indicators. For the TB knowledge indicator (percentage who report TB is spread through coughing), the richest scored higher than the poorest in nearly all countries in both females and males. High economic-related inequality

[1] Costs due to TB are considered catastrophic when they account for 20% of the household income or more. Costs include direct medical payments for diagnosis and treatment, as well as direct non-medical payments (e.g. transportation and lodging) and indirect costs (e.g. lost income). This indicator is restricted to people diagnosed with TB who are users of health services that are part of National TB Programme networks. It is different from the SDG indicator 3.8.2 for catastrophic health expenditures which is defined as "the proportion of the population with large household expenditures on health as a share of total household expenditure or income". See box in Annex 3.

[2] The number of countries with available data about catastrophic costs due to TB was limited to 17, and 6 countries had data disaggregated by economic status.

was reported in the majority of countries for prompt care-seeking for febrile children, to the benefit of children in the richest households, whereas the direction of inequality in other malaria indicators was mixed. While the level of overall economic-related inequality in malaria insecticide-treated nets indicators and malaria treatment indicators across countries was not high, some countries reported high inequality favouring the poorest and some countries reported high inequality favouring the richest. For example, for the indicator households with at least one insecticide-treated net, 2 of 30 countries had high inequality favouring the richest, and 6 had high inequality favouring the poorest.

High sex-related inequalities were evident in a few indicators. For HIV, condom use was an area of potential concern. In more than half of countries, males reported at least 20 percentage points higher condom use at last high-risk sex than females. In a fifth of countries, there was a large difference of 20 percentage points or more between females and males living with HIV and on antiretroviral therapy (in most countries, it was higher in females). HIV testing was substantially higher (at least 20 percentage points) in females than males in a fifth of countries.[1] Sex-related inequality was also explored in disease burden indicators (Box E2).

Where are inequalities absent or low?

Inequalities across age were low in many cases.[2] Age-related inequality among females was low for some HIV knowledge, attitudes and practices and testing indicators. In more than half of countries, females aged 15–19 years and females aged 40–49 years had about the same comprehensive correct knowledge about AIDS, and the global median across countries showed no difference between these subgroups.

BOX E2. Sex-related inequalities in disease burden

Limited availability of disaggregated data about disease burden meant that the assessment of inequality for these indicators was not extensive. For HIV and TB, modelled estimates about disease incidence and mortality were available by sex. High sex-related relative inequalities[1] in HIV incidence were reported in about half of countries (most of which had higher incidence in males than females). Countries in the WHO African Region, where HIV burden is higher, tended to report higher incidence among females than males, whereas countries outside this region tended to report higher incidence among males. AIDS-related mortality was at least twice as high in males compared with females in 38% of countries, with all of these countries having low national AIDS-related mortality. Just under a third of countries had high sex-related relative inequality in TB incidence (28% of countries) and TB mortality (30% of countries), with males usually having a higher burden than females. Malaria prevalence in children aged under 5 years was similar in female and male children across all countries (based on data from household surveys in 23 countries).

[1] High inequality for HIV and TB incidence and mortality indicators was determined based on a ratio (measure of relative inequality) between sexes of 2 or higher (or, equivalently, 0.5 or lower).

For several indicators with sex-disaggregated data, the global median across countries showed no or low differences between females and males (Fig. E3). In HIV, around half of countries reported low difference between females and males for the accepting attitudes indicator and comprehensive correct knowledge about AIDS and people living with HIV who know their HIV-positive status. In TB, nearly all countries reported no or low differences in TB case detection, knowledge and attitudes indicators, globally. In malaria, there was little difference between females and males aged under 5 years in most (or all) countries with available data for sleeping under an insecticide-treated net, prompt care-seeking, use of malaria diagnostics, and prompt treatment for children with fever.

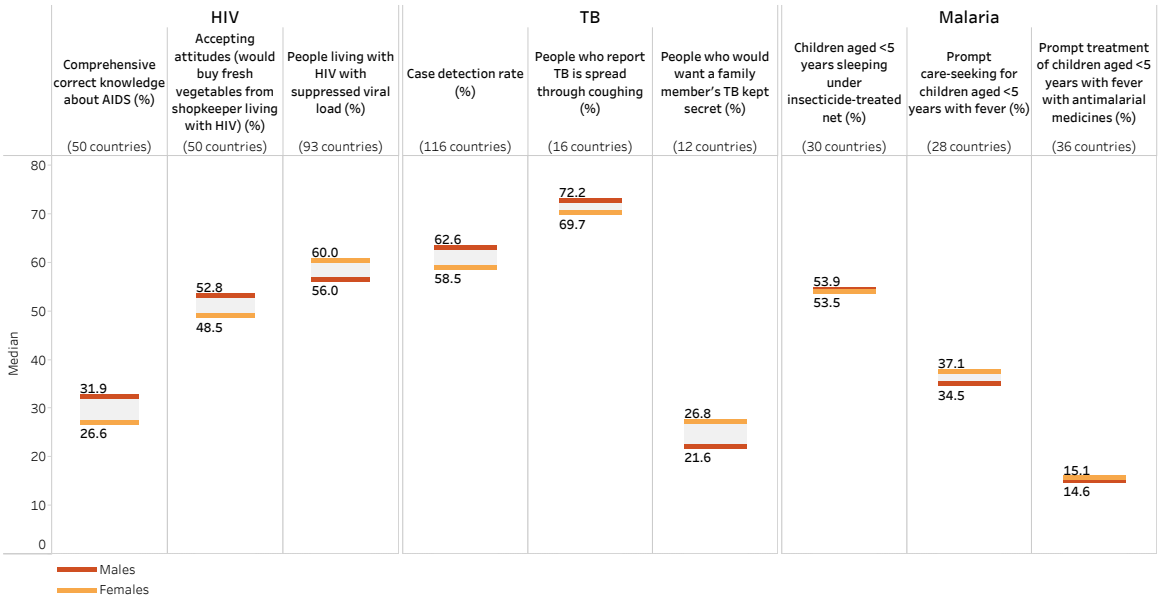
How have situations of inequality changed over time?

Overall, national averages of HIV, TB and malaria indicators have generally improved over the past 10 years. In most indicators, however, inequalities have remained

[1] The HIV testing indicator includes HIV testing during pregnancy, which is likely to contribute to higher testing among females.

[2] Low inequality was considered a difference of less than 5 percentage points between two subgroups (absolute difference). Age was not included in the analysis for disease burden indicators, as it is considered descriptive of the epidemiologic nature of the disease.

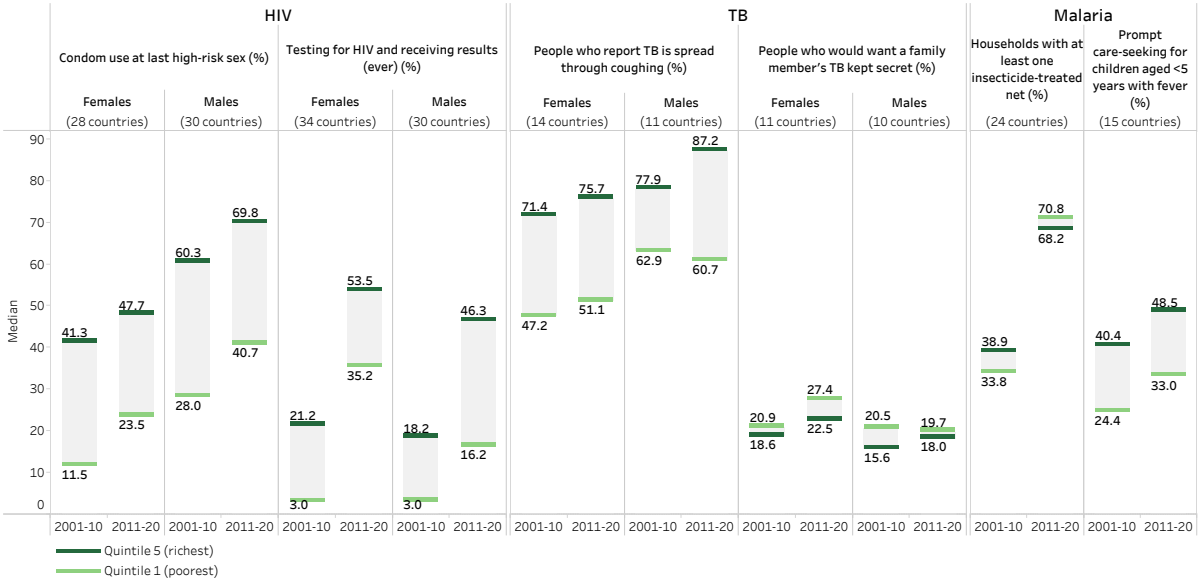
FIG. E3. Selected HIV, tuberculosis (TB) and malaria indicators with low levels of sex-related inequality: latest situation (2011–2020)



Horizonal lines represent the median value across countries for each subgroup.
Grey shading represents the difference between the median values.

Source: AIDS Indicator Surveys, Demographic and Health Surveys, Malaria Indicator Surveys, UNAIDS/UNICEF/WHO 2021, and World Health Organization-estimated TB incidence and country-reported case notifications.

FIG. E4. Selected HIV, tuberculosis (TB) and malaria indicators disaggregated by economic status with variable patterns over time: change over time (2001–2010 and 2011–2020)



Horizonal lines represent the median value across countries for each subgroup.
Grey shading represents the difference between the median values.

Source: AIDS Indicator Surveys, Demographic and Health Surveys and Malaria Indicator Surveys.

largely unchanged, with poorer, less educated and rural subgroups tending to remain at a disadvantage. The global median levels of data disaggregated by economic status for selected indicators across two time points are shown in Fig. E4. Various patterns and trends in economic-related inequality were evident overall. For example, alongside improved national averages:

- inequalities increased between the two time periods among males for ever testing for HIV and receiving results and an indicator of TB knowledge (people who report TB is spread through coughing);
- high inequalities remained largely unchanged between the two time periods for prompt care-seeking for febrile children and condom use;
- inequalities remained low between the two time periods for an indicator of TB attitudes (people who would want a family member's TB kept secret);
- the directionality of inequality changed and inequality decreased between the two time periods for households with at least one insecticide-treated net, such that the intervention is higher among the poorest than the richest in many countries.

For most of these indicators, the patterns over time for disaggregation by education and place of residence were similar to the patterns by economic status. For some indicators, such as families affected by TB facing catastrophic total costs due to TB, data were available only for the latest time (and for a small number of countries), and thus change over time could not be assessed.

What is the impact of addressing inequality?

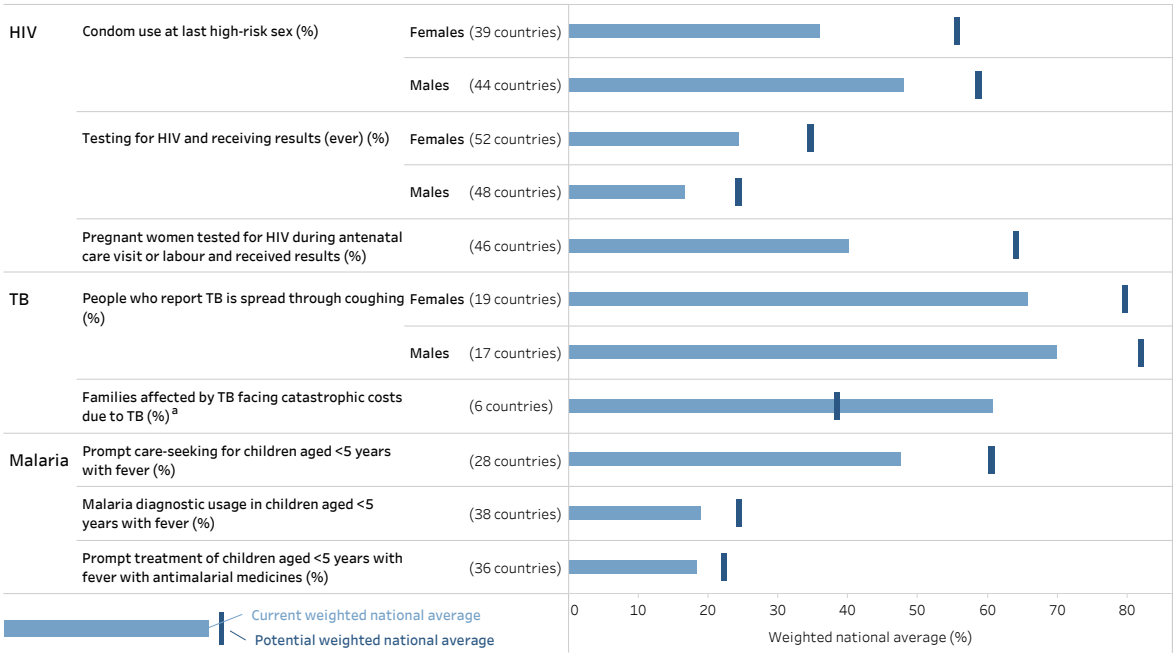
Efforts to end the epidemics of AIDS, TB and malaria can be accelerated through differentiated approaches that strategically identify and target subgroups with higher disease burden and lower access to essential services. In general, taking actions that promote faster improvements in service coverage among the poorest, least educated and rural – subgroups that have consistently lower coverage – will benefit the national average, bringing countries closer to achieving goals and targets.

EQUITY-ORIENTED RESPONSES INVOLVE ASSESSING HEALTH INEQUALITIES AND TAKING ACTION TO ADDRESS DIFFERENCES THAT ARE UNJUST, UNFAIR AND AVOIDABLE OR REMEDIABLE. THIS MAY ENTAIL ACTIONS TO ACCELERATE IMPROVEMENTS AMONG THOSE WITH GREATER EXPOSURE AND VULNERABILITY TO RISK FACTORS AND LESSER ACCESS TO SERVICES. AT TIMES, HEALTH INEQUALITY MONITORING MAY REVEAL DIFFERENCES THAT FAVOUR DISADVANTAGED SUBGROUPS, EVIDENT OF AN EQUITY-ORIENTED APPROACH TO REALIZING UNIVERSAL HEALTH COVERAGE.

How much would national averages improve if the entire population had the same level of coverage as the most advantaged subgroup? For indicators with high levels of economic-related inequality, eliminating unfair and remediable inequality stands to improve the situation substantially. Figure E5 illustrates the global impact of eliminating economic-related inequality in countries for selected HIV, TB and malaria indicators. For example, for pregnant women tested for HIV during antenatal care, the current national averages across 46 countries range from 1% to 98%, with an overall weighted average of 40%. If countries improved the level of HIV testing of all pregnant women to that of the richest subgroup, 21 countries would see an improvement in the national average by at least 50%, and the overall weighted national average would increase to 64% (a 60% relative increase).

Substantial improvement from eliminating economic-related inequality is also evident for families affected by TB. The percentage of families affected by TB facing catastrophic costs due to TB would decrease by at least 50% in half of countries (from a current weighted average of 61% to a potential average of 38%). For prompt care-seeking for children aged under 5 years with fever, eliminating economic-related inequalities would translate to a 26% relative improvement in the weighted average across 28 countries.

FIG. E5. Potential improvement in national average by eliminating economic-related inequality across selected HIV, tuberculosis (TB) and malaria indicators (2011–2020)



The potential for improvement (dark blue vertical line) represents the overall weighted average that would be possible if, in each country, the whole population had the same level of coverage as the most advantaged subgroup (richest quintile).
The current weighted average is indicated by the light blue bar. The overall average is calculated based on the above-mentioned number of countries for each indicator and weighted by the relevant population size.
[a] For the TB catastrophic cost indicator, lower averages are desirable; for all other indicators, higher averages are desirable.

Source: AIDS Indicator Surveys, Demographic and Health Surveys, Malaria Indicator Surveys and TB patient cost surveys.

Tackling inequities in HIV, TB and malaria through strengthened inequality monitoring

The analysis in this report demonstrates significant opportunities for tackling inequities in HIV, TB and malaria. These analyses were limited, however, by data availability, quality and frequency. Ongoing monitoring efforts that incorporate key indicators are warranted to continue tracking the state of inequality in these three diseases. The analysis undertaken in the preparation of this report has led to four overarching recommendations for strengthened inequality monitoring in HIV, TB and malaria:

- Institutionalize inequality monitoring by inclusion of indicators and targets in global and national health performance assessments of HIV, TB and malaria. This creates a strong impetus for prioritizing regular health inequality monitoring and accountability mechanisms for tackling inequities.
- There is a need for more and better inequality data. This entails collecting data from more countries, covering a broader range of health indicators and multiple dimensions of inequality. It also means ensuring rigorous protocols are established to promote the collection of high-quality data.

- Inequality analysis and reporting should be conducted regularly. Comprehensive assessments of inequalities in HIV, TB and malaria should be integrated into regular monitoring and evaluation activities at the global, national and subnational levels.

- Inequality monitoring should be complemented by quantitative and qualitative studies. The analysis of inequalities according to a broad range of dimensions of inequality, also taking into account intersecting and compounding forms of vulnerability, is needed to illustrate the diverse ways that inequities in these diseases manifest in populations. The quantitative findings that emerge from health inequality monitoring should be considered alongside findings from other qualitative and quantitative studies, and other sources of knowledge about the context. Country-specific equity analyses, in particular, are an important undertaking to provide a nuanced understanding of the state of inequality in a given setting and can help to inform impactful solutions to tackle inequities.

Conclusions

The COVID-19 pandemic has had far-reaching and devastating impacts on health and health systems worldwide. Against the backdrop of the COVID-19 pandemic, the quality and availability of essential care for all conditions, including HIV, TB and malaria, have been compromised. Testing, treatment and prevention programmes have suffered widespread interruptions, and many people have faced changes in routine services and heightened stigma, discrimination and fear. Tackling inequities in HIV, TB and malaria is key to accelerating progress and closing the persistent gaps in access to care and health outcomes across population subgroups.

Identifying and characterizing inequalities through health inequality monitoring lends important insights to inform differentiation in service provision, so that resources are aligned to achieve maximal impact. An understanding of patterns of inequalities can help to promote equity by increasing the availability of essential health services and interventions among groups at higher risk of infection or mortality. Recognizing instances where countries have reduced inequities to improve access to key services among groups experiencing higher burden of disease provides an important opportunity to dig deeper into understanding how and why actions were successful. The results of health inequality monitoring, alongside consideration of relevant in-depth quantitative and qualitative studies, can be used to inform equity-oriented policies, programmes and practices, which are central to address the underlying conditions that put groups at higher risk for HIV, TB and malaria.

The impact of monitoring activities, however, lies in their application. Developing technical capacity for health inequality monitoring is important to ensure the process is rigorous and impactful and generates change. Capacity-building activities may encompass identifying and implementing changes to data sources to strengthen the data available for inequality monitoring. To ensure the representation of all groups, data collection efforts should take into account subnational and civil society programmes that work with disadvantaged groups. Other activities include conducting training and skills-building sessions for data analysis and for conducting quantitative and qualitative studies; and strengthening reporting approaches to effectively reach diverse target audiences.

Importantly, there is a need to support activities and practices that translate the findings of inequality analyses to inform the development of policies and programmes and to empower the wider use of data. WHO has developed a number of tools and resources to support health inequality monitoring (see https://www.who.int/data/gho/health-equity).

1 Introduction

1. Introduction

Over the past 20 years, the global community has taken decisive action against human immunodeficiency virus (HIV), tuberculosis (TB) and malaria. As set out in the Millennium Development Goals (MDGs), the spread of HIV, TB and malaria was halted and reversed by 2015. The United Nations 2030 Agenda for Sustainable Development now calls for an end to these epidemics by 2030 as components of a broader agenda centred on economic, environmental and social pillars of sustainable development.

Although the overall burden of each disease has lessened over the past decades, the gains are not fast enough to meet global milestones and targets. HIV, TB and malaria remain diseases of poverty, taking the heaviest toll among certain populations that experience higher disease mortality and morbidity and lower access to life-saving interventions. Globally, the funding dedicated to prevention and control efforts falls short of the amount needed. And now, the COVID-19 pandemic threatens to reverse the progress already made, with implications for future efforts.

This report, by systematically quantifying the magnitude and extent of inequalities globally, serves as an evidence base for developing equity-oriented responses. This introductory chapter includes an overview of global strategies and progress; a discussion of COVID-19 and its impacts on HIV, TB and malaria; the foundations of inequality monitoring of HIV, TB and malaria; and the objectives and organization of the report.

1.1 Global overview: strategies and progress

Accelerating prevention and control efforts among disadvantaged populations who are most at risk is integral to ending the epidemics of AIDS, TB and malaria. Accordingly, global strategies for each disease chart detailed plans and milestones to guide efforts over the coming years, with a cross-cutting focus on equity:

- The United Nations General Assembly Political Declaration on HIV and AIDS *(1)* and the Joint United Nations Programme on HIV/AIDS (UNAIDS) Global AIDS Strategy 2021–2026 *(2)* present commitments and targets as part of a global mandate to end inequalities that perpetuate the global AIDS epidemic. The World Health Organization (WHO) Global Health Sector Strategy on HIV 2016–2021 identifies fast-track actions by countries and WHO to accelerate the HIV response towards ending the AIDS epidemic as a public health threat *(3)*. Priority actions under strategic direction 3 focus on covering the populations in most need of services and delivering for equity.

- The WHO End TB Strategy specifies milestones and targets spanning 2015–2035 towards the end of the global TB epidemic *(4)*. This strategy was endorsed by all WHO Member States at the 2014 World Health Assembly. The 2018 United Nations General Assembly high-level meeting on TB established a set of targets for 2018–2022 *(5)*, and a subsequent meeting in 2020 established priority recommendations *(6)*.

- The WHO Global Technical Strategy for Malaria 2016–2030 sets out targets for reducing case incidence and mortality rate by 90% and eliminating malaria from at least 35 countries by 2030 *(7)*. The strategy was endorsed by the World Health Assembly in 2015. The Roll Back Malaria Partnership Action and Investment to Defeat Malaria defines the approach, investments and coordination required for 2016–2030 *(8)*.

- The Global Fund to Fight AIDS, Tuberculosis and Malaria (Global Fund) 2023–2028 Strategy Framework responds to the challenges of the persistent inequities that prevent progress against HIV, TB and malaria, with an explicit strategy objective that aims to maximize health equity, gender equality and human rights *(9)*. This includes specific subobjectives spanning the better use of data to identify inequalities and tackle inequities; scaling up programmes to address gender-related and human rights barriers; advancing youth-

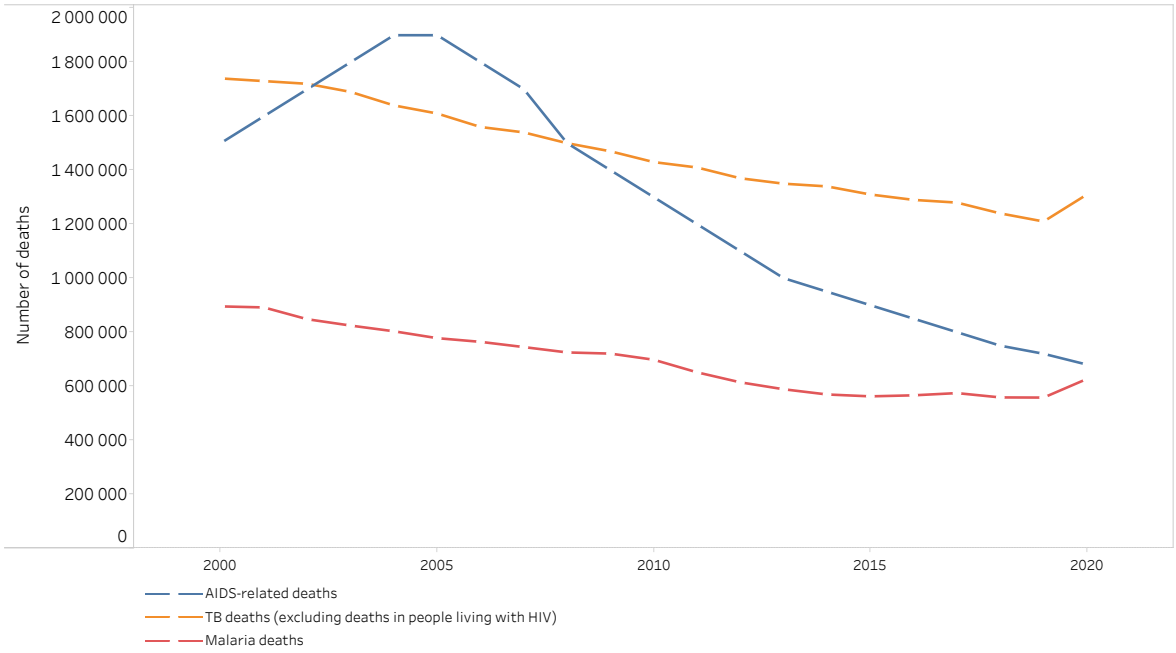
responsive programming; and leveraging the Global Fund's diplomatic voice to challenge laws, policies and practices that limit impact on the three diseases.

Tackling inequities is a growing priority in the responses to HIV, TB and malaria. Health inequity is a normative concept that describes systematic differences in health between population subgroups deemed to be unjust, unfair, and avoidable or remediable *(10)*. This report is an assessment of health inequalities, defined as the observable health differences between subgroups within a population that can be measured and monitored.

Monitoring inequalities in HIV, TB and malaria provides insight into how the diseases are experienced across population subgroups. The results of inequality monitoring can guide the development of subsequent in-depth studies to understand the sources and drivers of health inequalities. Inequality monitoring helps to inform equity-oriented responses to address inequalities that are unjust, unfair and avoidable or remediable. For example, an equity-oriented approach to realizing universal health coverage may entail targeting those with greater exposure and vulnerability to risk and lesser access to services (and therefore, in some cases, health inequality monitoring may reveal differences that favour disadvantaged subgroups).

HIV, TB and malaria continue to affect millions of people worldwide, although the burden of these diseases has lessened over the past two decades (Fig. 1.1). AIDS-related mortality decreased considerably between 2005 and 2010, following the scale-up of antiretroviral therapy, and TB and malaria mortality have declined steadily since 2000. In 2020, an estimated 1.5 million people acquired HIV, and 680 000 people lost their lives to AIDS-related illnesses *(11)*. In the same year, 9.9 million people became ill with TB and 1.5 million lives were lost (1.3 million among people who were HIV-negative, and 214 000 among people who were living with HIV) *(12)*. In 2020, there were 241 million cases of malaria and 627 000 deaths *(13)*.

FIG. 1.1. Global deaths due to AIDS, tuberculosis (TB) and malaria (2000–2020)



Source: UNAIDS/UNICEF/WHO 2021 and World Health Organization.

Interventions related to the prevention and control of HIV, TB and malaria have become more widespread. For example, in 2020, of all people living with HIV, 84% knew their HIV-positive status (versus 70% in 2015), 73% were accessing treatment (versus 49% in 2015), and 66% were virally suppressed (versus 41% in 2015) *(11)*.

Global TB treatment coverage in 2020 was negatively impacted by the COVID-19 pandemic (falling from 72% in 2019 to 59% in 2020 *(12)*), though remains higher than 2000 levels (35%) *(14)*.

With regard to malaria prevention, insecticide-treated net access and use in sub-Saharan Africa have improved dramatically since 2000. For example, the percentage of households that have at least one insecticide-treated net increased from 5% in 2000 to 65% in 2020, with coverage peaking in 2017 *(13)*.

Financial investment in the control of these diseases has grown but is currently below that needed to achieve global commitments. The resources available for HIV in low- and middle-income countries quadrupled between 2000 and 2020 (from US$ 5.1 billion to US$ 21.5 billion[1]) *(11)*. Funding shortfalls are notable over the past 5 years, however (including a 30% shortfall in the funds needed to adequately respond to HIV in 2020), and annual investments in low- and middle-income countries need to rise to US$ 29 billion to reach the 2025 target specified by the United Nations General Assembly 2021 Political Declaration *(1)*.

The amount of funding for TB increased substantially in low- and middle-income countries between 2000 and 2017, primarily due to spending by governments and national TB programmes on notified cases *(15)*. At US$ 6.5 billion in 2020, global TB spending on prevention and control remains substantially below the target set at the United Nations high-level meeting on TB of US$ 13 billion annually by 2022 *(12)*. Between 2019 and 2020, spending in low- and middle-countries declined by 8.7% (from US$ 5.8 billion to US$ 5.3 billion), back to 2016 levels *(12)*.

Funding for malaria programming has increased substantially (from US$ 960 million in 2005 to US$ 2.5 billion in 2014) *(16)*. In recent years, however, the amount invested has fallen further behind the amount needed to stay on track for the Global Technical Strategy milestones, with deficits of US$ 1.3 billion in 2017 and US$ 3.5 billion in 2020 *(13)*.

Across all three diseases, increases in global spending since 2000 have not translated into increases in spending in all countries, and the associations between spending and disease outcomes have been mixed *(17)*.

Key partnerships and initiatives have driven improvements in disease outcomes and interventions over the past 20 years. The Global Fund was created in 2002 with the purpose of attracting, leveraging and investing resources to accelerate the end of the AIDS, TB and malaria epidemics. Since 2002, the Global Fund has disbursed more than US$ 45 billion across more than 155 countries, and it is now one of the largest global health funders *(18)*. The Global Fund provides 21% of all international financing for HIV, 73% of all international financing for TB, and 56% of all international financing for malaria *(19)*.

1.2 COVID-19 and its impacts on HIV, TB and malaria

Responding to the COVID-19 pandemic initially overwhelmed health systems around the world, compromising the quality and availability of essential care for all conditions, including HIV, TB and malaria. Health sectors face concurrent challenges of responding to COVID-19, managing disruptions to other essential services (including those pertaining to HIV, TB and malaria), and taking action to protect the long-term health of the population amidst unfolding economic uncertainty. As longer-term economic and employment crises drive increased social inequalities, the ability to attain overarching health and development goals has been called into question *(20, 21)*.

COVID-19 represents a threat to efforts to end AIDS, TB and malaria, especially in settings where health systems are fragile. Globally, there have been widespread

[1] The resources availability for HIV are expressed as constant 2019 US$.

interruptions in testing, treatment and prevention programmes *(22, 23)*.

According to the WHO Pulse Survey, conducted in May–July 2020 to assess the impact of the COVID-19 pandemic on essential health services, 32% of countries reported partial or severe disruptions to the continuation of established antiretroviral therapy; 42% of countries reported partial or severe disruptions to TB case detection and treatment; and 46% of countries reported partial or severe disruptions to malaria diagnosis and treatment *(24)*.

A second round of the survey, conducted in January–March 2021, reported sustained disruptions across these services *(25)*. HIV, TB and malaria programmes have experienced disruptions to procurement and supply chains, suspension of data collection activities, and diversion of resources from other essential services. The pandemic has also contributed to eroded trust in the capacity of the health system and led to increased misinformation and fear. Many people living with HIV, TB or malaria have faced changes in routine services, fear of contracting COVID-19 during health-care encounters, and increased stigma *(26–28)*.

The COVID-19 pandemic has caused disruptions to the production and distribution of condoms, voluntary medical male circumcision, access to pre-exposure prophylaxis, HIV testing and treatment, and other programming *(29)*. Data from 502 health facilities in 32 African and Asian countries indicated a 41% decline in HIV testing between April and September 2020 compared with the same period in 2019.

Provision of prevention of mother-to-child transmission services was lower, as antenatal care visits were 66% lower in 2020 than 2019 across facilities surveyed in seven Asian countries *(23)*.

Across 25 provinces in China, more than a fifth of people living with HIV reported disruptions in their medication, and more than two thirds of those surveyed were worried about disruptions in their medication and clinical care *(30)*.

Key populations at increased risk for HIV face additional challenges in protecting themselves from COVID-19 and in accessing HIV prevention or treatment services *(26, 31)*. In many settings, however, the HIV response during the COVID-19 pandemic has been notable for its resilience, resourcefulness and innovation, helping to sustain HIV service delivery and minimize potential disruptions through measures such as strengthening the role of community and civil society organizations in the response *(29, 32)*.

The COVID-19 pandemic has reversed years of progress in TB, with widespread disruptions to services and increased vulnerability to TB *(33)*. Most notably, there was a large global reduction in the number of people newly diagnosed with TB between 2019 (7.1 million) and 2020 (5.8 million). As many countries reassigned staff, equipment and finances from TB to the COVID-19 response, the largest relative reductions in annual notifications between 2019 and 2020 were reported in Gabon (80%), the Philippines (37%), Lesotho (35%), Indonesia (31%) and India (25%) *(12)*. Globally, 1.3 million fewer people (a reduction of 18%) received care for TB during 2020 compared with 2019, and the number of people provided with treatment for drug-resistant TB fell by 15% *(12)*.

TB referrals (directing people suspected of having TB to obtain diagnosis and treatment) fell by 59% in April–September 2020 compared with the same period in 2019 across 32 countries in Africa and Asia. In seven Asian countries, referrals dropped by 70% between the two periods. In African countries, TB referrals fell by 29%, and drug-sensitive TB diagnosis and screening services declined by 58% *(23)*.

Efforts to eliminate the incidence of TB-related catastrophic costs are now challenged by higher costs due to treatment interruptions, diagnostic delays, and the economic recession caused by the pandemic *(34)*.

Malaria programmes have experienced disruptions to vector control activities, surveillance, diagnosis and treatment due to COVID-19. During 2020, 72% of insecticide-treated net distribution occurred as planned,

and during 2021, two thirds of countries with plans to implement indoor residual spraying had completed spraying or were on target for completing spraying *(13)*. In facilities across seven Asian countries, malaria diagnoses declined by 56% and treatment by 59% in April–September 2020 compared with the same period in 2019. In African facilities, malaria diagnoses fell by 17% and treatment by 15% in this period; a fifth of surveyed facilities in Africa were stocked out of antimalarial medicines for children aged under 5 years *(23)*. Constraints on the movement of health workers in some areas affected case management. Fear of contracting COVID-19 at a health facility has deterred people from seeking care *(19)*. In March 2020, WHO established a collaboration of malaria experts and leaders from 20 organizations to promote a coordinated response to malaria during the COVID-19 pandemic and enable information-sharing across malaria-related workstreams *(35)*.

The COVID-19 pandemic has had profound impacts on wider determinants of health, disproportionally affecting people who are socioeconomically disadvantaged and marginalized *(20, 36)*. The economic fallout of the pandemic has resulted in lost employment and income, which is particularly devastating for people who are precariously employed or working in informal sectors. In African settings, where there is a high burden of HIV, TB and malaria, disadvantaged people seeking essential medicines for these diseases may choose to use substandard medicines or doses, resulting in worse outcomes and contributing to the spread of drug-resistant pathogens *(28)*. Public health measures enacted in response to the pandemic have restricted movement and introduced physical distancing protocols, affecting transportation to health facilities *(22)*.

In August 2021, the United Nations Economic and Social Council recognized the multidimensional impacts of the COVID-19 pandemic, urging for renewed efforts to support the implementation of the Sustainable Development Goals (SDGs) and COVID-19 recovery *(37)*.

The COVID-19 pandemic has revealed the consequences of underinvesting in public health and social protection and brought to the forefront the deep inequities that exist in many societies. Responses to the COVID-19 pandemic are an opportunity for societies to prioritize equity in forthcoming health policies, programmes and practices. The United Nations socioeconomic response framework urges that the 2030 Agenda for Sustainable Development be preserved, calling for multisectoral action across levels of governance to promote an inclusive and sustainable future *(38)*. The five policy areas of this framework address:

- building stronger, equity-oriented health systems that ensure essential health services are available to all;
- strengthening social protection systems and public services to help people cope with adversity and reduce inequalities;
- bringing about a job-intensive economic recovery that is people-centred and environmentally sustainable, including supporting small and medium-sized businesses and informal sector workers;
- implementing gender-responsive economic policies that work for the most disadvantaged and uphold international solidarity and multilateral collaboration;
- promoting social cohesion and investing in community-led resilience and response systems.

To this end, policy-makers should aim to enhance social and environmental conditions for health. This includes accelerating equitable access to COVID-19 technologies between and within countries, and ensuring COVID-19 vaccines, tests and treatments are rolled out equitably, with relevant communications and services reaching everyone.

Health and social protection should be prioritized as part of post-COVID-19 recovery budgets and plans, both to mitigate the negative effects of the COVID-19 pandemic and to increase resilience to future threats. Investing in primary health care and upholding the right to health for all will bolster health systems strengthening for equitable response and recovery.

1.3 Monitoring inequalities in HIV, TB and malaria

HIV, TB and malaria have a disproportionate burden on the world's poorest populations and people who are most disadvantaged. None of these diseases is currently among the top 10 leading causes of death worldwide, but all are in the top 10 causes of death in low-income countries *(39)*.

National averages reveal only part of the situation, concealing the experiences of subgroups within national populations. For example, living in a densely populated area and living in poor-quality housing are risk factors for infectious diseases *(40)*. In sub-Saharan Africa, six out of seven new HIV infections among adolescents aged 15–19 years occur in girls, and young women aged 15–24 years account for 25% of HIV infections despite representing 10% of the population *(29)*.

The odds of developing TB are nearly five times greater in urban slum environments, compared with national situations on the whole *(41)*. Malaria risk is higher among people with low levels of education, with low income and working in agriculture *(42)*.

As part of its commitment to tackle inequity, the Global Fund has identified key and underserved populations for each disease that tend to experience human rights abuses, criminalization, social marginalization, or decreased access to good-quality health services (Box 1.1). Assessments of between-country and within-country inequalities are an important part of defining where inequities exist and starting conversations about how to tackle them.

Attention to within-country inequalities in HIV, TB and malaria – including efforts to monitor them – is warranted to better understand how these diseases affect population subgroups. Inequality monitoring can help to ensure efforts to end these epidemics are targeted for accelerated impact.

In this report, the general steps of health inequality monitoring are applied to the topic of HIV, TB and malaria. This step-by-step approach developed by WHO entails:

- determining the scope of monitoring, including identifying relevant health indicators and dimensions of inequality;
- obtaining data about the relevant indicators and dimensions, and identifying gaps in data availability;
- analysing the data, including disaggregation and calculation of summary measures of inequality;
- reporting the results to the target audiences;

BOX 1.1. Key and underserved populations

Key and underserved populations in the context of HIV, TB and malaria have a higher epidemiological impact from one of the diseases alongside reduced access to services, compared with the general population. They also experience a range of barriers, including stigma and discrimination, human rights violations, systematic disenfranchisement, social and economic marginalization, and criminalization of behaviours or practices that put them at risk.

The Global Fund has identified key and underserved populations in the response to each disease, recognizing that each country should define the specific populations most pertinent to its epidemiological and social context.[1]

Key populations in the HIV response include men who have sex with men, transgender people (especially transgender women), people who inject drugs, sex workers, and people in prison and detention.

Key populations in the TB response may include people in prison and other closed settings, people living with HIV, migrants, refugees and indigenous populations.

Underserved populations in the malaria response may include refugees, migrants, internally displaced people and indigenous populations.

The Global Fund Secretariat has committed to further institutionalize gender equality and key populations across all areas of work. It has made improvements in terms of policies, processes, data and evidence, capacity and expertise, leadership, and tools and good practice *(43, 44)*.

[1] Other organizations may use the terms "key populations" or "underserved populations" to refer to populations other than those specified above.

BOX 1.2. WHO resources for health inequality monitoring

The following can be accessed through the Health Equity Monitor page (http://www.who.int/data/gho/health-equity):

- HEAT: the Health Equity Assessment Toolkit (HEAT) and HEAT Plus are interactive applications that allow users to explore patterns of inequality in disaggregated data, calculate summary measures of inequality, and create customized visuals.
- Resources: reports and other publications describe the methodology of health inequality monitoring and provide examples of reporting across health topics. For example, the *Handbook on health inequality monitoring* introduces the cycle of health inequality monitoring and is a resource for countries to establish and strengthen health inequality monitoring *(46)*. The State of Inequality and Explorations of Inequality report series provide examples of detailed reports of health inequalities, cover the latest situations and changes over time, and integrate digital data visualization technology to present data interactively.
- Training: resources such as *National health inequality monitoring: a step-by-step manual* outline the general step-by-step approach to monitoring *(45)*. *Inequality monitoring in immunization: a step-by-step manual* applies this approach to the topic of immunization *(47)*. The Health Inequality Monitoring eLearning course guides learners through the key concepts and implications of health inequality monitoring, with self-assessment exercises and quizzes. Learners can attain a record of achievement for the course.
- Data: the Health Equity Monitor database, a component of the WHO Global Health Observatory, is a repository for disaggregated data. It includes data about more than 35 reproductive, maternal, newborn and child health indicators, disaggregated by 6 dimensions of inequality and representing surveys conducted in 115 countries.

- undertaking knowledge translation activities and implementing changes based on the findings *(45)*.

Applied to HIV, TB and malaria, inequality monitoring should capture indicators about the burden of each disease and a range of indicators that address key interventions, access to treatment, prevention and control efforts, and other relevant contextual factors related to how the disease is experienced or perceived. Concurrently, data about dimensions of inequality should reflect social, economic, geographical, demographic and other characteristics that serve as a basis for discrimination within populations.

Collecting high-quality health data, and accompanying data about multiple dimensions of inequality, at regular intervals ensures health inequality monitoring can be conducted on a recurring basis as part of routine monitoring and evaluation activities. WHO has developed a number of tools and resources to support health inequality monitoring across different topic areas (Box 1.2).

1.4 Objectives and organization of this report

This report is the first systematic global analysis of the state of inequality in HIV, TB and malaria. Drawing from two decades of global data about indicators relevant to each disease and for multiple dimensions of inequality, it aims to facilitate a broad understanding of where inequalities in the diseases exist, globally and across a subset of high-burden or high-funding Global Fund priority countries.

Change over time analyses lend additional insight into how situations of inequality have changed between two time periods (2001–2010 and 2011–2020).

The main objectives are to:

- present evidence about inequalities in HIV, TB and malaria indicators across countries, and tabulate the occurrence of high and low inequality across relevant dimensions of inequality (sex, economic status, education, place of residence, age);

- track global changes in inequality over time;
- assess the associations of HIV, TB and malaria incidence and mortality with country-level indicators of social determinants of health.

For each disease, the analysis is contextualized within the current state of knowledge from the broader literature, including information about key and underserved populations. The findings from global analyses are compared with findings in a subset of high-priority countries.[1] The implications of the findings are discussed, including examples of approaches to address unfair and remediable inequalities and opportunities for strengthening inequality monitoring. Additional resources, including interactive visuals and data, accompany this report (see https://www.who.int/data/health-equity/report_2021_hiv_tb_malaria).

The report is organized into seven chapters, accompanied by a glossary, technical details about the methods and metadata. Chapter 2 provides an overview of the methods used throughout the report, including information about the data and analysis approaches. Chapter 3 is devoted to HIV, including separate inequality analyses for the general population, young people and pregnant women. Data are presented for indicators related to incidence and mortality; knowledge, attitudes and practices; and testing and treatment. Chapter 4 covers inequalities in TB burden, detection, prevention, knowledge and attitudes, and social protection. Chapter 5 focuses on inequalities in malaria burden, prevention, and testing and treatment. Chapter 6 is an exploration of the associations between HIV, TB and malaria incidence and mortality indicators and selected social determinants of health. Chapter 7 concludes with overarching recommendations for strengthening health inequality monitoring.

[1] These countries, identified in Annexes 2–4, are prioritized by the Global Fund because they are high burden or receive high levels of funding.

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2

Overview of methods

2. Overview of methods

This report describes the results of a comprehensive and systematic analysis of inequalities in HIV, TB and malaria. The analyses undertaken demonstrate rigorous health inequality monitoring. The report underscores the importance of orienting and strengthening health information systems to support ongoing health inequality monitoring and evaluation processes that are equity-sensitive.

This chapter provides an overview of the data and analysis approaches applied across Chapters 3–6. It describes the types of data used in the analyses, and the strengths and weaknesses of the underlying sources. The general approaches to analysis are outlined, highlighting special considerations for understanding and interpreting the findings. It describes the common methods used in Chapters 3–5 to assess the state of inequality in HIV, TB and malaria, and the methods used to explore the relationships between disease burden and determinants of health in Chapter 6. Comprehensive information about the technical details can be found in Annexes 2–5, and indicator metadata can be found in Annex 7.

2.1 State of inequality in HIV, TB and malaria

2.1.1 Data

Health inequality monitoring requires data about health indicators and data about dimensions of inequality. In the context of this report, the health indicators are related to HIV, TB and malaria. They provide information about the burden of disease;[1] knowledge, attitudes and practices; detection; prevention; testing and treatment; and social protection.

Dimensions of inequality refer to the categorizations applied to form subgroups for monitoring, such as sex, economic status, education, place of residence and age. Unless otherwise specified, the data analysed for this report cover the general population in countries where data were available. Chapter 3 on HIV also includes analyses within the subpopulations of young people and pregnant women.

2.1.1.1 Data sources

The data sources for the inequality analysis encompass modelled annual estimates (for most HIV and TB incidence and mortality indicators and certain HIV testing and treatment indicators) and data from nationally representative household surveys (for most other indicators) (Box 2.1). The modelled annual estimates used in inequality analyses in Chapters 3–5 are sourced from data published and maintained by UNAIDS, the United Nations Children's Fund (UNICEF) and WHO *(1, 2)* and the WHO Global TB Programme *(3, 4)*. The nationally representative household surveys include the AIDS Indicator Surveys (AIS), Demographic and Health Surveys (DHS) and Malaria Indicator Surveys (MIS), available through the DHS Program STATcompiler tool *(5)*; and DHS, Reproductive Health Surveys (RHS) and UNICEF Multiple Indicator Cluster Surveys (MICS), available through the WHO Global Health Observatory Health Equity Monitor *(6)*. Other data sources for certain TB indicators include data provided by countries (for TB case notifications) and data from TB prevalence surveys *(7)* and TB patient cost surveys available from country reports.

[1] In this report, burden of disease indicators cover incidence, mortality and prevalence. For TB, an indicator specifying the proportion of people with TB with multidrug-resistant TB (MDR-TB) or rifampicin-resistant TB (RR-TB) is also included as an aspect of disease burden.

BOX 2.1. Modelled annual estimates and household surveys

In the absence of reliable direct measures from all countries, modelling is a way to generate estimates across countries that derive from a common methodology and are considered comparable. The preparation of the modelled annual estimates featured in this report used systematic and rigorous methods *(8–10)*. Data from several sources were triangulated, taking into consideration the epidemiological and programmatic data, the strength of available data sources (especially routine surveillance and surveys), expert opinions, and factors such as underreporting, overdiagnosis and underdiagnosis.

Household surveys collect data from a representative sample of the study population. They include information about a range of dimensions of inequality and health indicators *(11)*. Large international household surveys (including AIS, DHS, MICS, MIS and RHS) are routinely conducted in low- and middle-income countries. Using standardized questionnaires and, in some cases, biomarker tests, they collect information about a range of health topics, including HIV, TB and malaria. These household surveys generate data that can be compared across countries and over time.

Limitations of using household surveys for health inequality monitoring are that the surveys may not be representative of certain population subgroups; household surveys are not conducted in all countries; and the timing of surveys is variable across countries.

2.1.1.2 Health indicators

Indicators pertaining to HIV, TB and malaria were selected in consultation with disease experts, primarily based on data availability (of the health indicator and dimensions of inequality), data quality and relevance. Chapters 3–5 contain data about disease burden (incidence, mortality, prevalence and drug resistance); knowledge, attitudes and practices; detection; prevention; testing and treatment; and social protection (Table 2.1).

The names and brief descriptions of each health indicator are provided in the approach sections of these chapters; see Annex 7 for complete metadata.

2.1.1.3 Dimensions of inequality

The dimensions of inequality included in this report reflect common sources of discrimination or disadvantage that are widely applicable across countries. They were also selected with consideration of data availability. Subgroups are constructed for each dimension of inequality and serve as the basis for comparing health indicator performance and monitoring inequalities. The dimensions of inequality that appear most frequently in this report are sex, economic status, education and place of residence (Table 2.2).

Age is considered a relevant dimension of inequality for certain indicators (knowledge, attitudes and practices; detection; prevention; testing and treatment), where age-related inequalities may be inequitable (deemed unjust, unfair, and avoidable or remediable). Although age-disaggregated data were available for some burden indicators, inequalities by age for these indicators are affected by expected age-related progression of the disease. Therefore, patterns of disease by age are presented as part of the disease context.

TB drug resistance is used as an additional inequality dimension to analyse families affected by TB facing catastrophic costs due to TB.

TABLE 2.1. Number of health indicators included in the inequality analysis, by disease and health indicator category

	Category of health indicator					
Disease	Burden	Knowledge, attitudes and practices	Detection	Prevention	Testing and treatment	Social protection
HIV	2	5			6	
Tuberculosis	4	2	2	1		1
Malaria	1			5	3	

TABLE 2.2. Dimensions of inequality descriptions

Dimension of inequality[a]	Description	Subgroups
Sex	Biological sex of individual	Two subgroups: females and males
Economic status	Determined at household level using wealth index (composite measure accounting for ownership of certain assets and access to services, constructed using principal component analysis)	Five subgroups: from quintile 5 (richest 20% of population) to quintile 1 (poorest 20% of population)
Education	Highest level of education attained by individual or (for indicators pertaining to children) child's mother	Two subgroups: no or primary education, and secondary or higher education[b]
Place of residence	Location of household	Two subgroups: rural and urban[c]
Age	Age of individual	Subgroups vary depending on indicator

[a] Tuberculosis (TB) drug resistance status is also used as an inequality dimension for the indicator of families affected by TB facing catastrophic costs due to TB.
[b] For bacille Calmette-Guérin (BCG) immunization coverage and TB knowledge and attitudes indicators, education subgroups are no education, primary education, and secondary or higher education.
[c] Criteria to categorize rural and urban areas were country-specific and subject to variation across countries and over time.

2.1.1.4 Study countries

The number of countries included in the analyses varied according to data availability. For inclusion in the inequality analyses, the data source had to contain comparable data about the health indicator and dimension of inequality, and the data had to be available for all subgroups of a dimension.

For modelled annual estimates, the latest situation was assessed for 2020, with an older data point from 2010 used to assess change over time.[1] For survey data, the latest situation was assessed using the most recently available data from 2011–2020 and an older data point from 2001–2010, with data points 5–15 years apart. The years vary across countries and indicators.

Detailed information about the study countries for each disease, including the data sources and corresponding years, is available in Annexes 2–4. Within each disease chapter, special consideration was given to a group of countries that are prioritized by the Global Fund because they are high burden or receive high levels of funding (see Annexes 2–4).

[1] In a few countries, depending on the indicator, data from 2015–2019 were used, with the comparison year of 2008, 2009 or 2010, as per data availability. For a complete list of countries and the corresponding year of the data source, see Annexes 2–4.

2.1.2 Analysis

For each disease, the analysis covers the latest situation of inequality and the change in inequality over time. Health inequalities were analysed using disaggregated data and summary measures of inequality. Findings are presented at the country level, with statements about the global level of inequality reported at the indicator and dimension level based on the median across countries. The median is the middle point of a set of sorted numbers: half of the values are higher than the median, and half of the values are lower. These global comparisons provide a high-level overview of within-country inequality across all countries for a given health indicator and dimension of inequality.

The method of analysis for Chapters 3–5 is derived from simple disaggregation (disaggregation of data by a single inequality dimension at a time) and does not control for other factors. The results of the analysis therefore serve to indicate areas of potential concern but do not explain why inequalities exist.

Additional resources for data exploration, including interactive visuals and data, accompany this report (see https://www.who.int/data/health-equity/report_2021_hiv_tb_malaria).

2.1.2.1 Disaggregated data

Disaggregated data demonstrate the level of the health indicator by subgroup. Examining disaggregated data gives a sense of the situation in each subgroup and allows for comparisons across subgroups, especially when data are presented graphically.

The availability of disaggregated data varied by health indicator. Notably, data about disease burden derived from modelled estimates are not available by economic status, education or place of residence.

Double disaggregation of data allowed for the illustration of inequalities in female and male subgroups separately for certain knowledge, attitudes and practices and treatment indicators.

2.1.2.2 Summary measures of inequality

Absolute and relative summary measures of inequality – difference and ratio – were calculated based on the disaggregated data. These provide a single number that reflects the extent of inequality between subgroups in a country. Simple measures of inequality were used to make pairwise comparisons between two subgroups. For all measures, further inspection of the national average and disaggregated data is required to appreciate the overall state of inequality.

For reporting purposes, for each indicator, either absolute or relative summary measures were used to assess the latest situation of inequality and change over time. Ratios were used for indicators that were not percentages (on a 0–100 scale) due to the complexity of having consistent absolute inequality thresholds across different scales. These indicators include HIV incidence and AIDS-related mortality, all TB burden indicators, and TB prevalence to notification ratio. For all other indicators (measured as percentages), differences were used.

Inequality thresholds were developed to describe the state of inequality, using the reported summary measure of inequality for a given indicator. The thresholds label latest situations that are considered to be high, moderate or low inequality and describe changes in inequality over time that are large, moderate or small. The inequality thresholds were applied to the summary measures of inequality used to report the global state of inequality.

At the global level, thresholds were used to evaluate the median values of inequality measures across countries for each indicator and dimension to assess inequality overall. At the country level, the thresholds were used to identify countries with high and low inequality (and large and small changes over time) for each indicator and dimension. The values associated with the thresholds were determined subjectively, taking into account a variety of factors. A sensitivity analysis was done to ensure the inequality thresholds would reasonably capture the range of results for the three diseases.

Consideration was given to the level of inequality that is meaningful in terms of implications for public health programmes, policies and practices. This was informed by previous experience reporting on health inequalities across a variety of health topics. The thresholds were constructed to be easy to communicate.

2.1.2.3 Latest situation

To assess the latest situation of inequality, difference (a measure of absolute inequality) and ratio (a relative measure of inequality) were calculated (Table 2.3). Difference was used to assess the extent of absolute inequality. It is calculated as the magnitude of difference in the health indicator between two population subgroups.

For economic status, difference is based on quintile 5 (richest) and quintile 1 (poorest). For age, difference compares the oldest and youngest subgroups. For education, difference compares the most and least educated subgroups. For place of residence and sex, each consisting of two subgroups, difference compares urban and rural areas, and females and males, respectively.

Difference retains the same unit of measure as the health indicator (e.g. indicators measured as percentages yield a difference in percentage points). A difference value of 0 indicates no inequality (both subgroups have the same level of the health indicator). This measure offers an intuitive way to express inequality.

TABLE 2.3. Latest situation summary measures of inequality calculations, by indicator type and common inequality dimension

		Summary measure of inequality calculation	
Indicator type	**Inequality dimension[a]**	Difference	Ratio
Adverse health indicators (lower estimates are desirable)	Sex	Females – males *or* Males – females (depending on indicator)	Females / males or Males / females (depending on indicator)
	Economic status	Poorest – richest	Poorest / richest
	Education	Least educated – most educated	Least educated / most educated
	Place of residence	Rural – urban *or* Urban – rural (depending on indicator)	Rural / urban or Urban / rural (depending on indicator)
Favourable health indicators (higher estimates are desirable)	Sex	Males – females *or* Females – males (depending on indicator)	Males / females or Females / males (depending on indicator)
	Economic status	Richest – poorest	Richest / poorest
	Education	Most educated – least educated	Most educated / least educated
	Place of residence	Urban – rural	Urban / rural
	Age	Oldest – youngest	Oldest / youngest

[a] For the adverse indicator of families affected by TB facing catastrophic costs due to tuberculosis (TB), TB drug resistance status is an additional inequality dimension. The difference is calculated as drug-resistant TB – drug-susceptible TB.

Ratio, a unitless measure, was used to assess the extent of relative inequality, demonstrating the proportional difference in the health indicator. Ratio is calculated by dividing the estimate from one subgroup by the estimate from a second subgroup. A ratio of 1 indicates the two subgroups have the same level of the health indicator (no inequality). A ratio of 2 (or 0.5) indicates the level of health in one subgroup is twice (or half) that of the other subgroup. Ratio is a straightforward measure to interpret, although small absolute differences between subgroups can appear as large ratios if the overall level of the health indicator is very low.

The values used to define the thresholds for the latest situation are described in Table 2.4. For situations of inequality measured using the difference, high inequality denotes an absolute difference of 20 percentage points or more between two population subgroups. The threshold for low inequality is an absolute difference of less than 5 percentage points between two population subgroups (including cases where the absolute difference is zero and there is no inequality). Absolute difference values that fall between these two thresholds (5–20 percentage points) are considered to be moderate inequality.

For ratios, high inequality denotes a ratio of ≤ 0.5 or ≥ 2.0 between two population subgroups. The ratio values of 0.5 and 2.0 are mathematically equivalent, expressing that a value is half as much in subgroup A compared with subgroup B (ratio of 0.5), or twice as much in subgroup B compared with subgroup A (ratio of 2.0). Low inequality denotes a ratio of 0.9–1.1, whereby the estimates are the same (ratio of 1.0) or considered to be very similar in both subgroups. Moderate inequality for ratio values falls either above 0.5 and below 0.9, or above 1.1 and below 2.0.

TABLE 2.4. Summary measures and inequality thresholds to assess latest situation of inequality

	Threshold				
Summary measure of inequality	High inequality (favouring poorest, least educated, rural, youngest, female/male[a])	Moderate inequality (favouring poorest, least educated, rural, youngest, female/male[a])	Low inequality	Moderate inequality (favouring richest, most educated, urban, oldest, female/male[a])	High inequality (favouring richest, most educated, urban, oldest, female/male[a])
Difference between two population subgroups	≤ −20 percentage points	> −20 and ≤ −5 percentage points	> −5 and < 5 percentage points	≥ 5 and < 20 percentage points	≥ 20 percentage points
Ratio between two population subgroups	≤ 0.5	> 0.5 and ≤ 0.9	> 0.9 and < 1.1	≥ 1.1 and < 2	≥ 2

[a] Use of female or male as the reference group varied by indicator.

Global performance in the latest situation of inequality is determined by the median level of inequality in the set of countries – that is, the median difference or ratio. For example, a median difference of 15 percentage points between the poorest and richest quintiles across 50 countries indicates 25 countries have a difference of more than 15 percentage points, and 25 countries have a difference of less than 15 percentage points.

2.1.2.4 Change over time

To assess change in inequality over time, difference and ratio measures were calculated and compared between the two time points (Table 2.5). For difference, the change in inequality over time was calculated as the difference between the absolute values of the two differences in the two time points. The difference calculation yielded a value of 0 in the case of no change in inequality. Values above 0 indicate an increase in inequality over time, and values below 0 indicate a decrease in inequality over time.

For ratios, relative change in the ratio was analysed. The ratio calculation yielded a value of 1 in the case of no change in inequality. Values above 1 indicate an increase in inequality over time, and values below 1 indicate a decrease in inequality over time.

TABLE 2.5. Change over time measures of inequality calculations

Time period	Difference calculation	Ratio calculation
Time 1 (2001–2010)	Difference between two population subgroups in time 1[a] *|Difference time 1|*	Ratio between two population subgroups in time 1[b] *Ratio time 1*
Time 2 (2011–2020)	Difference between two population subgroups in time 2[a] *|Difference time 2|*	Ratio between two population subgroups in time 2[b] *Ratio time 2*
Change over time	Difference between difference in time 2 and difference in time 1 *(|Difference time 2| − |difference time 1|) / number of years between two time points × 10*	Ratio between ratio in time 2 and ratio in time 1 *(Ratio time 2 / ratio time 1) / number of years between two time points × 10*

[a] Calculated as absolute value yielding values above 0.
[b] Calculated as converted ratio yielding values above 1 (values were converted to be greater than 1 by dividing maximum value by minimum value).

TABLE 2.6. Summary measures and inequality thresholds to assess change in inequality over time

Summary measure of inequality	Threshold[a]				
	Large decrease	Moderate decrease	Small change	Moderate increase	Large increase
Difference between difference in time 2 and difference in time 1	≤ −20 percentage points	> −20 and ≤ −5 percentage points	> −5 to < 5 percentage points	≥ 5 and < 20 percentage points	≥ 20 percentage points
Ratio between ratio in time 2 and ratio in time 1	≤ 0.5	> 0.5 and ≤ 0.9	> 0.9 and < 1.1	≥ 1.1 and < 2	≥ 2

[a] These thresholds were used to describe change in inequality over time for countries that had high inequality according to the latest situation.

The thresholds for change in inequality over time are detailed in Table 2.6. In cases where the latest situation of inequality was measured using difference, countries that reported high inequality according to the latest situation were described as having a large increase in inequality if the change in difference between the two population subgroups was 20 percentage points or more over 10 years. The threshold for a large decrease in absolute difference was a reduction of at least 20 percentage points over 10 years. Countries with high absolute inequality according to the latest situation that had an increase or decrease of less than 5 percentage points were considered to have little change in inequality over time (including instances where there was no change in inequality over time).

Thresholds were defined for cases where the latest situation of inequality was measured using ratio. Change over time for countries with high inequality according to the latest situation was considered a large increase if the ratio had at least doubled (changed by a factor of ≥ 2), and a large decrease if the ratio had at least halved (changed by a factor of ≤ 0.5). If the relative change in the range ratio was 0.9–1.1, the situation was considered a small change in inequality over time (including instances where there was no change in inequality over time).

The median change in inequality across a set of countries was used to assess global performance. A median change over time of 20 percentage points across 50 countries, for example, would mean the change over time was greater than 20 percentage points in half of the countries and less than 20 percentage points in half of the countries.

2.1.2.5 Addressing inequality

The summary measure population attributable risk (PAR) was used to assess the impact of addressing inequality in HIV, TB and malaria indicators. PAR estimates the possible improvement in national averages if the entire population had the same level of coverage as the most advantaged subgroup. PAR was calculated for indicators with data disaggregated by economic status, with the most advantaged subgroup being the richest 20% of the population. In the majority of cases, this subgroup reported better performance compared with the national average, and thus PAR yielded a positive value. In the few cases where PAR was negative due to the richest quintile having a worse situation compared with the national average, PAR was assigned to 0, indicating the national average would not be improved. To assess PAR globally across countries for a given health indicator, the weighted average PAR was calculated using the applicable population for the indicator (e.g. total population, children aged under 5 years, people aged 15–49 years) for each country.[1]

[1] Population estimates are from the 2019 revision of the United Nations World Population Prospects database, matched to the same year as the disaggregated data for each country and indicator *(12)*.

2.2 Exploring associations between HIV, TB and malaria burden and social determinants of health

2.2.1 Data

2.2.1.1 Data sources

This exploration drew from data about HIV, TB and malaria disease burden and social determinants of health. The disease burden data were modelled annual estimates for incidence and mortality sourced from data published and maintained by UNAIDS/UNICEF/WHO *(1)*, the WHO Global TB Programme *(3)* and the WHO Global Malaria Programme *(13)*. Data about social determinants of health were sourced from a number of databases, including UNAIDS/UNICEF/WHO AIDSinfo *(1)*, the United Nations Development Programme (UNDP) Human Development Data Center *(14)*, the United Nations Global SDG Indicators database *(15)*, the United Nations World Population Prospects *(12)*, the WHO Global Health Observatory *(16)* and the World Bank DataBank *(17)*.

The study countries generally included all WHO Member States with available data about disease burden (from 2020) and data for the social determinant of health (from within the past 5 years: 2015–2020).

2.2.1.2 Health indicators and social determinants of health

In terms of health indicators, the analysis included estimates of disease incidence and mortality for HIV, TB

TABLE 2.7. Social determinants of health indicators included in correlation analyses

Category	Social determinant of health indicator	Data source
Demography	Average annual rate of population change (%)	United Nations World Population Prospects
	Net migration rate	United Nations World Population Prospects
Environmental quality	Population with primary reliance on clean fuels and technology (%)	United Nations Global SDG Indicators Database
Livelihoods and skills	GDP per capita, PPP (current international $)	World Bank DataBank
	Population living in slums (%)	United Nations Global SDG Indicators Database
	Poverty headcount ratio at international $1.90 a day (2011 PPP) (% of population)	World Bank DataBank
	Primary school completion rate (%)	World Bank DataBank
Health system coverage and inputs	Government health expenditure per capita, PPP (international $)	WHO Global Health Observatory
	Universal health coverage service coverage index[a]	WHO Global Health Observatory
Health risk factors	HIV incidence (new infections per 1000 population)[b]	UNAIDS/UNICEF/WHO AIDSinfo
	Mortality rate attributed to cardiovascular disease, cancer, diabetes or chronic respiratory disease (%)	WHO Global Health Observatory
	Prevalence of undernourishment (%)	United Nations Global SDG Indicators Database
	Total alcohol per capita consumption in adults aged ≥ 15 years (litres of pure alcohol)	WHO Global Health Observatory
Social and economic inclusion	Gender inequality index[c]	UNDP Human Development Data Center
	Gini index for income inequality	World Bank DataBank
	Inequality-adjusted human development index	UNDP Human Development Data Center

GDP: gross domestic product; PPP: purchasing power parity; SDG: Sustainable Development Goal; UNDP: United Nations Development Programme; WHO: World Health Organization.

[a] The universal health coverage service coverage index is made up of 14 tracer indicators related to reproductive, maternal, newborn and child health; infectious diseases; noncommunicable diseases; and service capacity and access. HIV, TB and malaria indicators (1 per disease, relating to prevention or treatment) comprise 3 of the 14 tracer indicators.

[b] HIV incidence was considered a risk factor only in the analysis of TB burden.

[c] The gender inequality index covers five indicators related to reproductive health, empowerment and economic status.

and malaria. The selection of relevant social determinants of health was informed by a literature review, the TB SDG monitoring framework (developed based on linkages between TB incidence and relevant SDG monitoring framework indicators *(4, 18)*), and consultation with WHO experts. The indicators were selected to address a range of social determinants of health (Table 2.7).

The disease incidence and mortality data are from 2020 across all countries, but the social determinants of health indicator data reflect the most recent data within the past 5 years for each country (2015–2020). More details about the justification for indicator selection are provided in Annex 5.

2.2.2 Analysis

The analysis investigated relationships between HIV, TB and malaria burden indicators and single social determinant indicators (correlation analysis). Associations between burden indicators and selected social determinants of health were assessed using bivariate correlation analysis. Correlation analysis does not look at the presence or effect of other variables outside the two being analysed, and it does not imply causal relationships.

The sign of the correlation coefficient indicates the direction of the association. A positive coefficient indicates that higher levels of one variable are associated with higher levels of the other. A negative coefficient indicates that higher levels of one variable are associated with lower levels of the other.

The value of the correlation coefficient indicates the strength of the association, ranging from 0 (weakest) to ± 1 (strongest). For more detailed information about the methods used in this analysis, see Annex 6.

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3

HIV

3. HIV

In the decades following the first identification of HIV, enormous global efforts have achieved expanded access to live-saving prevention and treatment services. In all HIV epidemic contexts, however, barriers occur at the individual, interpersonal, community and societal levels that impede progress towards ending the epidemic.

HIV prevention, treatment and control programmes face challenges related to limited access to care, social exclusion and marginalization, criminalization, poverty, stigma, gender-based violence and gender inequality, among others.

The 2021 United Nations General Assembly Political Declaration on HIV and AIDS underscores the centrality of tackling inequities in ending the AIDS epidemic as a public health threat. This provides a strong impetus to identify and understand more fully the nature of inequalities in HIV – including quantifying the extent, direction and magnitude of within-country inequalities – as part of the larger process of developing interventions, global targets and strategies to sustainably reduce them where required.

This chapter explores within-country inequalities in HIV, including in the general population, young people and pregnant women. It provides findings from the literature pertaining to inequalities in key populations that are more likely to be exposed to HIV or to transmit it, and whose engagement is critical to a successful HIV response, including men who have sex with men, transgender people (especially transgender women), people who inject drugs, sex workers, people in prison and detention, and people living with HIV. The chapter discusses the implications of the results and provides insights into addressing inequalities in HIV.

3.1 General population

3.1.1 Context

3.1.1.1 Epidemiological profile

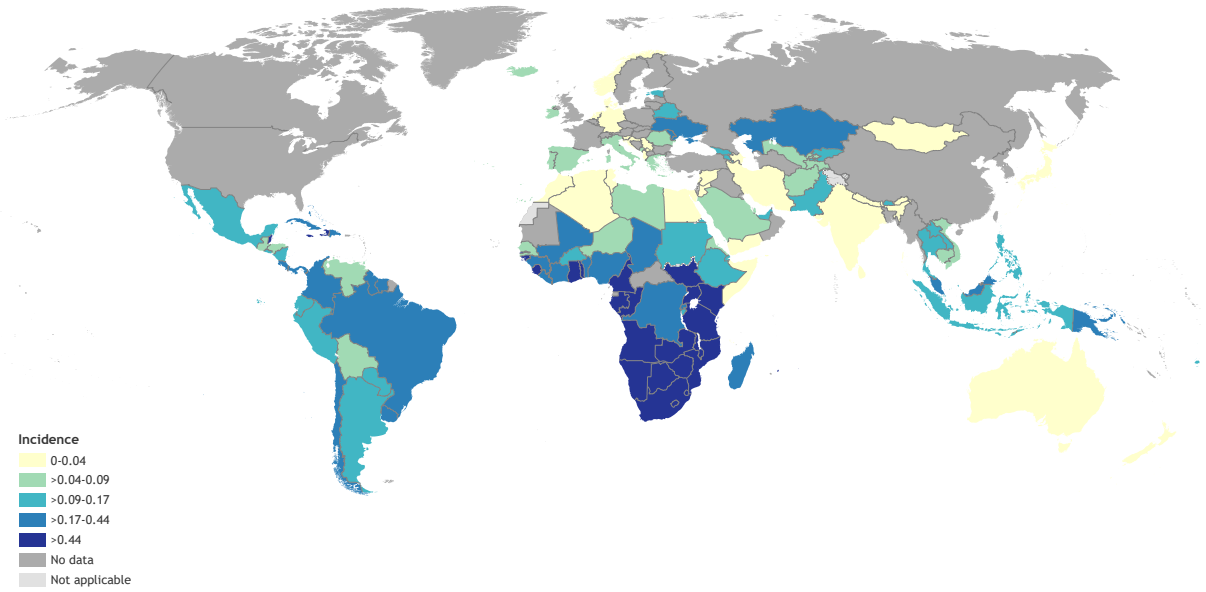
Globally, there are an estimated 37.7 million people living with HIV as of 2020, including 36.0 million adults (aged 15 years and older) and 1.7 million children (aged 14 years and younger) *(1)*. More than half of people living with HIV are in eastern and southern Africa. An estimated 79.3 million people globally have been infected with HIV since the start of the epidemic, and 36.3 million have lost their lives due to an AIDS-related illness *(1)*.

The geographical distributions of HIV incidence and AIDS-related mortality are shown in Figs 3.1 and 3.2. Global AIDS-related mortality peaked in 2004. The number of new HIV infections globally has been decreasing since 1999 *(1)*. Much of this progress has been due to the expansion in access to affordable antiretroviral therapy, particularly in low- and middle-income countries hardest hit by HIV.

Progress in addressing and reducing HIV, however, has been uneven and substantially below the targets for 2020. For instance, the annual number of new HIV infections has decreased by 31% since 2010, falling short of the 75% reduction target set by the United Nations General Assembly in 2016.

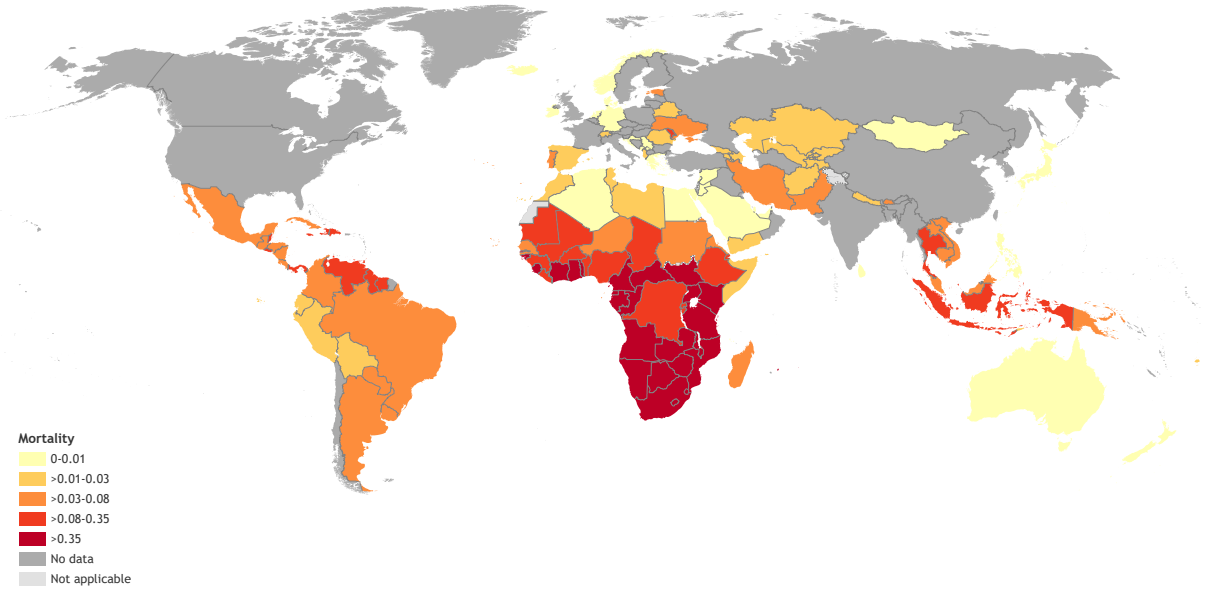
Global AIDS-related deaths fell by 47% between 2010 and 2020 – including notable reductions of more than 50% in Asia and the Pacific, the Caribbean and eastern and southern Africa – but AIDS-related deaths have increased by a third in eastern Europe and central Asia. Similarly, eastern and southern Africa reported large decreases (43%) in new HIV infections between 2010 and 2020, with a substantial decrease (37%) also reported in western and central Africa. In eastern Europe and central Asia, however, new HIV infections have increased by 43% since 2010.

FIG. 3.1. HIV incidence (new infections per 1000 population) in 130 countries: latest situation (2020)



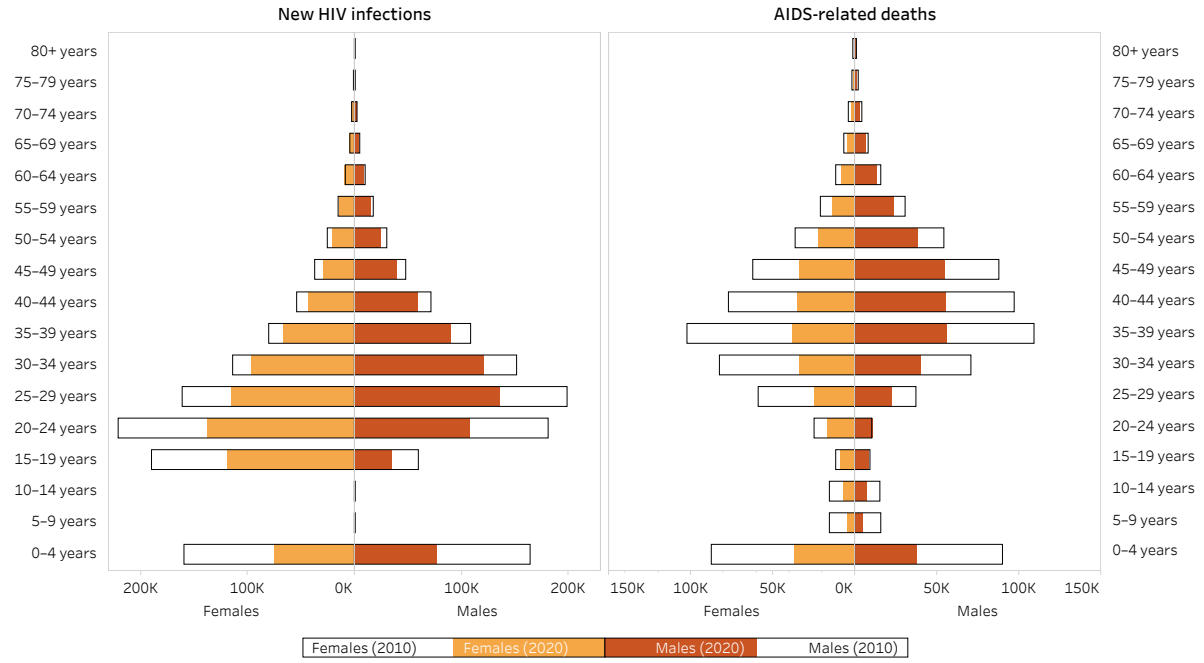
Source: UNAIDS/UNICEF/WHO 2021.

FIG. 3.2. AIDS-related mortality (deaths per 1000 population) in 131 countries: latest situation (2020)



Source: UNAIDS/UNICEF/WHO 2021.

FIG. 3.3. Global estimates of new HIV infections and AIDS-related deaths, by sex and age (2010 and 2020)



Source: UNAIDS/UNICEF/WHO 2021.

Patterns of reductions in new HIV infections and AIDS-related deaths are also evident based on sex and age (Fig. 3.3) *(1)*. Between 2010 and 2020, the number of new HIV infections decreased more in females than in males among people aged 15–24 years. The number of new HIV infections and AIDS-related deaths among children aged under 5 years declined by more than half. In 2020, new HIV infections in females were highest among those aged 20–24 years, whereas in males they were highest among those aged 25–29 years. AIDS-related deaths remain highest among young children and adults aged 30–49 years, with particularly striking reductions in young females compared with young males.

3.1.1.2 Global commitments to end AIDS

Since the formation of the WHO Global Programme on AIDS in 1987 and UNAIDS in 1994, successive global initiatives have brought heightened attention and coordination to efforts to end the spread of HIV (Box 3.1).

The first "3 by 5" initiative, launched in 2003, was a global target to provide 3 million people living with HIV in low- and middle-income countries with life-prolonging antiretroviral therapy by the end of 2005. It was a step towards the human rights-based goal of making HIV prevention and treatment services universally accessible to all who need them. This steady drive to improve treatment access led to the 2016 *Consolidated guidelines on the use of antiretroviral drugs for treating and preventing HIV infection*, where new recommendations from WHO raised the bar to treat all people living with HIV as soon as they were diagnosed ("Treat All") *(11)*. These recommendations cover children, adolescents, adults, and pregnant and breastfeeding women.

The WHO World Health Assembly has successive resolutions supporting global efforts to end AIDS as a public health problem in 2006, 2011 and 2016. In 2016, the World Health Assembly endorsed the development of the updated Global Health Sector Strategy on HIV 2016–2021 *(12)*. This strategy established the role of the health sector in responding to HIV, including delivering for equity, by adapting HIV services for different populations and locations.

The subsequent UNAIDS Global AIDS Strategy 2021–2026 specified high-level targets and commitments for 2025, established through extensive consultations across partners *(13)*. These priorities focus on maximizing equitable and equal access to HIV services; eliminating barriers to achieving HIV outcomes; and fully resourcing and sustaining HIV responses *(9, 13)*. The targets and commitments include less than 10% of people living with HIV and key populations experience stigma and discrimination; less than 10% of people living with HIV, women and girls, and key populations experience gender-based inequalities and gender-based violence; and less than 10% of countries have punitive laws and policies.

Additionally, the targets include at least 95% of people at risk of HIV use combination prevention; at least 95% of women access sexual and reproductive health services; at least 95% of pregnant women living with HIV have access to services for eliminating vertical transmission; at least 90% of people living with HIV receive preventive treatment for TB; and at least 90% of people living with HIV and people at risk are linked to other integrated health services.

The 95–95–95 targets for 2025 specify that 95% of people living with HIV know their HIV status, 95% of people who know their HIV-positive status are accessing treatment, and 95% of people on treatment have suppressed viral loads *(13)*. A set of similarly constructed 90–90–90 targets for 2020 was achieved by eight countries and narrowly missed at the global level *(14)*. These targets reflect key aspects of the response to HIV and provide entry points to address all HIV goals and targets.

The provision of accessible and acceptable voluntary HIV testing services helps people at risk of HIV to know their status. When people know their HIV-positive status, they are better able to seek care and treatment to live healthy and productive lives and can take action to reduce the possible transmission of the disease to other people *(15)*. WHO has recommended health programming practices to improve the accessibility and efficiency of HIV testing services in clinical and community settings, such as integrating HIV testing services with other testing and health services; decentralizing HIV testing services to primary health-care facilities and community-based settings; task-sharing of HIV testing service responsibilities to increase the role of trained lay providers; and establishing HIV self-testing and partner notification services *(16, 17)*. In 2020, an estimated 84% of people living with HIV knew their status, but an estimated 6.1 million people worldwide did not know they were living with HIV *(1)*.

Access to antiretroviral therapy by people living with HIV reduces HIV-related morbidity and mortality, especially when started early *(18)*. Antiretroviral therapy also helps to stop the transmission of HIV. Improved access to antiretroviral therapy was accelerated by the WHO Treat

BOX 3.1. HIV as a United Nations priority

MDG 6 was devoted to combating HIV/AIDS, malaria and other diseases, with two of three targets specifying gains in the response to HIV/AIDS: target 6A, to have halted by 2015 and begun to reverse the spread of HIV/AIDS; and target 6B, to achieve, by 2010, universal access to treatment for HIV/AIDS by all those who need it *(2)*.

The World Summit Outcome in 2005 reaffirmed these commitments, with aspirations to scale up responses through prevention, care, treatment and support, and to mobilize additional resources *(3)*.

The SDGs, launched in 2015, call for an end to the AIDS epidemic as a public health threat by 2030 (SDG 3.3), with indicator 3.3.1 tracking the number of new HIV infections per 1000 uninfected population by sex, age and key populations *(4)*.

Successive political declarations on HIV/AIDS by the United Nations General Assembly in 2001, 2006, 2011 and 2016 reaffirm commitments to end the AIDS epidemic as a public health threat, introducing a focus on women, young adults and children (2001), universal access to HIV-related services (2006), key populations (2011), and fast-track targets to accelerate progress by 2020 (2016) *(5–8)*.

In 2021, the United Nations General Assembly Special Session on the global AIDS pandemic adopted the Political Declaration on HIV and AIDS. This has an overarching focus on reducing inequalities, outlining new global commitments and targets for 2025 *(9)*. The health sector actions of the declaration will be implemented through 2022–2030 WHO global health sector strategies on HIV, viral hepatitis and sexually transmitted infections *(10)*.

All recommendations *(11)* and more recent guidelines on flexible, people-centred approaches to reach people with services where they need them *(17)*. In 2020, an estimated 87% of people who knew their HIV-positive status were accessing treatment. This amounts to almost three quarters of people living with HIV (27.5 million) accessing antiretroviral therapy in 2020. Among children aged 14 years or younger, only an estimated 54% had access to antiretroviral therapy *(1)*.

Having a suppressed viral load is indicative of antiretroviral treatment efficacy and adherence. Among people accessing treatment, an estimated 90% were virally suppressed in 2020 *(1)*.

3.1.1.3 Inequalities and barriers to progress

Patterns of sex-related inequality in HIV indicators have been explored in diverse settings and populations. In sub-Saharan Africa, there are more women living with HIV than men (i.e. women have higher prevalence), especially among people aged 15–24 years *(19)*. Outside sub-Saharan Africa, however, men tend to have higher HIV incidence than women and are more likely to die from AIDS-related causes in many contexts. This may be due to low access to health care among men, lack of care-seeking behaviours among men, and prioritization of HIV programming for women *(20)*.

More often than not, the extent of sex-related inequality in sub-Saharan African countries has increased over time, usually due to slower decreases in prevalence in women, which could be due to larger reductions in HIV incidence among men or better survival with HIV infection among women *(19)*.

Harmful gender norms, including social norms on masculinity, negatively (albeit differently) impact HIV-related health outcomes in men and women. Sex-related inequalities in HIV risk factors and outcomes often stem from gender norms and discrimination that disadvantage women. There is overwhelming evidence that violence and human rights violations are commonly experienced by women living with HIV in sub-Saharan Africa, and are reasons that underlie HIV exposure *(21)*.

Norms related to masculinity have deleterious effects on men's health, which contribute to higher morbidity and death in some settings. In South Africa, condom use at last sex was more likely to be reported among women living with HIV who were aged under 26 years and reported more equitable gender norms, compared with those of the same age reporting inequitable gender norms *(22)*.

HIV testing is proportionally higher in females than males in many settings across sub-Saharan Africa, following introduction of routine testing of pregnant women as part of prevention of mother-to-child transmission programmes and the expanded availability of antiretroviral therapy since 2008 *(23)*.

HIV-related experiences are different across age groups. HIV testing of infants and children declined between 2019 and 2020, leaving only 40% of children aged 14 years and younger living with HIV with suppressed viral loads, compared with 67% of people aged 15 years and older living with HIV *(13)*.

In low- and middle-income countries, there is increasing prevalence of HIV in people aged over 50 years, especially among men who identify as sexual or gender minorities *(24)*. In South Africa, adults aged 50 years and older are less likely to have ever tested for HIV than those aged 25–49 years. People aged 15–24 years are the least likely to have ever been tested, despite having the largest proportion of new HIV infections in the country *(25)*.

Age-related differences in HIV testing were evident in Botswana, where the percentage of men and women tested in the past year (of those who did not know their HIV-positive status) was lower among people aged 50–64 years than those aged 25–49 years. Since 2004, the prevalence of HIV in older men and women in Botswana has increased alongside greater access to antiretroviral therapy, although the majority of sexually active older adults also reported inconsistent condom use *(26)*.

Across 31 European countries, adults aged 50 years and older were more likely to have a late diagnosis than younger adults, as HIV testing is less common among older people and more likely to occur incidentally while in hospital *(27)*.

Trends in socioeconomic inequality show variation across time and settings. For example, at earlier stages of the epidemic in sub-Saharan Africa, adults with more education tended to have higher HIV prevalence. Since the mid-1990s, however, this trend has been shifting towards higher prevalence in people with lower levels of education *(28)*. A possible explanation is the uptake of protective behaviour changes and knowledge among more educated people, including higher condom use and participation in HIV educational programmes. Higher education levels are also associated with higher rates of HIV testing *(25, 29)*. Although education was not associated with AIDS-related mortality in South Africa, people with lower income or household wealth and people who were unemployed were at a higher risk of dying from AIDS-related causes *(30)*. In high-income countries, AIDS-related mortality was higher in socially disadvantaged racial groups *(31)*.

Geographical factors are determinants of HIV risk. Communities with elevated wealth-related inequality demonstrated higher risk of HIV infection, while other factors, including community-level poverty and education, had mixed associations with HIV risk *(32)*. In Latin American countries, national AIDS-related mortality has generally been on the decline since 2000, although there is notable inequality between municipalities, with at least half of deaths concentrated in less than 10% of municipalities *(33)*. Migrants and mobile populations are at a higher risk for HIV infection, especially women, who are more likely to be adversely affected by mobility than men *(34, 35)*.

Various barriers to HIV services and interventions, and their disproportionate burden among some groups of people, stand in the way of everyone benefiting from HIV services and interventions. A growing body of research characterizes barriers to HIV service use in different settings and population groups (Box 3.2). For disadvantaged population groups, multiple factors usually act simultaneously to deter HIV service use.

BOX 3.2. Barriers to HIV testing

Barriers to HIV services and programmes can be grouped as individual-level factors, factors related to health-care settings, and institutional or policy factors.

In terms of HIV testing, for example, people living with or at risk of HIV report the following barriers to testing: lack of knowledge about HIV and testing options; fear of receiving a positive result; stigma (including self-stigma, and stigmatization by family members, health-care providers or others); perceived low risk of infection; and lack of access due to transportation, cost or time constraints *(36, 37)*.

Across studies of men in sub-Saharan African countries, masculinity and associated stigma around health-seeking behaviours and concerns about confidentiality were pertinent barriers to testing *(38)*.

Health-care providers cite a need for additional training and education, as they may lack confidence about how and when to talk to people about HIV testing and refrain from offering testing to people who they perceive to be at low risk for HIV *(36, 39)*.

Institutional and policy barriers to testing relate to criminalization of certain behaviours practised by some people living with or at risk of HIV, lack of resources to administer testing (especially in more remote locations), costs and concerns with reimbursement protocols, and human resource limitations *(36, 37, 39)*.

Ensuring a strategic mix of differentiated testing services, including peer-led models, is important to address the range of barriers to testing for people who experience disadvantage.

3.1.2 Approach

The following analysis of inequalities in HIV in the general population features selected indicators related to incidence and mortality; knowledge, attitudes and practices; and testing and treatment (Table 3.1). The availability of disaggregated data comparable across countries was a factor in determining the indicators, dimensions of inequality and countries included in the analysis. For this reason, certain priorities, such as paediatric HIV, were regrettably not featured.

TABLE 3.1. Overview of disaggregated data used for general population HIV analysis

			Inequality dimension					Countries with available data	
Category	Indicator	Source	Sex	Economic status	Education	Place of residence	Age	Latest situation[a]	Change over time[b]
Incidence and mortality[c]	HIV incidence (new infections per 1000 population)	UNAIDS/UNICEF/WHO	✔					130	130
	AIDS-related mortality (deaths per 1000 population)	UNAIDS/UNICEF/WHO	✔					131	130
Knowledge, attitudes and practices	Comprehensive correct knowledge about AIDS (%)	AIS, DHS	✔					50	32
	• Females	AIS, DHS		✔	✔	✔	✔	53	41
	• Males	AIS, DHS		✔	✔	✔	✔	49–50[d]	30–32[d]
	Accepting attitudes (would buy fresh vegetables from shopkeeper living with HIV) (%)	AIS, DHS	✔					50	36
	• Females	AIS, DHS		✔	✔	✔	✔	54–55[d]	41
	• Males	AIS, DHS		✔	✔	✔	✔	48–50 [d]	34–36[d]
	Condom use at last high-risk sex (%)	AIS, DHS	✔					44	31
	• Females	AIS, DHS		✔	✔	✔	✔	36–43[d]	25–33[d]
	• Males	AIS, DHS		✔	✔	✔	✔	41–44[d]	28–34[d]
	People living with HIV who know their HIV-positive status (%)	UNAIDS/UNICEF/WHO	✔					121	
	People living with HIV on antiretroviral therapy (%)	UNAIDS/UNICEF/WHO	✔					128	
	People living with HIV with suppressed viral load (%)	UNAIDS/UNICEF/WHO	✔					93	
Testing and treatment	Testing for HIV and receiving results (ever) (%)	AIS, DHS	✔					48	29
	• Females	AIS, DHS		✔	✔	✔	✔	52	34
	• Males	AIS, DHS		✔	✔	✔	✔	47–48[d]	30

AIS: AIDS Indicator Surveys; DHS: Demographic and Health Surveys; UNAIDS: Joint United Nations Programme on HIV/AIDS; UNICEF: United Nations Children's Fund; WHO: World Health Organization.

[a] Data for the latest situation are the most recent published data. Estimates from UNAIDS/UNICEF/WHO are for 2020; estimates from AIS and DHS reflect the most recent survey conducted between 2011 and 2020. Although data are available for a larger number of countries, analysis was restricted to countries with complete disaggregated data.

[b] Data for change over time are from two periods. Estimates from UNAIDS/UNICEF/WHO are for 2010 and 2020; estimates from AIS and DHS reflect the most recent survey conducted between 2011 and 2020 and a previous survey conducted between 2001 and 2010, with a 5- to 15-year gap between the two surveys.

[c] Although age-disaggregated data were available for HIV incidence and AIDS-related mortality indicators, inequalities by age for these indicators are affected by expected age-related progression of the disease and, therefore, patterns of disease by age are presented as part of the disease context.

[d] Number of countries with available data may vary within indicator depending on the availability of information for the inequality dimension.

Data about HIV indicators were sourced from UNAIDS/UNICEF/WHO (from the 2021 modelled annual estimates for 2020) *(1)* and nationally representative household surveys, including AIS and DHS, available through the DHS Program STATcompiler tool *(40)*.[1] Indicators related to new infections and deaths include HIV incidence (new infections per 1000 population) and AIDS-related mortality (deaths per 1000 population).

The knowledge indicator, comprehensive correct knowledge about AIDS, is a composite indicator reflecting the percentage of the population aged 15–49 years who correctly identify the two major ways of preventing the sexual transmission of HIV (using condoms and limiting sex to one faithful, uninfected partner), who reject the two most common local misconceptions about HIV transmission, and who know that a healthy-looking person can have HIV.

Attitude is measured as the percentage of people aged 15–49 years who say they would buy fresh vegetables and fruit from a shopkeeper who they know is living with HIV. The practice indicator is condom use at last high-risk sex among people aged 15–49 years.[2]

Testing and treatment indicators include those related to the cascade of interventions for people aged 15 years or older: people living with HIV who know their HIV-positive status, people living with HIV who are on antiretroviral therapy, and people living with HIV who have suppressed viral load. An additional indicator of ever testing for HIV and receiving results among people aged 15–49 years is also included (noting that this indicator includes HIV testing during pregnancy). The complete metadata for all indicators is available in Annex 7.

Disaggregated data are available for up to five dimensions of inequality, including sex, economic status, education, place of residence and age. For knowledge, attitudes and practices and testing indicators sourced from AIS or DHS, double disaggregation was possible, and inequalities are presented separately for females and males. Age-disaggregated data for knowledge, attitudes and practices and testing and treatment indicators encompassed four subgroups (15–19 years, 20–29 years, 30–39 years, 40–49 years). The subgroups for the other dimensions of inequality were similarly constructed throughout the report: economic status (wealth quintiles), place of residence (rural and urban) and sex (female and male).[3]

The analysis approach is described more fully in Chapter 2, including the inequality thresholds used to describe situations of high and low inequality. For the following analysis, sex-related inequality in the incidence and mortality indicators was reported as the ratio of female to male estimates (a summary measure of relative inequality). For all other indicators, inequality was reported as the difference between two population subgroup estimates (an absolute summary measure of inequality). The global assessment is based on the overall median of measures of inequality for all countries with available data.

The analysis included all countries with available data, including those with relatively higher and lower overall HIV incidence. To capture trends specific to high-burden or high-funding settings, a subanalysis was conducted in countries prioritized by the Global Fund.[4] For the HIV incidence indicator, comparisons are made between countries in the WHO African Region (where HIV burden is higher) and other countries outside this region.

For comprehensive information about the data analysis methods, see Chapter 2 and Annex 2.

ADDITIONAL RESOURCES FOR DATA EXPLORATION, INCLUDING INTERACTIVE VISUALS AND DATA, ACCOMPANY THIS REPORT (see https://www.who.int/data/health-equity/report_2021_hiv_tb_malaria).

[1] Although the Population HIV Indicator Assessment Surveys have been a vital source of data for the HIV epidemic, they are available for a reduced number of countries, making this source less suitable for a global analysis of inequalities.

[2] Indicators related to consistent condom use are subject to recall bias and other biases. These biases are minimized, however, when referring to the most recent act of non-cohabiting sex. The notion of undetectable = untransmittable (U = U) underscores the possibility for people living with HIV who have an undetectable viral load to have sex without a condom with no risk of transmitting HIV. The promotion of condom use and other combination prevention strategies remains a key part of the HIV response and sexual and reproductive health programming more generally *(41)*.

[3] For sex-disaggregated data, most sources reported data by biological sex (females and males). This language was adopted throughout the results section. The lack of data availability reflecting diverse gender identities is a limitation.

[4] These countries, identified in Annex 2, are prioritized because they have the highest number of deaths, or have the highest incidence rate, or are among those that received the highest amount of funding from the Global Fund.

3.1.3 Results

3.1.3.1 Incidence and mortality

KEY FINDINGS

- HIV incidence tended to be higher in females than males in countries in the WHO African Region, especially where the overall burden of disease was higher. In Congo and Gabon, HIV incidence was twice as high in females than males. In countries outside this region, incidence and mortality were higher in males than females.
- In the majority of high-inequality countries, sex-related inequality in HIV incidence and AIDS-related mortality was unchanged or had worsened since 2010.

Inequalities in HIV incidence and AIDS-related mortality were assessed in up to 131 countries. Table 3.2 gives an overview of the number of countries reporting high and low inequality for the two indicators. The results of a subanalysis comparing the global findings with high-burden or high-funding settings are presented in Section 3.1.3.4.

In 2020, most countries in the WHO African Region were more likely to report higher HIV incidence in females than males (Fig. 3.4). All countries with 0.6 or more new infections per 1000 population were located in this region. The median female/male ratio of HIV incidence across 41 countries in the WHO African Region was 1.6. In two countries, HIV incidence was more than twice as high in females than males (Congo, national HIV incidence 1.94 per 1000; Gabon, national HIV incidence 0.48 per 1000).

In countries outside the WHO African Region where the burden of HIV was lower, HIV incidence was higher in males. The median ratio for HIV incidence in 89 countries outside the WHO African Region was 0.4, demonstrating a trend of moderately higher incidence in males than females.

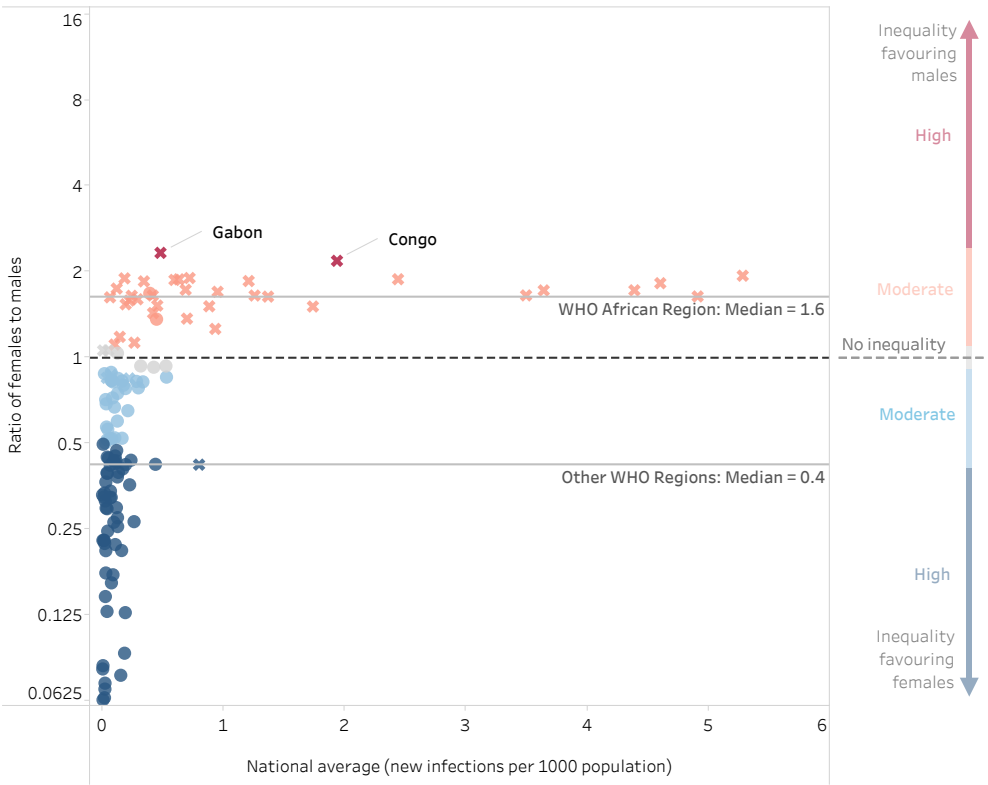
Overall, the global median ratio of female to male HIV incidence was 0.6. In 45% of countries (58 of 130), HIV incidence among females was half or less of that among males. Most of these countries, however, had a low overall burden of HIV, and the resulting "large" relative inequality may reflect small absolute differences that do not have public health significance. Among the 58 countries with high relative inequality, the majority reported no change in inequality or increased inequality compared with 2010.

AIDS-related mortality showed a global median female/male ratio of 0.6, suggesting moderately higher mortality among males than females across 131 countries. Females had half or less than half the mortality rates of males in over a third of countries (47 of 131 countries). Three countries (Costa Rica, Cuba, El Salvador) reported high inequality favouring males. Notably, however, all countries with high levels of sex-related inequality had low national AIDS-related mortality. Overall, there was little change in the female/male ratio between 2010 and 2020.

TABLE 3.2. Overview of high and low inequality in HIV incidence and AIDS-related mortality indicators in general population across study countries

Indicator	Dimensions of inequality explored	Countries included in analysis	Countries with high inequality	Countries with low inequality
HIV incidence	Sex	130	58	6
AIDS-related mortality	Sex	131	50	15

FIG. 3.4. Relative sex-related inequality in, and national average of, HIV incidence in 130 countries: latest situation (2020)



Each country is represented by one shape. Crosses represent countries in the WHO African Region. Circles represent countries outside the WHO African Region.
Solid horizontal lines indicate the median across countries.
The dashed horizontal line indicates the ratio value of no inequality (1).

Source: UNAIDS/UNICEF/WHO 2021.

3.1.3.2 Knowledge, attitudes and practices

KEY FINDINGS

- Sex-related inequalities in knowledge about AIDS and in HIV attitudes were low overall. Condom use at last high-risk sex was higher among males than females. Across all three indicators, there were minimal changes in sex-related inequality over the previous 10 years overall.
- High levels of economic-related inequality among females and males were observed for all knowledge, attitudes and practices indicators. Global inequality favoured the richest and showed little change over the past decade. For females and males and across all three indicators, around half or more of countries demonstrated a gap of at least 20 percentage points between the richest and poorest.
- Moderate to large education-related inequalities favouring the most educated people were observed across all knowledge, attitudes and practices indicators with, at most, moderate reduction over time. Three countries reported large education-related inequalities for both sexes in all knowledge, attitudes and practices indicators (Angola, Chad, Côte d'Ivoire).
- Moderate inequality favouring urban over rural areas has persisted with little change over the past decade overall. Angola was the only country that demonstrated high place of residence inequality favouring urban areas for both sexes in all knowledge, attitudes and practices indicators.
- Younger subgroups were moderately more likely to use condoms globally, especially females.

TABLE 3.3. Overview of high and low inequality in HIV knowledge, attitudes and practices indicators in general population across study countries

Indicator	Sex	Dimensions of inequality explored	Countries included in analysis	Countries with high inequality by at least one dimension	Countries with low or no inequality across all dimensions
Comprehensive correct knowledge about AIDS	Females and males	Sex	50	0	22
	Females	Economic status, education, place of residence, age	53	34	1
	Males	Economic status, education, place of residence, age	49–50[a]	39	1
Accepting attitudes (would buy fresh vegetables from shopkeeper living with HIV)	Females and males	Sex	50	0	25
	Females	Economic status, education, place of residence, age	54–55[b]	26	1
	Males	Economic status, education, place of residence, age	48–50[c]	29	1
Condom use at last high-risk sex	Females and males	Sex	44	24	3
	Females	Economic status, education, place of residence, age	36–43[d]	30	0
	Males	Economic status, education, place of residence, age	41–44[e]	31	0

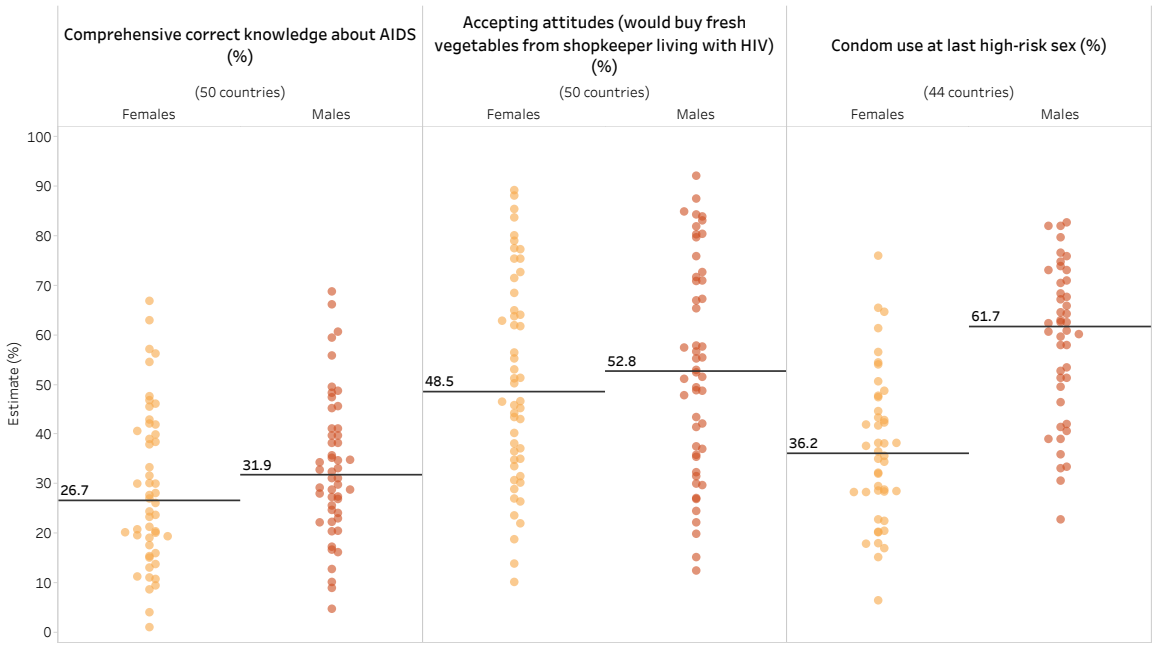
[a] 49 countries had disaggregated data by age and education, and 50 countries had disaggregated data by economic status and place of residence.
[b] 54 countries had disaggregated data by education, and 55 countries had disaggregated data by age, economic status and place of residence.
[c] 48 countries had disaggregated data by age, 49 countries had disaggregated data by education, and 50 countries had disaggregated data by economic status and place of residence.
[d] 36 countries had disaggregated data by age, 39 countries had disaggregated data by economic status, and 43 countries had disaggregated data by education and place of residence.
[e] 41 countries had disaggregated data by age, and 44 countries had disaggregated data by economic status, education and place of residence.

Inequalities in knowledge, attitudes and practices were assessed in up to 55 countries. Table 3.3 gives an overview of the number of countries reporting high and low inequality for the three indicators.

Overall, sex-related inequality was low for the knowledge and attitude indicators, while the practice indicator (condom use) demonstrated inequalities, with higher use among males (Fig. 3.5). Knowledge about AIDS, measured as the percentage of the population with comprehensive correct knowledge, tended to be similar in females and males across 50 countries overall, with no country reporting high inequality in knowledge between females and males. In 22 of 50 countries, the difference in knowledge level between females and males was less than 5 percentage points. Across the 32 countries where data were available to assess change over time, overall low sex-related inequality was unchanged. Similarly, the prevalence of accepting attitudes about HIV was, overall, the same in females and males across 50 countries, with no countries reporting high sex-related inequality and half of countries (25 of 50) reporting low inequality.

The use of a condom at last high-risk sex was, overall, higher in males than females across 44 countries, with over half of countries (55%) reporting a gap of at least 20 percentage points. In the majority of the countries with high sex-related inequality, the gap between females and males was unchanged or had worsened over the previous decade.

FIG. 3.5. Knowledge, attitudes and practices indicators, by sex: latest situation (2011–2020)



Each country is represented by multiple circles (one for each indicator and subgroup).
Solid horizontal lines indicate the median across countries. The difference between the median values of two subgroups evident on the figure is distinct from the overall median difference across countries (reported in the text and used to assess the overall level of inequality as low, moderate or high).

Source: AIDS Indicator Surveys and Demographic and Health Surveys.

Males reported substantially higher condom use than females to an extent that was unchanged or had worsened over the past 10 years in Albania, Burundi, Côte d'Ivoire, Dominican Republic, Ethiopia, Ghana, Guinea, Liberia, Malawi, Mali, Niger, Nigeria, Senegal and Uganda.

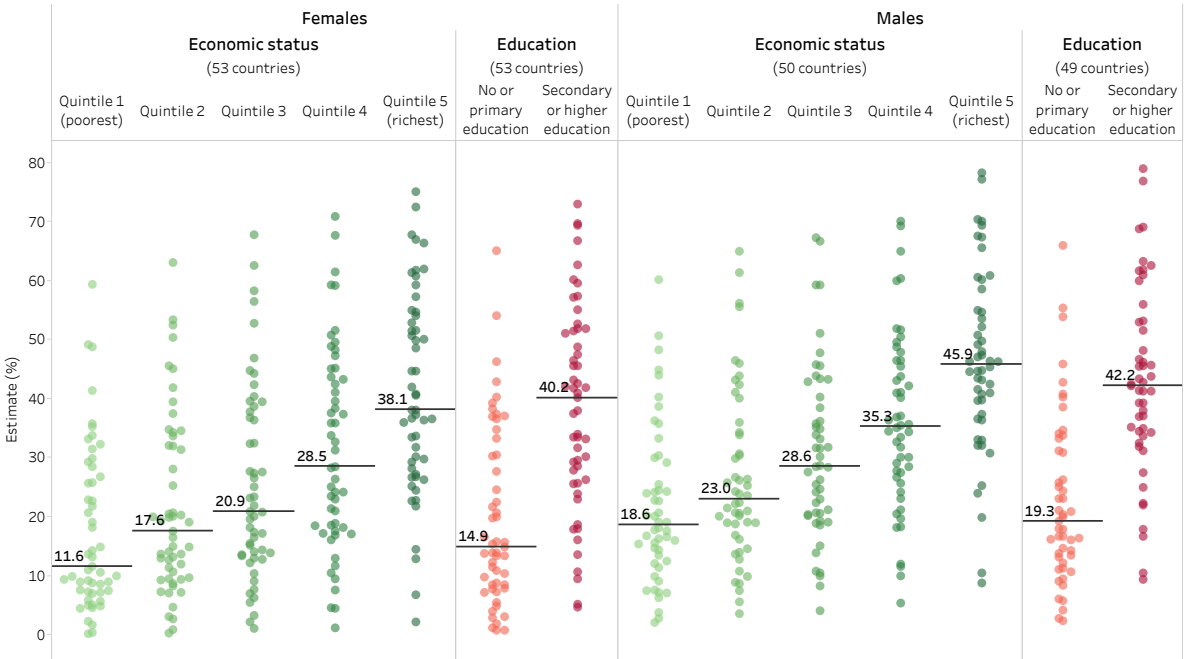
Only one country (Armenia) reported a decrease in sex-related inequality. Three countries (India, Lesotho, Mozambique) showed low levels of sex-related inequality in condom use according to the latest available data since 2011.

Inequalities in AIDS knowledge by economic status and education were large or moderate for females and males, benefiting richer and more educated people (Fig. 3.6), with little reduction over time. In females and males, the median difference between the richest and poorest quintiles was nearly 25 percentage points. Education-related inequalities in knowledge were, overall, around 20 percentage points between the most educated people (secondary or higher education) and the least educated people (no or primary education) in males (49 countries) and females (53 countries). Among males, education-related inequality was high in the majority of countries (29 of 49); in females, education-related inequality was high in 45% of countries (24 of 53).

Countries that reported low levels of inequality in AIDS knowledge by economic status or education (e.g. Afghanistan, Egypt, Jordan) also had low national levels of AIDS knowledge (less than 10% of males in Afghanistan and Jordan and females in Egypt) and low HIV prevalence (less than 0.1% among adults aged 15 years and older in all three countries).

Patterns of inequality in knowledge about AIDS by place of residence were similar in females and males,

FIG. 3.6. Comprehensive correct knowledge about AIDS among females and males, by economic status and education: latest situation (2011–2020)



Each country is represented by multiple circles (one for each subgroup).
Solid horizontal lines indicate the median across countries. The difference between the median values of two subgroups evident on the figure is distinct from the overall median difference across countries (reported in the text and other resources that accompany this report and used to assess the overall level of inequality as low, moderate or high).

Source: AIDS Indicator Surveys and Demographic and Health Surveys.

demonstrating moderate inequality favouring urban areas, and little change over time overall. Angola, Cambodia, Myanmar, Niger and Senegal reported high urban–rural inequality in females and males. Inequalities by age were low and unchanged overall over the previous decade.

The prevalence of accepting attitudes about HIV was higher in females and males with higher economic status and education levels and, to a lesser extent, females and males in urban areas. In terms of economic status, there was a gap in the prevalence of accepting attitudes of at least 20 percentage points between the richest and poorest males in the majority of countries (28 of 50), and between the richest and poorest females in nearly half of countries (26 of 55). Both sexes reported a low overall reduction in inequality related to economic status over the previous 10 years.

Overall, education-related inequality across countries was moderate in females and males, with a median of over 15 percentage points higher prevalence among the most educated people (secondary or higher education) than the least educated people (no or primary education). In over a third of countries, there was large education-related inequality in accepting attitudes (20 of 49 countries for males; 19 of 54 countries for females).

Among countries with high levels of education-related inequality in males, nearly twice as many countries reported no change or increased inequality (9 of 20) than a decrease in inequality (5 of 20) over time. Differences in accepting attitudes between urban and rural residents were moderate overall, with little change over time for females or males.

Inequality in accepting attitudes related to age was less pronounced than the other three dimensions, with global medians suggesting accepting attitudes tend to be moderately more prevalent in people aged 40–49 years than those aged 15–19 years. There was little overall change in age-related inequality in the previous 10 years.

Across all four dimensions, 29 of 48–50 countries had high inequality for at least 1 dimension of inequality in males, and 26 of 55 countries had high inequality for at least 1 dimension in females.

There were moderate to large levels of inequality in condom use, generally favouring richer, more educated, urban and younger subgroups. The overall median level of inequality by economic status in condom use was large for males (24 percentage points across 44 countries) and females (21 percentage points across 39 countries). In males and females, about 60% of countries reported high economic-related inequality, whereas the number of countries with low economic-related inequality was limited to a few countries with mostly low HIV prevalence: Colombia, Kyrgyzstan and Nepal had low inequality among males, and the Dominican Republic and Ghana had low inequality among females.[1]

Condom use was more prevalent in subgroups with secondary or higher education compared with those with no or primary education, demonstrating moderate inequality overall in males (14 percentage points median difference across 44 countries) and females (16 percentage points median difference across 43 countries). In both sexes, the majority of countries with high levels of inequality (where data were available) showed no change or increased inequality over the past decade.

Place of residence inequality in condom use was moderate overall in females and males. In all countries with high levels of inequality, coverage was higher in urban than rural areas. In both sexes, people aged 15–19 years (especially females) were more likely to use condoms than people aged 40–49 years. In females, there was a median difference of 14 percentage points between the younger and older age groups across 36 countries, and a third of countries (13 of 36) reported high inequality. Only one of these countries (Zimbabwe) had substantially higher condom use in older adult females than younger females.

3.1.3.3 Testing and treatment

KEY FINDINGS

- **Overall, there was low sex-related inequality in people living with HIV who know their HIV-positive status, who are on antiretroviral therapy and who have suppressed viral load. Among countries with high inequalities in these three indicators (20%), a larger number of countries reported high inequality favouring females over males.**
- **Across countries, females were moderately more likely than males to have ever been tested for HIV and received results. Among females and males, testing coverage was higher among richer, more educated and urban subgroups globally. Over the previous decade, the gap in HIV testing between people aged 40–49 years and people aged 15–19 years has grown as testing coverage has increased faster in the older group.**

Inequalities in HIV testing and treatment were assessed in up to 128 countries. Table 3.4 gives an overview of the number of countries reporting high and low inequality for the four indicators.

Globally, among people living with HIV, there was little sex-related inequality in knowledge about their status, use of antiretroviral therapy and suppression of their viral load. For each of these three indicators, more countries reported low sex-related inequality than high sex-related inequality. In the majority of countries that reported high sex-related inequality, the situation was more favourable among females than males. Almost two thirds of countries that had high sex-related inequality in people living with HIV who know their HIV-positive status (14 of 22 countries) reported higher awareness among females. Nine countries reported high sex-related inequality favouring females for all three

[1] In 2020, the national prevalence of HIV among adults aged over 15 years was 0.5% in Colombia, 0.9% in the Dominican Republic, 1.7% in Ghana, 0.2% in Kyrgyzstan and 0.1% in Nepal *(1)*.

TABLE 3.4. Overview of high and low inequality in HIV testing and treatment indicators in general population across study countries

Indicator	Sex	Dimensions of inequality explored	Countries included in analysis	Countries with high inequality by at least one dimension	Countries with low inequality across all dimensions
People living with HIV who know their HIV-positive status	Females and males	Sex	121	22	54
People living with HIV on antiretroviral therapy	Females and males	Sex	128	29	42
People living with HIV with suppressed viral load	Females and males	Sex	93	18	33
Testing for HIV and receiving results (ever)	Females and males	Sex	48	10	12
	Females	Economic status, education, place of residence, age	52	42	1
	Males	Economic status, education, place of residence, age	47–48[a]	37	2

[a] 47 countries had disaggregated data by education, and 48 countries had disaggregated data by age, economic status and place of residence.

indicators (Belarus, Benin, Bhutan, Colombia, Kazakhstan, Kyrgyzstan, Liberia, Republic of Moldova, Senegal). Two countries reported high sex-related inequality favouring males (El Salvador, Venezuela (Bolivarian Republic of)).

Overall, females were more likely than males to have ever been tested for HIV and received results, with a median difference of 12 percentage points across 48 countries.[1] Ten of 48 countries reported high inequality favouring females; 7 of these reported no change or increased inequality over the past decade, and no data were available for the remaining 3 countries.

Inequalities were also evident across other dimensions of inequality in females and males (Fig. 3.7). As would be expected due to the nature of the indicator (specifying "ever" testing), coverage was higher among people aged 40–49 years than people aged 15–19 years. In many countries, however, the age gap has widened over the past decade due to increased testing among people aged 40–49 years. The overall median increase in age-related inequality over the previous 10 years was nearly 20 percentage points for both females and males.

Richer subgroups were more likely to report HIV testing than poorer subgroups. Globally, both females and males reported economic-related inequality, with more than half of countries demonstrating a gap of at least 20 percentage points between testing among males in the richest and poorest households. The majority of countries with high economic-related inequality did not report improvements in inequality over the previous decade.

Inequalities by education and place of residence were moderate in females and males globally, with more testing among the most educated and urban subgroups.

For economic status, education and place of residence, global inequalities in HIV testing had increased moderately or demonstrated no change over the previous decade.

[1] This indicator includes HIV testing during pregnancy, which is likely to contribute to higher testing among females.

FIG. 3.7. Testing for HIV and receiving results (ever) among females and males, by economic status, education and place of residence: latest situation (2011–2020)

Each country is represented by multiple circles (one for each subgroup).
Solid horizontal lines indicate the median across countries. The difference between the median values of two subgroups evident on the figure is distinct from the overall median difference across countries (reported in the text and other resources that accompany this report and used to assess the overall level of inequality as low, moderate or high).

Source: AIDS Indicator Surveys and Demographic and Health Surveys.

3.1.3.4 Patterns of inequality in high-burden or high-funding countries

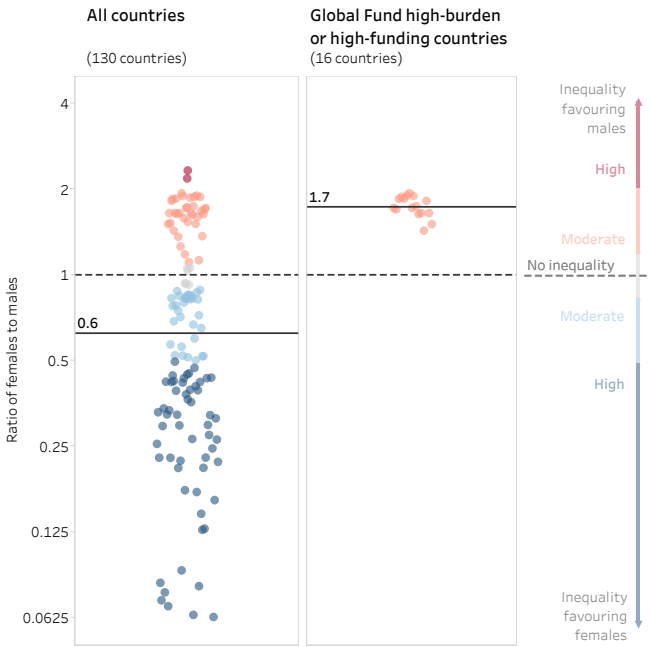
Patterns of inequality were assessed in a subset of countries that are prioritized by the Global Fund because they have a high burden of disease or receive high levels of funding. This analysis included up to 16 countries, depending on the availability of disaggregated data. In contrast to the overall findings across all countries (where HIV incidence and AIDS-related mortality were, according to the global median, higher in males), the subset of 16 high-burden or high-funding countries reported 1.7 times higher HIV incidence in females than males overall (Fig. 3.8) and no sex-related inequality in AIDS-related mortality.

All high-burden or high-funding countries had moderate sex-related inequality (measured as female/male ratio) for HIV incidence, with ratios ranging from 1.44 in Nigeria to 1.90 or higher in the Democratic Republic of the Congo, Eswatini, Kenya, Malawi, Namibia and Rwanda. In all high-burden or high-funding countries, sex-related inequalities have grown in the past 10 years.

For knowledge, attitudes and practices indicators, the patterns of inequality in the subset of 14–15 high-burden or high-funding countries were very similar to the full set of study countries (the subset comprised 25–41% of the full set of countries, depending on the indicator).

Patterns of inequality for testing and treatment indicators among high-burden or high-funding countries were also largely similar to global patterns. Notably, high-burden or high-funding countries reported very elevated overall age-related inequality for ever having tested for HIV and received results, with higher testing among older people.

FIG. 3.8. Relative sex-related inequality in HIV incidence in all countries and high-burden or high-funding countries: latest situation (2020)



Each country is represented by one circle on the left graph and high-burden or high-funding countries are represented by one circle on the right graph.
Solid horizontal lines indicate the median across countries.
The dashed line indicates the ratio value of no inequality (1).

Source: UNAIDS/UNICEF/WHO 2021.

Across 15 countries, the overall median difference between age groups in females and males was over 30 percentage points, with growing inequality (at least 20 percentage points overall) over the previous decade.

3.2 Young people

3.2.1 Context

Young people, defined as people aged 15–24 years, are a high-priority population for reducing HIV. In many countries, the population of young people is sizeable and growing. In the 47 least developed countries, this population comprised 207 million people in 2019 and is projected to reach 336 million in 2050 *(42)*. In 2020, there were 3.3 million young people living with HIV globally, the majority of whom lived in eastern and southern African countries *(1)*. Worldwide, AIDS-related deaths among young people peaked in 2004 at 72 000 and amounted to 45 000 in 2020. HIV epidemics are largely perpetuated through the sexual transmission of infection to successive generations of young people *(43)*.

Efforts to improve HIV risk factors and outcomes among young people are gaining momentum globally. The MDGs included a focus on HIV in young people, specifying indicators related to HIV prevalence among people aged 15–24 years (indicator 6.1), and comprehensive correct knowledge of AIDS among people aged 15–24 years *(2)*. The SDGs call for monitoring the number of new HIV infections disaggregated by age group and sex *(4)*. Indirectly, other aspects of the SDGs address cross-cutting risk factors for HIV in young people, including eliminating poverty and promoting gender equality, education and peace *(44)*.

Young people living with HIV have diverse needs and experiences. The delivery of HIV-related services should cater to their circumstances and be integrated with other health services accessed by this population. WHO guidance on providing adolescent-friendly health services for adolescents living with HIV highlights five adolescent peer-based models for providing differentiated services for adolescents, underscoring the importance of accessible, acceptable, equitable, appropriate and effective services, and emphasizing the value of including adolescents in the processes of planning, monitoring and evaluating services *(45)*.

In 2012, recognizing that young people can be engaged as active partners in HIV responses, the UNAIDS Youth Programme was launched, advocating for evidence-informed policy through increased strategic information and fostering a decentralized, youth-led movement in the HIV response (Box 3.3) *(46)*.

Many social and cultural environments support and sustain risky sexual behaviours among young people. The complex interplay of individual, family, community and structural factors presents unique challenges for stopping the transmission of HIV *(48–50)*. In particular, prevailing social and cultural norms related to patriarchal taboos and silence and shame around female sexuality contribute to a lack of female autonomy, agency and choice. These dynamics favour male power in sexual relationships and contribute to gender-based violence and abuse *(51, 52)*.

As a result, young women are at disproportionate risk of acquiring HIV, which is heightened by other risk factors such as transactional sex, multiple partnerships, early sexual debut, substance abuse, having sex without a condom, precarious labour or migration circumstances, family disruptions and socioeconomic inequalities *(51–54)*.

Young people may face difficulty accessing, negotiating use of, and adhering to correct use of core HIV response interventions. In a study of 24 countries in sub-Saharan Africa, condom use among people aged 15–19 years in non-marital relationships was below 50% in most countries, with higher use in urban compared with rural areas and among people with higher levels of education *(55)*.

In some cultures, discussions about topics related to HIV and AIDS are taboo, and misconceptions about modes of transmissions, prevention measures and perceived risk are common among young people *(56)*. Educational programmes that promote adequate and accurate knowledge about HIV and AIDS can help to reduce sexual risk behaviours among young people and reduce stigma associated with HIV infection. For example, adolescents who have had formal sex education may be more likely to use condoms *(57)*. In Nigeria, higher levels of knowledge about AIDS and positive attitudes about people living with HIV are predictive of engagement with HIV testing services *(58)*.

BOX 3.3. #uproot campaign

The #uproot campaign is a global, youth-led political agenda with the overarching goal of ending the AIDS epidemic as a public health threat by 2030 and advancing sexual and reproductive health and rights of young people *(47)*.

Conceptualized by the PACT, a UNAIDS-supported coalition of more than 80 organizations working collaboratively in the HIV response, #uproot is focused on tackling the structural barriers that put young people at risk and promoting a sustainable HIV response for young people. Its four priority objectives are to:

- challenge policy and legal barriers that pose obstacles for people's access to HIV and sexual and reproductive health;
- support young people's participation in community-led responses through fostering leadership and youth participation in decision-making;
- support the scale-up of age-sensitive, youth-friendly HIV and sexual and reproductive health services;
- facilitate and strengthen partnerships between youth-led and youth-serving organizations and other stakeholders for an effective HIV response.

The #uproot campaign promotes an integrative approach focused on advocating for participation (especially of young people from key populations), changing policy and building partnerships.

Other predictors of HIV testing include higher levels of education, wealth and media exposure *(58)*. Barriers to HIV testing stem from fears of stigma and family reaction, poor attitudes of health-care providers, and requirements for parental consent *(59)*.

Young people are a heterogeneous population, with certain groups at higher risk with respect to HIV infection and inadequate treatment and care. Adolescent girls and young women are a particularly disadvantaged population with regard to HIV *(52)*. In sub-Saharan Africa, young adult females are twice as likely to be living with HIV than their male counterparts, and six of every seven new HIV infections among adolescents aged 15–19 years occur in girls *(14)*.

Depending on the setting, certain subgroups may be at higher risk, such as those living in informal or formal urban settlements, and those who are unmarried (or young women who marry early) *(52)*. Adolescent mothers affected by HIV and their children have higher health risks associated with gender inequality, poverty, violence, exclusion and poor education. They also tend to have poorer outcomes in prevention of mother-to-child transmission and are less likely to initiate or adhere to treatment *(60)*.

Other priority groups of young people, each with their own unique set of challenges and opportunities, include young people who use drugs; children exploited through, and older adolescents involved in, commercial sex; and adolescent boys who have sex with other males *(61–64)*.

A general lack of research on young people's risk factors for HIV and exclusion of adolescents in biomedical research has been noted *(54, 61, 62)*. Strengthened systems for monitoring and reporting on HIV indicators in young people are required to build an evidence base to inform strategic and targeted responses.

3.2.2 Approach

Inequality analysis for young people aged 15–24 years included three indicators related to knowledge, practices and testing and treatment (Table 3.5). These three indicators were selected based on the availability of globally comparable disaggregated data.

TABLE 3.5. Overview of disaggregated data used for young people (aged 15–24 years) HIV analysis

			Inequality dimension					Countries with available data	
Category	Indicator	Source	Sex	Economic status	Education	Place of residence	Age	Latest situation[a]	Change over time[b]
Knowledge and practices	Comprehensive correct knowledge about AIDS among young people (%)	AIS, DHS	✔					43	27
	• Young females	AIS, DHS			✔	✔	✔	46–47[c]	35–36[c]
	• Young males	AIS, DHS			✔	✔	✔	42–43[c]	26–27[c]
	Condom use at last sexual intercourse among young people (%)	AIS, DHS	✔					35	22
	• Young females	AIS, DHS			✔	✔	✔	25–29[c]	14–18[c]
	• Young males	AIS, DHS			✔	✔	✔	29–35[c]	21–23[c]
Testing and treatment	Testing for HIV and receiving results in past 12 months among sexually active young people (%)	AIS, DHS	✔					48	31
	• Young females	AIS, DHS			✔	✔	✔	50–51[c]	34
	• Young males	AIS, DHS			✔	✔	✔	46–48[c]	31

AIS: AIDS Indicator Surveys; DHS: Demographic and Health Surveys.

[a] Data for the latest situation are from the most recent survey conducted between 2011 and 2020.
[b] Data for change over time are from two periods: the most recent survey conducted between 2011 and 2020, and a previous survey conducted between 2001 and 2010, with a 5- to 15-year gap between the two surveys.
[c] Number of countries with available data may vary within indicator depending on the availability of information for the inequality dimension.

Data were sourced from AIS and DHS, available through the DHS Program STATcompiler tool *(40)*. Countries were included only if data were available for all subgroups of a particular inequality dimension.

Comprehensive correct knowledge about AIDS among young people is measured in the same manner as the knowledge indicator for the general population: the percentage of the population who correctly identify the two major ways of preventing the sexual transmission of HIV (using condoms and limiting sex to one faithful, uninfected partner), who reject the two most common local misconceptions about HIV transmission, and who know that a healthy-looking person can have HIV.

Condom use is considered at the last sexual intercourse among young people,[1] while the HIV testing indicator specifies being tested and receiving results in the past 12 months among sexually active young people. Detailed information about the indicators is available in Annex 7.

Disaggregated data are available for four dimensions of inequality: sex, education, place of residence and age. Sex-related inequalities are presented for each indicator, and inequalities in other dimensions are presented separately for females and males.[2] For all indicators, inequality was reported as the difference between two population subgroup estimates (a measure of absolute inequality). The inequality thresholds applied to describe situations of high and low inequality are explained in detail in Chapter 2. For comprehensive information about the data analysis methods, see Annex 2.

ADDITIONAL RESOURCES FOR DATA EXPLORATION, INCLUDING INTERACTIVE VISUALS AND DATA, ACCOMPANY THE REPORT (see https://www.who.int/data/health-equity/report_2021_hiv_tb_malaria).

[1] Indicators related to condom use are subject to recall bias and other biases, but these are minimized when referring to last sexual intercourse. The notion of undetectable = untransmittable (U = U) underscores the possibility for people living with HIV who have an undetectable viral load to have sex without a condom with no risk of transmitting HIV. The promotion of condom use and other combination prevention strategies remains a key part of the HIV response and sexual and reproductive health programming more generally *(41)*.

[2] For sex-disaggregated data, most sources reported data by biological sex (females and males). This language was adopted throughout the results section. The lack of data availability reflecting diverse gender identities is a limitation.

3.2.3 Results

3.2.3.1 Knowledge and practices

KEY FINDINGS

- Across countries, young females and males tended to have similar levels of comprehensive knowledge about AIDS. Condom use was moderately higher among young males than young females. Overall, patterns of sex-related inequality in knowledge and practice indicators were unchanged over the previous 10 years.
- Knowledge about AIDS and condom use among young people was higher in the most educated than the least educated, with a low to moderate reduction over the previous 10 years. Around half of countries reported high education-related inequality in knowledge about AIDS in young females and males. Condom use showed moderate or high levels of inequality by education in almost all countries for young females and males.
- Young people living in urban areas had moderately higher knowledge about AIDS and condom use than those in rural areas overall, with little change over the previous 10 years.
- Age-related inequality in knowledge and practice indicators among young males and young females tended to be low, with little change over the previous 10 years.

Inequalities in knowledge and practices in young people were assessed in up to 47 countries. Table 3.6 gives an overview of the number of countries reporting high and low inequality for the two indicators.

Overall, sex-related inequalities in comprehensive correct knowledge about AIDS and condom use at last sexual intercourse among young people were unchanged over the previous decade. The sex-related difference in knowledge across 43 countries was low overall. Nearly half of countries reported similar levels of knowledge about AIDS in young females and males (low sex-related inequality), and no country had high inequality by sex. There was moderately higher condom use among young males than young females (median difference 14 percentage points across 35 countries).

Globally, there were substantial inequalities by education in comprehensive correct knowledge about AIDS among young females and males aged 15–24 years.

TABLE 3.6. Overview of high and low inequality in HIV knowledge and practices indicators in population of young people (aged 15–24 years) across study countries

Indicator	Sex	Dimensions of inequality explored	Countries included in analysis	Countries with high inequality by at least one dimension	Countries with low inequality across all dimensions
Comprehensive correct knowledge about AIDS among young people	Young females and males	Sex	43	0	19
	Young females	Education, place of residence, age	46–47[a]	19	2
	Young males	Education, place of residence, age	42–43[b]	22	0
Condom use at last sexual intercourse among young people	Young females and males	Sex	35	11	5
	Young females	Education, place of residence, age	25–29[c]	13	2
	Young males	Education, place of residence, age	29–35[d]	18	2

[a] 46 countries had disaggregated data by education, and 47 countries had disaggregated data by place of residence and age.
[b] 42 countries had disaggregated data by education and age, and 43 countries had disaggregated data by place of residence.
[c] 25 countries had disaggregated data by place of residence and education, and 29 countries had disaggregated data by age.
[d] 29 countries had disaggregated data by education, 30 countries had disaggregated data by age, and 35 countries had disaggregated data by place of residence.

Knowledge about AIDS was higher among subgroups with secondary or higher education than those with no or primary education (Fig. 3.9). The median gap between the most and least educated was around 20 percentage points across 42 countries for young males and 46 countries for young females (Fig. 3.10).

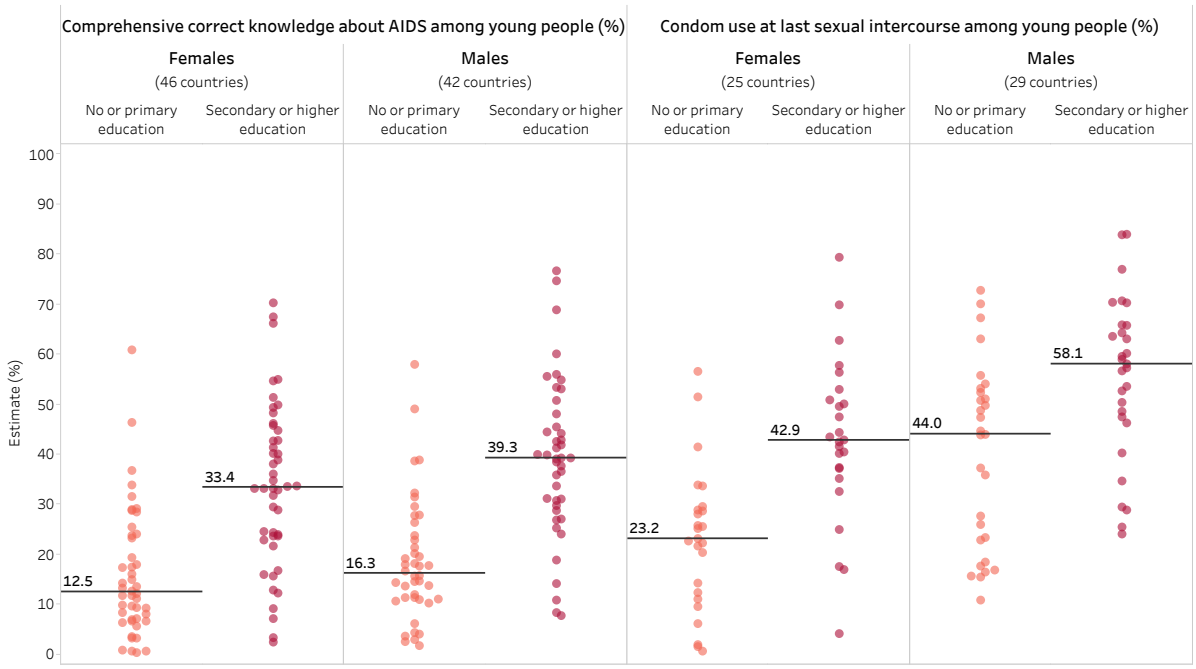
Over half of countries reported high levels of education-related inequality in young males, and no country reported low inequality. In young females, just under half of countries reported high levels of education-related inequality, and two countries had low inequality (Afghanistan and Egypt, where the level of knowledge about AIDS among young females is very low).

Inequalities in AIDS knowledge among young people were evident to a lesser extent by place of residence. Urban–rural differences in AIDS knowledge were, overall, moderate for young females and males, with higher knowledge in urban subgroups. The overall median difference was 13 percentage points in young males (43 countries) and 12 percentage points in young females (47 countries). Cambodia, Niger and Senegal had high urban–rural inequality for young males and young females, while Mali and Uganda reported high inequality only for young males.

Overall, age-related inequality in knowledge about AIDS was minimal. Only 1 of 42 countries (Liberia) reported large age-related inequality in young males that favoured the 20–24 years subgroup over the 15–19 years subgroup. A quarter of countries (10 of 42) demonstrated a gap of less than 5 percentage points in young males of different ages. Among young females, age-related inequality was less than 5 percentage points in over half of countries (24 of 47), and no country had high inequality. Inequalities in knowledge demonstrated little change overall across all dimensions of inequality for both sexes.

Condom use among young people was moderately unequal on the basis of education, favouring the more educated in young females and young males (Fig. 3.9). In young males, the most educated had, on average, 14 percentage points higher use than the least educated across 29 countries, with a moderate

FIG. 3.9. Comprehensive correct knowledge about AIDS and condom use among young females and males (aged 15–24 years), by education: latest situation (2011–2020)



Each country is represented by multiple circles (one for each subgroup).
Solid horizontal lines indicate the median across countries. The difference between the median values of two subgroups evident on the figure is distinct from the overall median difference across countries (reported in the text and other resources that accompany this report and used to assess the overall level of inequality as low, moderate or high).

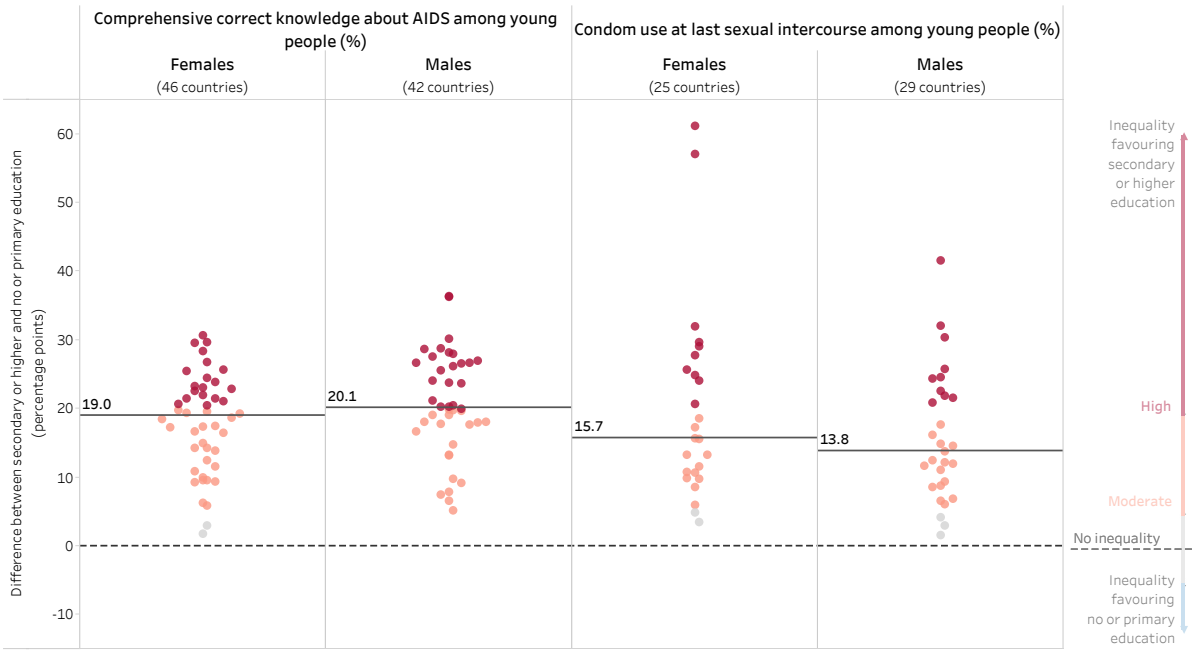
Source: AIDS Indicator Surveys and Demographic and Health Surveys.

reduction in inequality over the previous decade. In young females, there was a median gap of 16 percentage points between the most and least educated across 25 countries (Fig. 3.10), with little change over the past decade. Moderate or high levels of education-related inequality were evident in most countries, as only 3 of 29 countries had low inequality in young males (Ethiopia, Gabon, Kenya), and only 2 of 25 countries had low inequality in young females (Gabon, Sierra Leone).

Condom use tended to be higher in urban than rural areas, with a median gap of 15 percentage points in young males across 35 countries, and a median gap of 11 percentage points in young females across 25 countries. Place of residence inequality in condom use by young males was high in 10 of 35 countries. In young females, there was a difference in condom use of at least 20 percentage points between urban and rural subgroups in 5 of 25 countries (Congo, Lesotho, Mozambique, United Republic of Tanzania, Zambia). For young females and males, the majority of countries with high place of residence inequality reported no change or increased inequality over the past 10 years.

Age-related inequality in condom use was not apparent overall. Where there were situations of high age-related inequality, the directionality was mixed, with some countries reporting greater condom use in people aged 15–19 years (young males in Honduras and South Africa, young females in Chad), and some countries reporting greater use in the 20–24 years subgroup (young males in Guinea, young females in Peru). At least a third of countries reported similar condom use in the 15–19 years and 20–24 years subgroups.

FIG. 3.10. Absolute education-related inequality in comprehensive correct knowledge about AIDS and condom use at last sexual intercourse among young females and males (aged 15–24 years): latest situation (2011–2020)



Each country is represented by multiple circles (one for each indicator and subgroup).
Solid horizontal lines indicate the median across countries.
The dashed horizontal line indicates the difference value of no inequality (0).

Source: AIDS Indicator Surveys and Demographic and Health Surveys.

3.2.3.2 Testing

KEY FINDINGS

- Young females were, overall, moderately more likely to have been tested for HIV and received results than young males, a gap that has widened over the past decade. Nationally, Burundi, Lesotho and Zimbabwe reported more than 20 percentage points higher testing among young females than young males, gaps that have not improved over the past decade.
- Globally, inequalities in testing for HIV and receiving results among young people were low to moderate according to age, education and place of residence.

Inequalities in testing for HIV and receiving results among sexually active young people were assessed in up to 48 countries. Table 3.7 gives an overview of the number of countries reporting high and low inequality for this indicator.

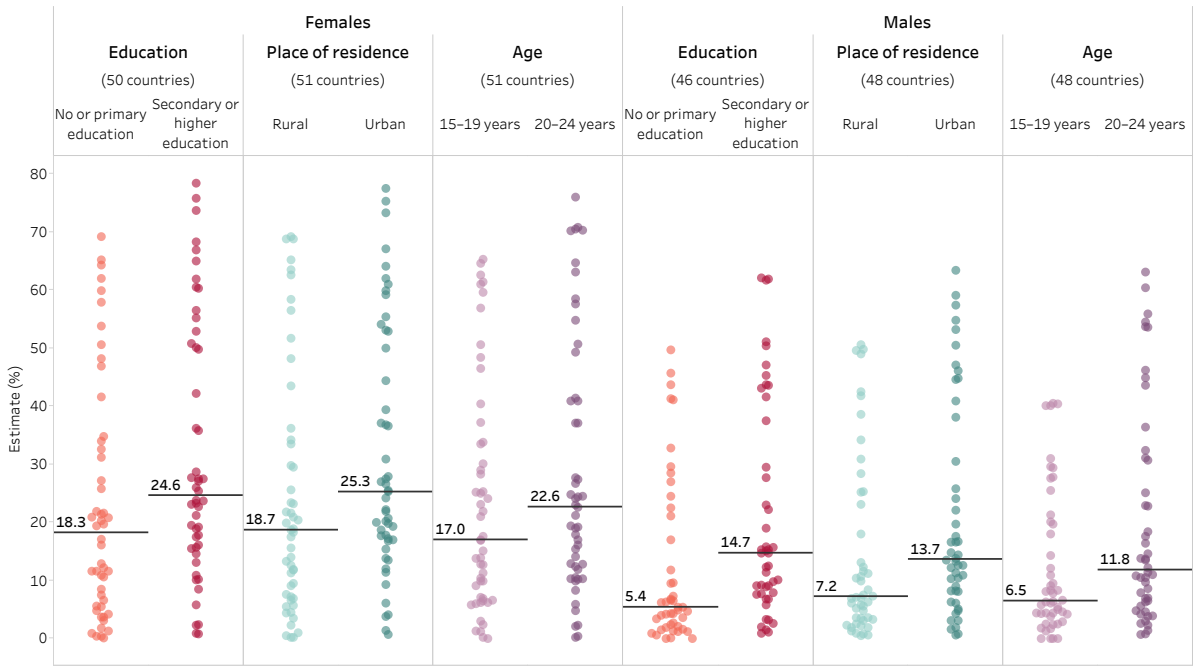
Testing for HIV and receiving results in the past 12 months was moderately higher among young females than young males overall, with a median difference of 10 percentage points across 48 countries. Across other dimensions of inequality, testing for HIV among young people tended to be low to moderately higher among older, more educated and urban subgroups (Fig. 3.11), with moderate, at most, widening of inequality over time. Across countries, the median differences in testing by age, education and place of residence for young females and males all fell below 10 percentage points. Among young females, the overall age-related inequality in testing was less than 5 percentage points across 51 countries, with half of countries having low inequality nationally. High levels of education-related inequality were evident in 5 of 46 countries among young males (Ethiopia, Lesotho, Namibia, South Africa, Uganda), and 4 of 50 countries among young females (Angola, Cameroon, Chad, Ethiopia). Place of residence inequalities were, on the whole, low and unchanged over the previous 10 years in young females and males.

TABLE 3.7. Overview of high and low inequality in HIV testing indicators in population of young people (aged 15–24 years) across study countries

Indicator	Sex	Dimensions of inequality explored	Countries included in analysis	Countries with high inequality by at least one dimension	Countries with low inequality across all dimensions
Testing for HIV and receiving results in past 12 months among sexually active young people	Young females and males	Sex	48	5	14
	Young females	Education, place of residence, age	50–51[a]	6	8
	Young males	Education, place of residence, age	46–48[b]	9	11

[a] 50 countries had disaggregated data by education, and 51 countries had disaggregated data by place of residence and age.
[b] 46 countries had disaggregated data by education, and 48 countries had disaggregated data by place of residence and age.

FIG. 3.11. Testing for HIV and receiving results in past 12 months among sexually active young females and males (aged 15–24 years) by education, place of residence and age: latest situation (2011–2020)



Each country is represented by multiple circles (one for each subgroup).
Solid horizontal lines indicate the median across countries. The difference between the median values of two subgroups evident on the figure is distinct from the overall median difference across countries (reported in the text and used to assess the overall level of inequality as low, moderate or high).

Source: AIDS Indicator Surveys and Demographic and Health Surveys.

3.2.3.3 Patterns of inequality in high-burden or high-funding countries

Patterns of inequality were assessed in a subset of Global Fund priority countries (determined by a high burden of disease or high levels of funding) and compared with findings across all countries. Depending on data availability for each particular indicator, the number of Global Fund high-burden or high-funding countries included in the analysis ranged from 10 to 15 (see Annex 2). Across the three indicators pertaining to knowledge about AIDS, condom use and testing for HIV in young people, patterns of inequality and change over time were not different in the subset of high-burden or high-funding countries; levels of knowledge and testing in young people were overall higher, however, in these countries.

3.3 Pregnant women

3.3.1 Context

Pregnant women are an important population in efforts to stop the transmission of HIV. Mother-to-child (vertical) transmission of HIV is the dominant mode of HIV acquisition among young children. Over the past two decades, the global number of new HIV infections in children has declined drastically as prevention of mother-to-child transmission programmes have become widespread. The global proportion of pregnant women living with HIV who received antiretroviral medicines for preventing mother-to-child transmission increased from 45% in 2010 to 81% in 2014, followed by a modest increase to 85% in 2020 *(1)*. Over the same period, the global rate of mother-to-child transmission fell from 24% in 2010 to 12% in 2020, and the number of new HIV infections in children aged 14 years and younger declined from 320 000 to 150 000. These achievements have been attributed mainly to the increased provision of antiretroviral therapy to pregnant and breastfeeding women living with HIV *(1)*.

Progress was still not sufficient to meet expired global targets, however *(65)*. More than two fifths of children living with HIV remain undiagnosed. In 2020, almost 800 000 infants and children aged 14 years and younger living with HIV were not on antiretroviral therapy.

Pregnant women and children remain a priority of current strategies to eliminate vertical HIV transmission and end paediatric AIDS *(9, 13)*. Targets for 2025 include ensuring 95% of pregnant women have access to antenatal testing for HIV (as well as syphilis, hepatitis B and other sexually transmitted infections); 95% of pregnant and breastfeeding women in high HIV burden settings have access to retesting; and all pregnant and breastfeeding women living with HIV have access to antiretroviral therapy, with 95% having suppressed viral loads.

The "last mile" approach to elimination of mother-to-child HIV transmission provides guidance for countries to achieve rapid reductions of new HIV infections in infants *(66)*, together with the WHO validation of elimination of mother-to-child HIV transmission for countries with regard to HIV, syphilis or hepatitis B (Box 3.4) *(67)*. WHO recommends offering provider-initiated HIV testing and counselling services to pregnant women as an essential component of prevention of mother-to-child transmission programmes *(17)*. Pregnant women have a right to know their HIV status and gain access to counselling and testing services. When pregnant women are aware of their HIV status, appropriate strategies can be taken to minimize the risk of transmission to infants.

Early provider-initiated testing and counselling as a routine part of antenatal care visits is an entry point for treatment and prevention services. HIV testing during labour is beneficial for stopping vertical transmission and is particularly important in environments with low use of antenatal care *(69)*. Universal antenatal HIV screening has been shown to be cost-saving (compared with targeted testing of pregnant women in high-risk groups), even in contexts where HIV prevalence is low *(70, 71)*. In high-prevalence settings, WHO recommends retesting for HIV in the third trimester, during labour or shortly after delivery, due to the risk of becoming infected with HIV during pregnancy. Periodic retesting of HIV-negative mothers who are breastfeeding is recommended in these settings to ensure early identification of HIV infection and to initiate immediate interventions to prevent transmission to the child *(17)*.

BOX 3.4. Elimination of mother-to-child HIV transmission

The overall goal of elimination of mother-to-child HIV transmission programmes is to ensure mother-to-child HIV transmission is sustained at a sufficiently low level so that HIV is not considered a public health threat *(67)*. As one component of obtaining elimination of mother-to-child HIV transmission validation, WHO specifies that countries meet (and maintain for at least a year) impact targets of a population case rate of new paediatric HIV infections due to mother-to-child HIV transmission of 50 or fewer per 100 000 live births, and mother-to-child transmission rates below 5% (breastfeeding countries) or 2% (non-breastfeeding countries).

Process indicators additionally specify more than 95% coverage of antenatal care (at least one visit), more than 95% coverage of HIV testing of pregnant women, and more than 95% coverage of antiretroviral therapy for pregnant women living with HIV. Validation also requires that interventions to reach the targets are implemented according to international human rights standards, that the community of women living with HIV is engaged, and that gender equality is taken into consideration *(67)*.

Elimination of mother-to-child HIV transmission validation is based on population-level data. Indicators should measure the entire population of pregnant women and not only those who are part of a health programme. Processes exist to ensure the quality and strength of national data sources, including monitoring and surveillance systems *(67)*.

Cuba was the first country to be validated for elimination of mother-to-child HIV transmission in 2015, followed by Armenia, Belarus and Thailand in 2016 *(68)*. In these four countries, HIV is concentrated in populations other than women of reproductive age, and thus they have low numbers of pregnant women living with HIV. The countries introduced universal testing and treatment between 2011 and 2016, with coverage of more than 90% by 2016. These countries also demonstrated strong contact-tracing practices, programme monitoring, leadership and governance.

In Cuba and Thailand, stable health systems with universal health coverage ensure HIV services are widely available, with integration between maternal and child health and sexual and reproductive health services. Belarus and Thailand have taken steps to reduce HIV-related stigma at the population level, such as delivering anti-stigma training for religious leaders, removing negative portrayal of HIV in the media, and providing individual support to reduce self-stigma *(68)*.

Across diverse settings and contexts, socioeconomic inequalities in HIV testing by pregnant women are widely reported. Commonly, HIV testing coverage is reported to be higher among pregnant women who are wealthier (despite testing often being provided free of charge) and who have higher levels of education. Among pregnant women in Mozambique, higher educational attainment was associated with financial well-being and greater capacity to access health care *(72)*. In Ghana, higher education was linked to better understanding of perceived vulnerability and greater knowledge of mother-to-child HIV transmission and the benefits of testing *(73)*.

Women who had more knowledge about HIV and mother-to-child HIV transmission, who engaged with the media, and who did not have a stigmatizing attitude were generally more likely to be tested for HIV during pregnancy *(72, 74–78)*. Reasons for refusing HIV testing included wanting to avoid a needle prick (Nigeria) *(69)*, fear of a partner's reaction to a positive result (United Republic of Tanzania) *(79)*, and low perceived risk of HIV infection (Sudan) *(77)*.

In settings with low use of antenatal care, there have been challenges enrolling women in prevention of mother-to-child transmission programmes. HIV testing during antenatal care visits and labour is tied to aspects of maternal, newborn and child health service access and use. Pregnant women who presented at a late gestational age for their first antenatal care visit were less likely to test for HIV than women who presented at an early gestational age *(80, 81)*. Difficulty reaching a health facility for antenatal care due to geographical or financial reasons may be a barrier to HIV testing for some people *(73, 74)*. Pregnant women attended at their antenatal care visits by a skilled attendant such as a nurse or physician demonstrated higher rates of HIV testing *(74, 82)*, possibly because unskilled attendants may not have access to HIV testing resources. In some countries, delayed and

fewer antenatal care visits among adolescent pregnant women resulted in lower HIV testing in this subgroup *(83)*. HIV testing may be low in settings where testing services are not routinely offered to all women, to those women who do not have adequate information to make a decision about testing, or to women who lack clarity about privacy and confidentiality *(58, 84–86)*. In Uganda, sensitization of pregnant women about HIV testing services before their antenatal care visit, including education about the potential implications for the baby, prepared women to expect and accept HIV testing *(87)*.

To work effectively, each component of the prevention of mother-to-child transmission – accessing antenatal care, receiving HIV testing and counselling services, and receiving appropriate treatment – requires the health system to work reliably. Small deficiencies can compound to compromise the overall effectiveness of the pathway *(88)*. Efforts to strengthen the health system should include a focus on retaining women living with HIV in care, increasing medication adherence, providing high-quality health information and education, and building the capacity and confidence of health-care workers to deliver prevention of mother-to-child transmission interventions *(84, 89, 90)*.

3.3.2 Approach

Inequality analysis about pregnant women included one indicator, which measures the percentage of women who were tested for HIV during an antenatal care visit or labour and received results (Table 3.8). This indicator was chosen based on the availability of disaggregated data comparable across countries.

Data were sourced from AIS and DHS, available through the DHS Program STATcompiler tool *(40)*. The analysis in this subsection included disaggregation by age, economic status, education and place of residence. For age, comparisons were made between pregnant women aged 15–19 years and those aged 40–49 years. Inequality was reported as the difference between two population subgroup values (a measure of absolute inequality). The results cover the latest situation in 45 or 46 countries and change over time analysis in 22 countries. The inequality thresholds applied to describe situations of high and low inequality are explained in detail in Chapter 2. For comprehensive information about the data analysis methods, see Annex 2.

ADDITIONAL RESOURCES FOR DATA EXPLORATION, INCLUDING INTERACTIVE VISUALS AND DATA, ACCOMPANY THE REPORT (see https://www.who.int/data/health-equity/report_2021_hiv_tb_malaria).

TABLE 3.8. Overview of disaggregated data used for pregnant women HIV analysis

			Inequality dimension				Countries with available data	
Category	Indicator	Source	Place of residence	Economic status	Education	Age	Latest situation[a]	Change over time[b]
Testing and treatment	Pregnant women tested for HIV during antenatal care visit or labour and received results (%)	AIS, DHS	✔	✔	✔	✔	45–46[c]	22

AIS: AIDS Indicator Surveys; DHS: Demographic and Health Surveys.
[a] Data for the latest situation are from the most recent survey conducted between 2011 and 2020.
[b] Data for change over time are from two periods: the most recent survey conducted between 2011 and 2020, and a previous survey conducted between 2001 and 2010, with a 5- to 15-year gap between the two surveys.
[c] Number of countries with available data may vary within indicator depending on the availability of information for the inequality dimension.

3.3.3 Results

3.3.3.1 Testing

KEY FINDINGS

- Testing for HIV during pregnancy was more common among women with higher economic status, with more education and in urban areas. In almost two thirds of countries, testing for HIV among pregnant women was at least 20 percentage points higher among women in the richest than the poorest households. Education-related and place of residence inequalities in HIV testing by pregnant women were high in about half of countries.
- There were no age-related inequalities, globally. In India, however, HIV testing among pregnant women aged 15–19 years was more than 20 percentage points higher than among pregnant women aged 40–49 years.
- Overall, there were moderate reductions in economic- and education-related inequality during the past decade. Nationally, however, Congo, Côte d'Ivoire, the Democratic Republic of the Congo, Ghana, Mali, Niger and Nigeria had high levels of unchanged or worsening inequality over the previous 10 years according to economic status, education and place of residence.

Inequalities in testing for HIV among pregnant women were assessed in up to 46 countries. Table 3.9 gives an overview of the number of countries reporting high and low inequality for this indicator.

Among pregnant women, testing for HIV and receiving results demonstrated large global inequalities by economic status (Fig. 3.12). The median difference between the richest and poorest across 46 countries indicated a gap of 31 percentage points higher coverage in the richest than the poorest. Almost two thirds of countries (29 of 46) reported a gap of at least 20 percentage points. Globally, there was a moderate reduction in economic-related inequality over the previous decade, while 10 countries (predominantly located in the WHO African Region) reported persistently high or widening economic-related inequality over this period (Benin, Congo, Côte d'Ivoire, Democratic Republic of the Congo, Ghana, Haiti, Mali, Niger, Nigeria, Senegal).

Large inequalities related to education and place of residence in HIV testing among pregnant women were apparent. Globally, the median difference between the most and least educated was in excess of 20 percentage points across 45 countries, with moderate change over the previous 10 years. Over half of countries (23 of 45) reported large education-related inequality, and low inequality was reported by 3 countries (Burundi, Dominican Republic, Rwanda).

The median level of place of residence inequality in HIV testing among pregnant women was nearly 20 percentage points across 46 countries, with higher coverage in urban than rural areas. About half of countries reported an urban–rural gap of at least 20 percentage points. There was little change in inequality over the previous decade, globally.

Six countries reported low inequality in HIV testing on the basis of both economic status and place of residence (Dominican Republic, Lesotho, Malawi, Namibia, Rwanda, South Africa).

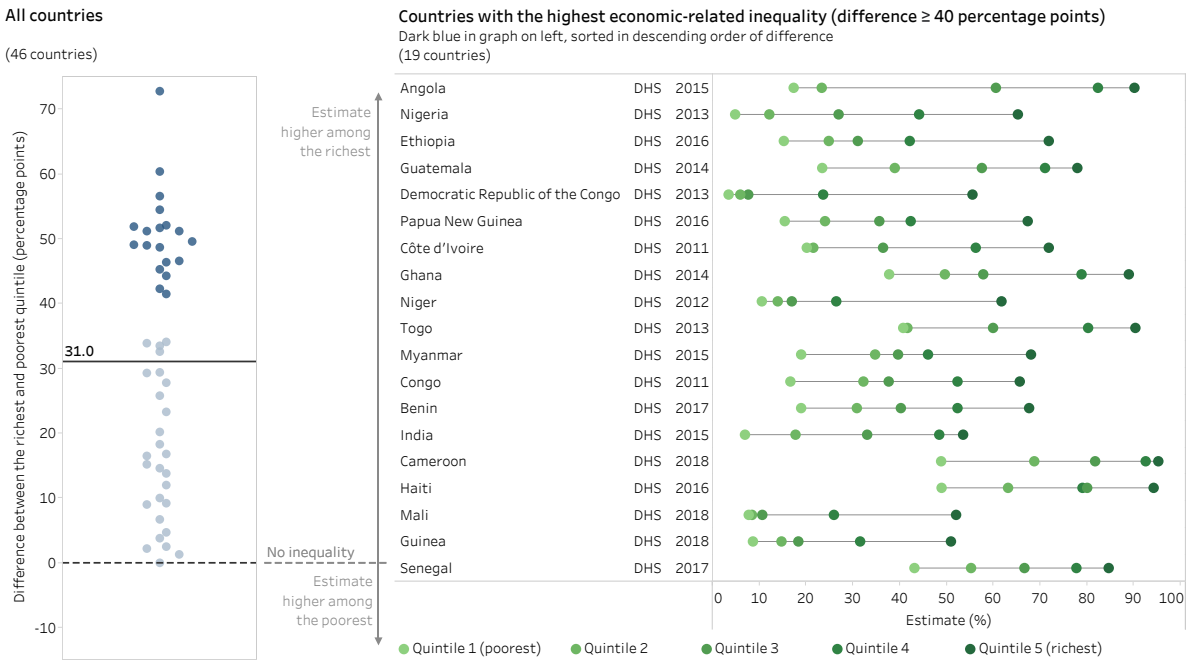
There was no age-related inequality globally, and half of countries (22 of 46) reported age differences of 5 percentage points or less. In India, however, there was

TABLE 3.9. Overview of high and low inequality in HIV testing indicators in population of pregnant women across study countries

Indicator	Dimensions of inequality explored	Countries included in analysis	Countries with high inequality by at least one dimension	Countries with low inequality across all dimensions
Tested for HIV during antenatal care visit or labour and received results	Economic status, education, place of residence, age	45–46[a]	29	2

[a] 45 countries had data disaggregated by education, and 46 countries had data disaggregated by economic status, place of residence and age.

FIG. 3.12. Absolute economic-related inequality in pregnant women testing for HIV during antenatal care visit or labour and receiving results in all countries, and disaggregated data in countries with the highest economic-related inequality: latest situation (2011–2020)



DHS: Demographic and Health Surveys.
Each country is represented by one circle on the left graph and selected countries are represented by five circles on the right graph (one for each subgroup). Countries shown on the right graph are dark blue on the left graph.
On the left graph, the solid horizontal line indicates the median across countries and the dashed horizontal line indicates the difference value of no inequality (0).
Source: AIDS Indicator Surveys and Demographic and Health Surveys.

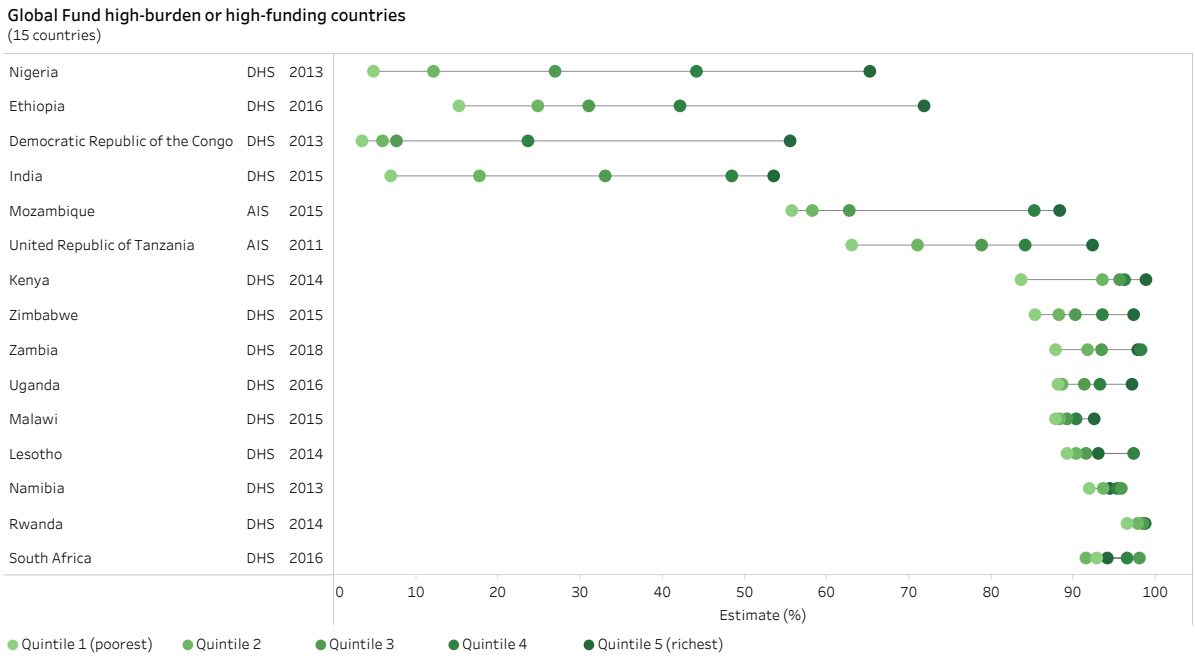
a large gap between testing in the younger subgroup (women aged 15–19 years, who reported higher levels of testing) and the older subgroup (women aged 40–49 years).

3.3.3.2 Patterns of inequality in high-burden or high-funding countries

Patterns of inequality were assessed in a subset of Global Fund priority countries (determined by a high burden of disease or high levels of funding) and compared with findings across all countries. Fifteen of these countries had disaggregated data for HIV testing in pregnant women (see Annex 2). Compared with the global situation, inequalities across the subset of high-burden or high-funding countries tended to be less pronounced overall, although they also demonstrated greater reductions over the previous 10 years compared with all study countries. Most notably, although the global analysis revealed median economic-related inequality of 31 percentage points across 46 countries with moderate change over the previous decade, the group of high-burden or high-funding countries had a median difference of 12 percentage points between the richest and the poorest, with a median reduction of inequality of 20 percentage points across 9 countries. Although 6 of 15 of the high-burden or high-funding countries had large inequalities by wealth, 5 countries reported low economic-related inequality (Fig. 3.13).

In comparison with the global situation, the median urban–rural inequality in high-burden or high-funding countries was lower (6 percentage points across 15 countries versus 19 percentage points across 46 countries), with a faster median reduction in inequality

FIG. 3.13. Pregnant women testing for HIV during antenatal care visit or labour and receiving results in high-burden or high-funding countries, by economic status: latest situation (2011–2020)



AIS: AIDS Indicator Surveys; DHS: Demographic and Health Surveys.
Circles represent population subgroups within each country.

Source: AIDS Indicator Surveys and Demographic and Health Surveys.

in the high-burden or high-funding countries of 16 percentage points over the previous decade compared with all study countries.

Education-related inequality was less pronounced in the subset of high-burden or high-funding countries, with about the same median change over the previous 10 years.

In terms of age-related inequality, the subset of high-burden or high-funding countries reported low inequality across countries (similar to the global finding), although this group of countries saw a moderate reduction in overall inequality over the previous 10 years (whereas there was no change overall, globally).

3.4 Key populations

Global actors have identified populations at higher risk of HIV exposure: men who have sex with men, transgender people (especially transgender women), people who inject drugs, sex workers, and people in prison and detention. These populations account for almost two thirds of HIV infections globally, and 93% of HIV infections outside of sub-Saharan Africa *(14)*. They have lower access to HIV prevention, diagnosis and treatment services and higher HIV prevalence than the general population *(91)*.

Men who have sex with men have a 25 times greater risk of acquiring HIV than heterosexual men. Female sex workers have a 26 times greater risk of acquiring HIV than

BOX 3.5. Data availability and quality in key populations

Health data for key populations, including data about HIV, are often lacking or of low quality. Although there have been gradual improvements over the past decades, the lack of data about key populations is an ongoing challenge for global HIV monitoring and reporting.

Key populations were alluded to but not directly mentioned in the United Nations General Assembly Special Session on HIV/AIDS Declaration of Commitment on HIV/AIDS in 2001, but the United Nations General Assembly 2011 Political Declaration on HIV/AIDS directly referenced key populations in 2 of its 10 targets *(8)*. This prompted more widespread data collection and reporting on men who have sex with men, people who inject drugs, and sex workers. For example, in 2006, less than 10% of countries reported HIV prevalence among key populations, but by 2012, this had risen to about 30% of countries *(93)*.

Similarly, reporting rates for behavioural indicators have increased. For example, condom use among men who have sex with men was reported by about 15% of countries in 2006 but close to 50% of countries in 2012 *(94)*. In 2016, countries began reporting data about people in prison and transgender people in accordance with UNAIDS frameworks *(93)*.

The quality and consistency of data about key populations warrant attention. There are complexities in estimating the size of key populations, as people may be reluctant to be counted as members of certain populations due to stigma, discrimination or legal concerns *(91, 95, 96)*. Criteria for defining key populations have been found to be inconsistent across settings. In 2014, there were 6 definitions of men who have sex with men across 100 countries; 4 definitions of people who inject drugs across 67 countries; and 6 definitions of sex workers across 94 countries *(93)*. The established categories of key populations represent groupings of diverse individuals and may exclude or include certain people in problematic ways *(97)*. Moreover, people may move in and out of key population groups.

Efforts to improve the availability and quality of data about key populations must overcome a lack of political will and funding. In many settings, data collection is impeded by discriminatory legal frameworks that criminalize behaviours of key populations. This introduces complexities about the ethics of data collection practices, as necessary protections for the affected communities must be ensured *(93, 98)*. For instance, in situations where the safety and human rights of people from key populations cannot be assured, data collection should be avoided *(91)*.

Leveraging data from multiple sources, including programme data, medical records and surveys, can help countries to gain a more complete understanding of HIV indicators in key populations *(99, 100)*.

women in the general population. Transgender women are 34 times more likely to be infected with HIV than other adults. People who inject drugs have a 35 times greater risk of acquiring HIV than people who do not inject drugs *(14)*.

Over the past decade, these key populations have been specifically referenced in global HIV targets for the first time. Availability of data about these populations, although limited, is increasing (Box 3.5). The limited quantity of data about key populations and variability in data quality precluded a global analysis in this report. Instead, this section discusses findings from the literature, highlighting examples of pertinent issues faced by key populations that put them at risk for HIV. Local-level data about key populations are available through the UNAIDS Key Population Atlas *(92)*.

There is diversity in the circumstances surrounding individuals in key populations. The conditions that surround key populations put them at higher risk for HIV infection, especially if they co-occur or are linked to substance abuse and high-risk sex practices. In Asia, poverty and social deprivation have been established as underlying factors that drive the adoption of high-risk behaviours that put key populations at risk for HIV infection *(101)*. Transgender women in Uganda frequently engage in sex work due to a lack of other employment *(102)*. In South Africa, homelessness was strongly associated with HIV infection among transgender women *(103)*. Among people in prison living with HIV in the Russian Federation, as many as half did not seek treatment in the community following their release, indicating a need for community-based programmes that strengthen health service access for people

transitioning to communities after release from prison *(104)*. In Namibia, a study of people in key populations reported use of drugs or alcohol as barriers to consistent condom use *(105)*.

Key populations face substantial challenges associated with criminalization of their behaviours or identity and related stigma, discrimination and violence, which are determinants of HIV-related outcomes. Policies and legal systems that are punitive of same-sex behaviours and sex work are associated with increased HIV prevalence *(2, 9)*. In sub-Saharan Africa, for example, the odds of having HIV were more than eight times higher in settings where same-sex behaviours were severely criminalized compared with settings where they were not criminalized *(9)*.

Stigma related to sexuality, gender identity, HIV status, sex worker status and internalized stigma is a predominant barrier to accessing health services by sex workers and transgender people *(106–108)*. In Myanmar, fears of stigma and discrimination are cited as reasons why up to 50% of men who have sex with men and transgender women conceal same-sex preferences and behaviours, which can lead to avoidance of HIV testing and prevention services *(109)*. Female sex workers in the Dominican Republic and the United Republic of Tanzania reported stigma associated with HIV and sex work, discrimination and violence, often from multiple actors, including government authorities, health-care providers, employers and communities *(110)*. Sex workers living with HIV in the Dominican Republic who experienced intimate partner violence in the past 6 months were less likely to be on antiretroviral therapy *(110)*.

HIV programmes and interventions targeted at key populations are strengthened when they adopt a gender- and rights-affirming approach that reduces stigma and discrimination. Initiatives targeted at sex workers, for instance, were most likely to facilitate improved HIV outcomes when they were comprehensive and community-driven, empowering participants to identify and address structural, behavioural and biomedical priorities *(111)*. Among transgender women in Indonesia, positive attitudes of health professionals were a key factor in enabling service use, along with free access to services, proximity of health facilities, and availability of HIV information sessions *(112)*. Routine voluntary testing for HIV in prisons, implemented in South Africa and Zambia, was considered a best practice that can help to alleviate HIV transmission in other sub-Saharan African countries *(113)*.

The WHO *Consolidated guidelines on HIV prevention, diagnosis, treatment and care for key populations* underscore the importance of a well-defined good-quality package of key population services, enabling actions such as:

- reviewing laws, policies and practices to work towards the decriminalization of behaviours of key populations to support the scale-up of and access to health-care services for key populations;
- implementing and enforcing antidiscrimination and protective laws;
- making health services available, accessible and acceptable to key populations;
- implementing interventions that enhance community empowerment among key populations;
- taking actions to prevent violence against key populations *(91)*.

Such provisions, however, are not always reflected in national policies and their implementation *(114, 115)*.

Inequalities in HIV prevalence, services, prevention programmes and treatment affect all key populations. The risk of HIV infection for men who have sex with men is higher than that for the general population of men. In sub-Saharan Africa, this inequality was more pronounced in western and central African countries, and in countries with low overall HIV prevalence *(116)*.

Among men who have sex with men in Benin, HIV risk is higher in younger people, those living in couples, and those who do not consistently use a condom during

high-risk sex *(117)*. Factors associated with higher HIV prevalence in younger compared with older men who have sex with men include having discordant receptive intercourse without a condom; experiencing any sexually transmitted infection; having depression; using multiple substances; having a low income; decreased access to health care; and reporting early age of sexual expression *(118)*.

Across low- and middle-income countries, challenges for providing inclusive HIV services for men who have sex with men stem from unfavourable legal environments, lack of funding and lack of diagnostic technology *(115, 119)*.

Globally, there are more than 11 million people who inject drugs. An estimated 1.4 million of these are living with HIV *(120)*. The majority of people who inject drugs are men, but women who inject drugs face unique challenges and risks (Box 3.6). Among people who use illicit drugs, incarceration, poor housing and lack of legal income increase their vulnerability to HIV infection and disease outcomes through mechanisms such as decreased access and adherence to antiretroviral therapy *(121)*.

According to a systematic review published in 2017, about one in five people who inject drugs had experienced homelessness or unstable housing within the past year, and over half had a history of incarceration *(122)*. Behavioural interventions to address HIV risk factors were found to be effective in certain key populations in Nepal (e.g. female sex workers, men who have sex with men and transgender people who received peer education and HIV counselling and testing services had improved condom use), but they were not effective in reducing unsafe injection practices *(126)*. There is a need for better links between behavioural interventions and sufficient access to commodities that enable safer behaviours, such as sterile injection equipment.

People in prison may be denied health services and prevention measures (e.g. condom distribution, needle–syringe programmes, opioid substitution therapy) based on misconceptions about security concerns; this is especially the case for people living with HIV *(114)*. People who have spent time in prison are likely to face stigma and social marginalization after release, regardless of where they live *(114)*.

The criminalization of drug use and some sexual behaviours leads to unjust incarceration and may increase risks related to HIV. Men who have sex with men who are arrested or convicted under laws related to this behaviour are less likely to access HIV prevention, testing and care services, including condoms, medical care, and screening and management for sexually transmitted infections *(127, 128)*.

Across diverse settings, sex workers and transgender people face higher HIV-related risks (Box 3.7). This is especially the case when they live and work in

BOX 3.6. Experiences of women who inject drugs

Women comprise about 20% of the population who inject drugs globally, but this varies geographically. Women are estimated to account for more than a quarter of people who inject drugs in eastern and western Europe, North America and Australasia, and less than 5% in south Asia, the Middle East and North Africa *(122)*.

The experiences of women who inject drugs are different from those of men who inject drugs *(123)*. Women who inject drugs generally face higher risk of death, disease (including HIV) and violence, and more often have increased risky injection or sexual risk behaviours. Women who inject drugs and are living with HIV may be more prone to stigmatization and less likely to seek services.

In Viet Nam, unsafe drug injection practices are a driver of HIV transmission. A study among women who inject drugs found that knowledge about HIV and recent testing for HIV was inadequate in this population *(124)*. A large majority of women perceived injection drug use and sex work as intensely stigmatized by the community. Although not all the women engaged in sex work, most women who were engaged in sex work reported they were using drugs before they first sold sex. Condom use was high with clients but not with partners.

A study of women who inject drugs in Spain underscored women's vulnerability to psychological and physical gender-based violence *(125)*. Among women who inject drugs, nearly all had survived emotional or psychological violence by a partner (96%), and a large majority reported serious physical injury by a partner (70%), including sexual abuse. About half of the women surveyed were engaged in sex work.

precarious environments. For female sex workers in the United Republic of Tanzania, poverty and financial need underpin their engagement in sex work, with higher payment for unsafe practices such as sex without a condom motivating participation in high-risk activities *(110)*. Consistent condom use by female sex workers in Namibia was associated with higher levels of education, being HIV-negative and the use of condom-compatible lubricant *(105)*. In China, where HIV prevalence in female sex workers is generally low, pockets of "sporadic" HIV infection in female sex workers were identified in all but one province, with authors noting that HIV prevention programmes should be realigned to account for changing patterns in the Chinese sex industry, such as drug use and high-risk sex practices *(129)*.

In sub-Saharan Africa, stigma and criminalization of sex work impeded female sex workers from using HIV testing and counselling services *(132)*. A study of female sex workers in Ethiopia estimated readiness for HIV testing to be around 50%, with variation based on education level, perceived risk, social group membership, and vulnerability to HIV infection *(133)*. Barriers to HIV testing among transgender women include homelessness, health-care provider mistreatment, confidentiality breaches, stigma, alcohol use, post-traumatic stress symptoms, lack of education about HIV, cost and internalized homophobia *(134)*.

In addition to the key populations discussed above, there is a higher HIV risk among certain other contexts and groups of people for whom data, evidence and guidance are less forthcoming. For example, people living in humanitarian contexts face dynamic, insecure and unstable geopolitical realities that should be accounted for in HIV responses. Among women living in humanitarian contexts, 70% experience gender-based violence (compared with half that proportion globally) *(135)*, which makes them more likely to acquire HIV and less likely to access health services *(136, 137)*. In this context, HIV responses should be integrated with sexual and reproductive health services, recognizing the realities of gender inequality and violence against women *(138)*.

The relationship between HIV and disability is poorly understood, although people with disabilities are found among all key populations at higher risk of HIV exposure, and people living with HIV may develop impairments as the disease progresses *(139)*. HIV policies, guidelines and programmes should be designed and implemented in a manner that is accessible to all people with disabilities,

BOX 3.7. Transgender people: gender identity and HIV

The term "transgender" describes people who identify with a gender identity that is different from the sex assigned at birth. Transgender people account for a disproportionally large share of HIV. Transgender women are at 34 times greater risk of acquiring HIV infection than other adults, and account for 2% of HIV infections, globally *(14)*.

WHO increasingly recognizes the unique health needs of transgender people, although challenges remain *(130)*. Transgender-specific health care, preferences, and social and legal barriers to health are poorly understood. In turn, the mechanisms that underlie social exclusion of transgender people remain largely unaddressed. Data about transgender people are not available in many regions where this population may be absent from surveillance activities for social and technical reasons (see Box 3.5).

There are few data about transgender people and HIV in east Africa, and the sexual health needs of transgender people remain largely unrecognized and unaddressed, even in HIV policies and programmes specific to key populations. Smith and colleagues in 2021 were among the first to collect data about HIV prevalence and risky sexual behaviours among transgender people in Nairobi, Kenya *(131)*. Their study of over 600 people compared the HIV burden and infection risks between two key populations: cisgender men who have sex with men and transgender women who have sex with men. Compared with cisgender men who have sex with men, HIV prevalence among transgender women was considerably higher (41% versus 25%). Transgender women reported higher numbers of male sexual partners, higher likelihood of having transactional sex with a male partner, lower condom use (in certain instances) and lower HIV testing.

and include access to information, support and services for people with disabilities. Increased funding for research on HIV and disability is warranted, along with greater participation of people with disabilities in the response to HIV.

3.5 Discussion

The findings of this report illustrate where inequalities related to HIV exist and where they have persisted over the past decade. Understanding patterns of inequality help to inform policy and programme development for maximal impact. The UNAIDS Global AIDS Strategy 2021–2026 adopts an inequality lens with a primary focus on identifying, reducing and ending inequalities that drive the AIDS epidemic *(13)*. Equity is reflected in the new set of global targets and commitments centred on three strategic priorities: maximizing equitable and equal access to HIV services and solutions; breaking down barriers to achieving HIV outcomes; and fully resourcing and sustaining efficient HIV responses and integrating them across health systems, social protection measures, humanitarian settings and pandemic responses. Delivering services for health equity is a strategic direction of the WHO Global Health Sector Strategy on HIV 2016–2021 and will be a major consideration for the updated global health sector strategies for 2022–2030 *(10, 12)*.

Globally, the most prominent inequalities were reported for economic status and education. Knowledge, attitudes and practices and testing and treatment indicators across all dimensions demonstrated inequality that disadvantaged the poorest households and least-educated subgroups. This was observed most strikingly for testing and treatment in pregnant women, but it was also evident for the general population and young people. In all cases, a minority of countries had low inequality according to economic status or education, while modest reductions were observed among countries that received high levels of support from the Global Fund. For pregnant women, inequalities in testing and treatment may be linked to antenatal care visits, which tend to be lower among poorer women with low education *(140)*.

Inequalities favouring urban over rural areas were reported, to a lesser extent, for knowledge, attitudes and practices and testing and treatment indicators. These findings provide preliminary insight into inequalities, although further study is warranted into the reasons that contribute to lower coverage among poor and less-educated subgroups and the interaction and contribution of different inequality dimensions.

Chapter 6 explores the associations between HIV incidence, AIDS-related mortality and determinants of health, with a detailed look at the link between HIV and income inequality.

Divergent patterns of sex-related inequalities in HIV incidence and AIDS-related mortality were evident among countries in the WHO African Region and other countries due to the different nature of the epidemic in countries. In many African countries, where the epidemic is generalized, findings suggesting lower levels of sex-related inequality in the general population may be explained in part by a high burden among young women and girls alongside an improving situation among men. There is evidence that men in these settings may experience earlier and larger benefits from the scale-up of HIV prevention programmes than women *(141)*. For example, men benefit from the scale-up of voluntary medical male circumcision and from reduced transmission from women as a result of their accessing HIV testing and treatment services through antenatal care visits *(19)*.

At least a third of countries, all outside Africa, and most with low national incidence and mortality relative to the global medians, reported substantially higher incidence and mortality in males than females. This pattern was more often observed in situations where epidemics are more concentrated in predominantly male key populations than the general population. Most of these cases of elevated sex-related inequalities have been stagnant or worsening.

Globally, condom use tended to be higher in males, while females were more likely to report higher coverage of HIV testing and better adherence to treatment regimens *(67)*.

These trends were evident in young people and the general population. Females may have higher HIV testing due to the widespread implementation of testing as a component of antenatal care programmes. The interpretation of results about inequalities in condom use bears careful consideration, as results may be influenced by trends in viral suppression. In populations where treatment coverage is high and more people living with HIV have an undetectable viral load, the principle of undetectable being the same as untransmittable (U = U) means more people may consider the possibility of having sex without a condom, as it carries virtually no risk of transmitting HIV *(41)*. Across countries, differentiated approaches to address gender-related risk factors to HIV based on the national situation are warranted.

Certain countries of concern had consistently high levels of inequality across multiple dimensions of inequality and HIV indicators (incidence and mortality indicators were not included in this assessment). In Angola, for instance, 65% of available inequality data for knowledge, attitudes and practices and testing and treatment indicators suggested high levels of inequality (gaps of more than 20% between population subgroups) alongside a high national HIV prevalence of 1.7% among the population aged 15 years and older *(1)*. In Cameroon, Kenya, Uganda and the United Republic of Tanzania, with high national HIV prevalence of 3.0–5.7% among people aged 15 years and older, more than 90% of available data pointed to moderate or high levels of inequality.

The preliminary findings presented here are derived from the best publicly available data. Additional efforts are warranted to expand the availability of disaggregated data globally. A lack of data availability precluded inequality analyses of priority areas such as paediatric HIV and key populations and limited the analysis of inequalities in young people and pregnant women. Global data were not available for experiences related to stigma and discrimination and gender identities, and factors pertaining to legal protections and health systems. Building on the results of this report, there is a need for more detailed analyses at regional, national and subnational levels to assess setting-specific trends and factors that drive and perpetuate situations of inequity.

3.6 Addressing inequality

Addressing inequalities in HIV and ensuring sustained improvements among key populations are part of the "last mile" in ending the AIDS epidemic as a public health threat *(142)*. The HIV indicators featured in this report demonstrated variable potential for improvement by reducing or eliminating inequality.[1] Figure 3.14 illustrates the global improvement possible if national averages across countries were equal to the level of coverage in the richest fifth of the population – in other words, if within-country economic-related inequality were eliminated.

The greatest potential for improvement is evident for HIV testing during antenatal care visits among pregnant women. The current national averages for this indicator across 46 countries range from 1% to 98%, with an overall weighted average of 40%. If countries improved the level of testing of all pregnant women to that of the richest subgroup, 21 countries would see an improvement in the national average by at least 50%, and the overall weighted national average would increase to 64% (60% relative increase).

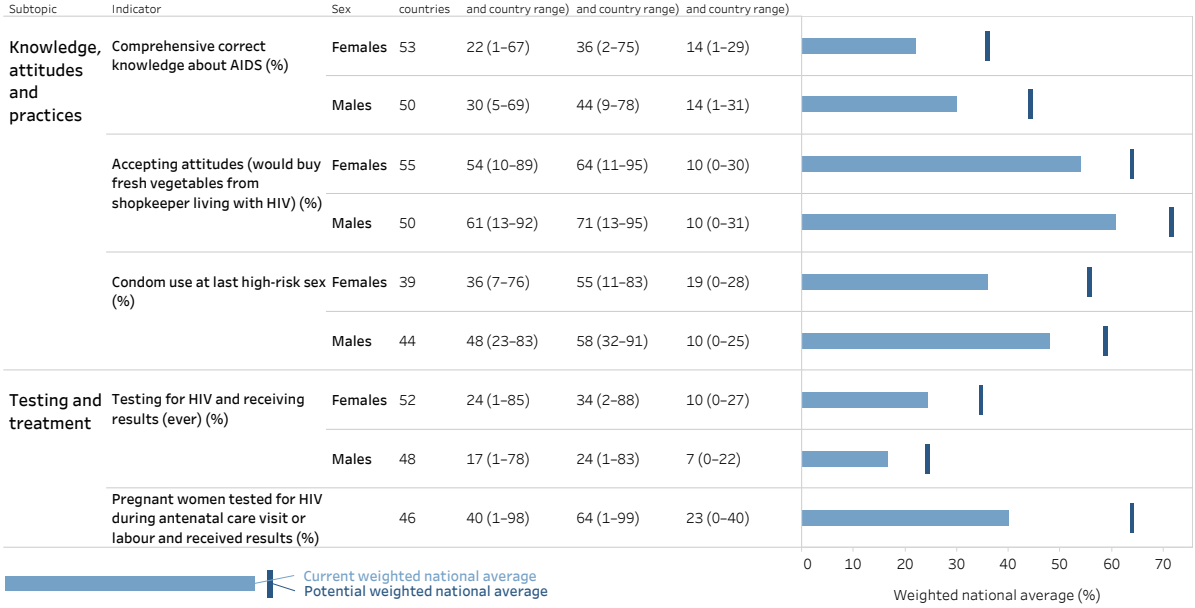
The potential improvement in condom use among women is also notable. If all women had the same level of condom use at last high-risk sex as the richest 20% of the national population, the overall weighted average across countries would improve by nearly 20 percentage points, from 36% to 55%.

Findings about the state of inequality in HIV are one input to inform strategies focused on reducing or eliminating inequalities between population subgroups. This information should be coupled with an in-depth understanding of the context and the factors that contribute to and perpetuate inequalities within populations. The following examples show how HIV interventions and programming have adopted an equity approach, responsive to the circumstances and needs of the subgroups to whom improvements are targeted.

[1] For an overview of the methods used to calculate PAR, see Chapter 2.

FIG. 3.14. Potential improvement in national average by eliminating economic-related inequality across selected HIV indicators (2011–2020)

Subtopic	Indicator	Sex	Number of countries	Current national average (global weighted average and country range)	Potential national average (global weighted average and country range)	Potential for improvement (global weighted average and country range)
Knowledge, attitudes and practices	Comprehensive correct knowledge about AIDS (%)	Females	53	22 (1–67)	36 (2–75)	14 (1–29)
		Males	50	30 (5–69)	44 (9–78)	14 (1–31)
	Accepting attitudes (would buy fresh vegetables from shopkeeper living with HIV) (%)	Females	55	54 (10–89)	64 (11–95)	10 (0–30)
		Males	50	61 (13–92)	71 (13–95)	10 (0–31)
	Condom use at last high-risk sex (%)	Females	39	36 (7–76)	55 (11–83)	19 (0–28)
		Males	44	48 (23–83)	58 (32–91)	10 (0–25)
Testing and treatment	Testing for HIV and receiving results (ever) (%)	Females	52	24 (1–85)	34 (2–88)	10 (0–27)
		Males	48	17 (1–78)	24 (1–83)	7 (0–22)
	Pregnant women tested for HIV during antenatal care visit or labour and received results (%)		46	40 (1–98)	64 (1–99)	23 (0–40)



The potential improvement (dark blue vertical line) represents the overall weighted average that would be possible if, in each country, the whole population had the same level of coverage as the most advantaged subgroup (richest quintile).
The current weighted average is indicated by the light blue bar. The overall average is calculated based on the above-mentioned number of countries for each indicator and weighted by the relevant population size.

3.6.1 HIV prevention programme activities

There are several service delivery intervention points where programmes can address gaps in service delivery and quality and thereby have a direct effect on the reduction of HIV transmission and morbidity and AIDS-related mortality. UNAIDS outlines five general pillars for HIV prevention responses that can be adapted based on the country context: programmes for key populations (men who have sex with men, people in prison and other closed settings, people who inject drugs, sex workers, transgender people); programmes for adolescent girls, young women and their male partners in settings with high HIV incidence; condom distribution and related behavioural change programmes; voluntary medical male circumcision; and pre-exposure prophylaxis *(143)*. These activities, especially when undertaken in synergy with actions to address structural inequalities and promote broader enabling environments, are a central part of HIV responses *(144)*.

For example, the Avahan programme in India began supporting the scale-up of HIV prevention programming in 2003 *(145)*. Rooted in a community-based approach to gain access and build trust, the Avahan strategy focused on both short-term and long-term HIV risks. In the short term, the programme sought to address the immediate needs among priority population groups by distributing free condoms and needles, working with peer educators to map beneficiary networks, and operating free clinics to diagnose and treat sexually transmitted infections. Over the first 10 years of the programme, an estimated 57% of new HIV infections were averted *(146)*. The longer-term approach sought to create enabling environments for HIV prevention by empowering key populations to advocate for their own health and interests. For example, Avahan had some

success in mobilizing and strengthening community organizations led by female sex workers *(147)*.

3.6.2 HIV-sensitive social protection systems

HIV-sensitive social protection systems can help to meet the needs of people living with, at risk of or affected by HIV, targeting groups who are socioeconomically disadvantaged *(148)*. Social protection systems encompass social insurance and labour market policies, social safety nets, and social services such as health and education. Social protection systems can contribute to ending HIV by enhancing opportunities for HIV services (e.g. prevention, testing, care, support and treatment) and alleviating conditions that put people at risk for acquiring HIV.

After assessing the HIV epidemic profile, including health inequalities, a first step for countries to strengthen the potential of social protection systems is to conduct an assessment of social protection responses and the degree to which they are HIV-sensitive. The next steps entail working to scale up and progressively broaden sustainable social protection mechanisms, such as cash transfers and improved education and health systems. The meaningful participation of civil society organizations in this process is key to ensuring the design and implementation of social protection programmes reflect the needs of the priority populations.

In Bangladesh, for example, HIV-sensitive social protection services have demonstrated benefits to children and their families affected by HIV *(149)*. Mechanisms including conditional cash transfers, counselling and community sensitization were used to address challenges associated with poverty, adverse gender norms, low knowledge of HIV, and stigma. HIV-sensitive social protection services enabled the continuation of education, access to treatment and other support, access to food and nutrition, reduced stigma in the community, and improved well-being of children.

In the United Republic of Tanzania, a conditional cash transfer programme targeted at adolescent girls and young women aged 15–23 years was paired with a behaviour change and communication curriculum and financial literacy course *(150)*. The programme addressed HIV risks by reducing participants' financial reliance on male partners and increasing their sense of agency and self-esteem, thereby empowering them to make decisions about their sexual practices. Participants in the programme reported greater ability to help their families meet their basic needs and more confidence in refusing unwanted sex partners and transactional sex.

3.6.3 Combating HIV stigma and discrimination

Stigma and discrimination are social processes that devalue, ostracize, restrict or otherwise exclude certain people from society *(151)*. HIV stigma refers to negative attitudes and beliefs about people associated with HIV, and discrimination occurs when this forms the basis for treating people differently than others. People living with HIV often face intersecting forms of stigma and discrimination related to their HIV status and other characteristics such as race, gender, sexual orientation, economic status, age, and other health conditions *(152)*.

Stigma and discrimination in HIV deter key populations from accessing good-quality health-care services, compromise adherence to treatment, lead to abuse and violence, and result in poorer health outcomes and quality of life *(14)*. Taking action to eliminate or minimize HIV stigma and discrimination addresses inequality and is important to ending the AIDS epidemic, as stated as a priority in current goals and targets *(9, 13, 151)*.

In China, for example, HIV stigma and discrimination take many forms. Since 2003, the Chinese Government and nongovernmental actors in the country have made efforts to address these *(153)*. Through the "Four Free and One Care" policy, China provides free access to testing, treatment, care and support services for people living with HIV in urban areas who are poor, and all people living with HIV in rural areas (where 60% of people living with HIV in China reside). The policy has positively impacted public attitudes towards the universal right to health, while also reducing HIV-related stigma and

discrimination. Successive laws and regulations explicitly protect patient privacy, ensure the right of people living with HIV to be married, prohibit refusal of care by medical institutions, and prohibit refusal of employment on the basis of disease status. Changes to the criminal code in the late 1990s decriminalized men who have sex with men. In 2010, China lifted a ban on foreigners with HIV infection from entering the country. There is still work to be done to strengthen enforcement mechanisms and increase legal protections for people living with HIV, including making legal aid more easily accessible.

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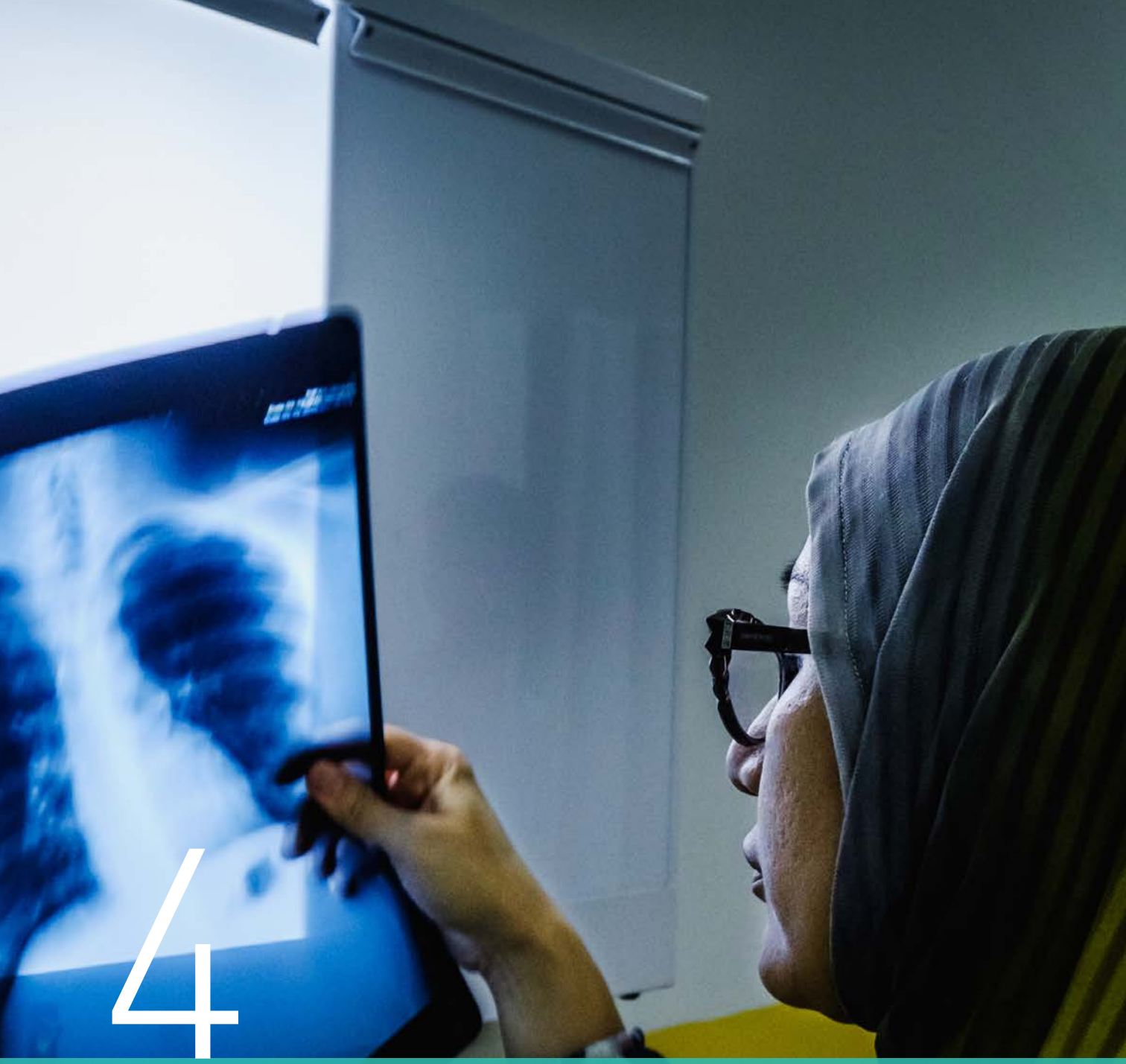


4

Tuberculosis

4. Tuberculosis

TB claims more lives than any other infectious disease. It exists in all countries and age groups, but it disproportionally affects populations in low- and middle-income countries and people living in poverty. Dedicated efforts of countries, with the support of stakeholders such as the WHO Global TB Programme, the Global Fund, the Stop TB Partnership, bilateral donors and civil society, have contributed to the steady decline in TB incidence in recent years. Tackling inequities, however, remains central to ending TB by 2030 in line with SDG target 3.3.

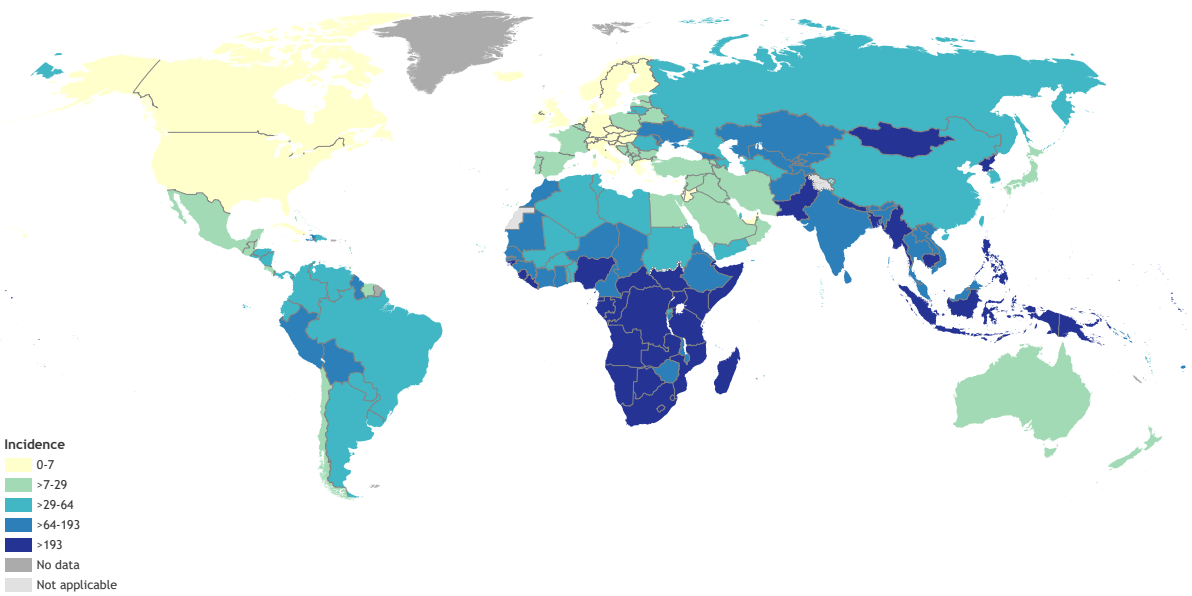
This chapter assesses within-country inequalities in TB. It gives an overview of the context and details about the analysis approach. The results explore inequalities related to TB burden, detection, prevention, knowledge and attitudes, and social protection. The findings are discussed and selected strategies to address inequalities are highlighted.

4.1 Context

4.1.1 Epidemiological profile

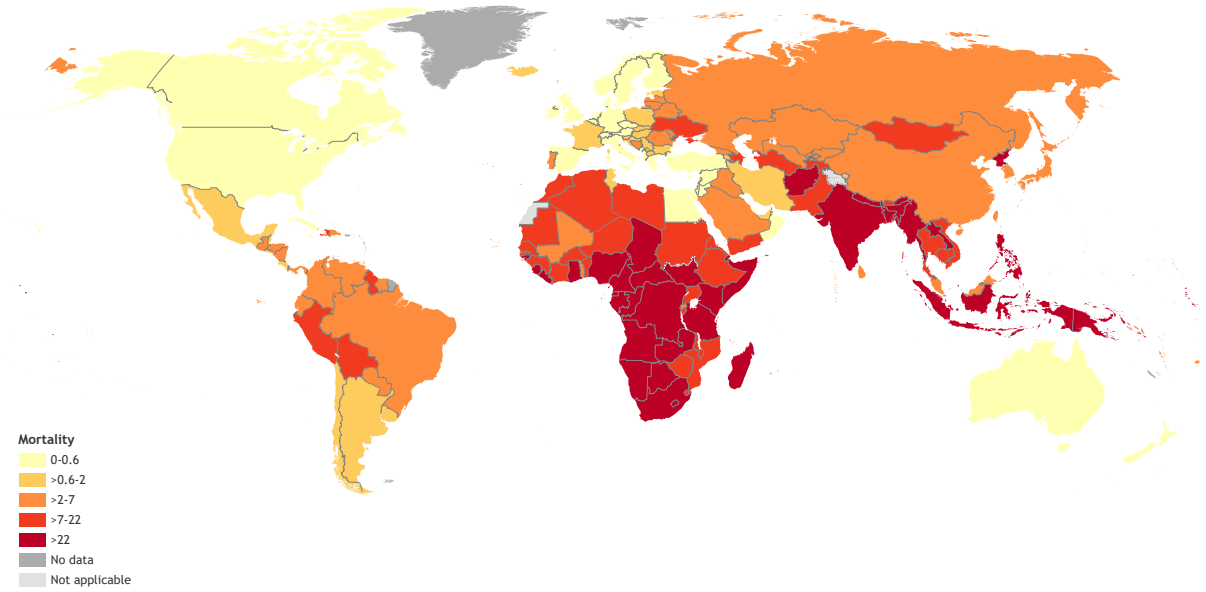
In 2020, an estimated 9.9 million people developed TB *(1)*. About 8.0% of new cases were among people living with HIV and multidrug- or rifampicin-resistant TB (MDR/RR-TB) remains a public health crisis. There were 1.3 million TB-related deaths among HIV-negative people and 214 000 TB-related deaths among people living with HIV. New TB cases were primarily concentrated in the WHO South-East Asia Region (43%) and the WHO African Region (25%). Eight countries accounted for more than two thirds of cases: India (26.2%), Indonesia (8.4%), China (8.5%), the Philippines (6.0%), Pakistan (5.8%), Nigeria (4.6%), Bangladesh (3.6%) and South Africa (3.3%). About 56% of cases were in men, 33% in women and 11% in children. The burden of TB globally is shown in Figs 4.1 and 4.2.

FIG. 4.1. Tuberculosis (TB) incidence (new infections per 100 000 population) in 194 countries: latest situation (2020)



Source: World Health Organization.

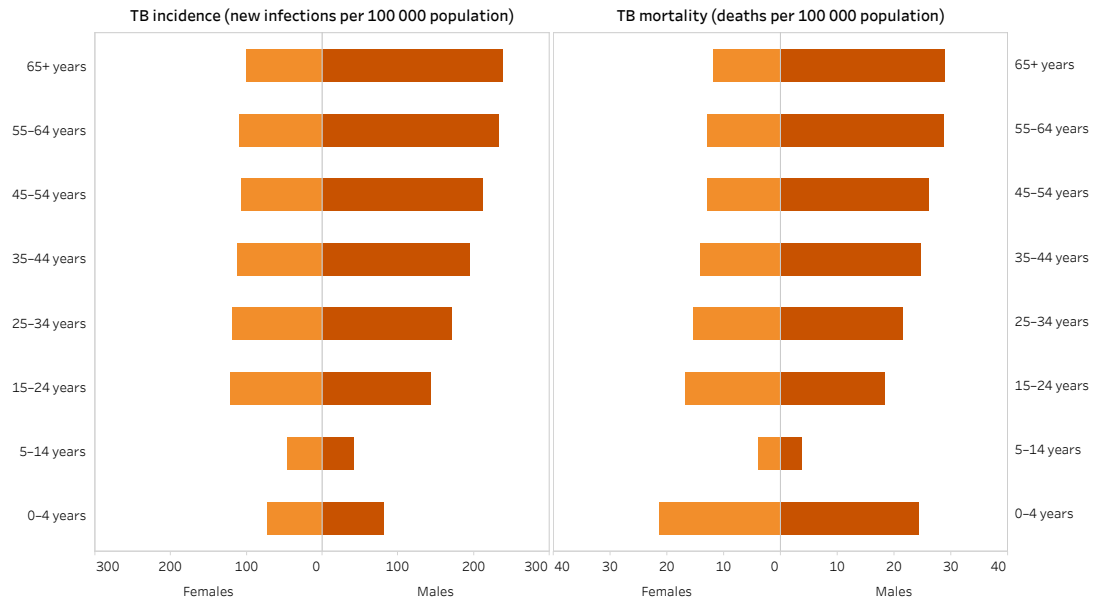
FIG. 4.2. Tuberculosis (TB) mortality (deaths per 100 000 population) in 194 countries: latest situation (2020)



Source: World Health Organization.

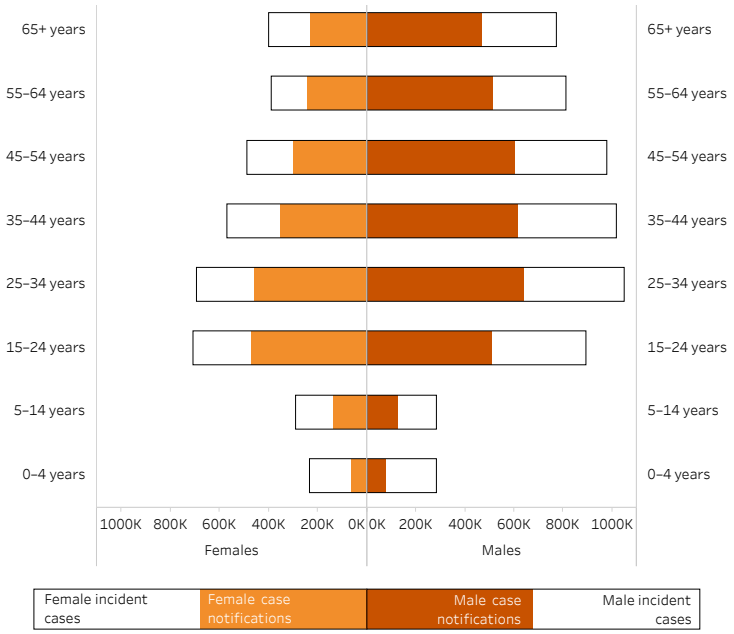
TB incidence and mortality rates tend to increase with age. Across age groupings over the age of 15 years, global TB incidence and mortality were higher in males than females, overall *(2)*. Global TB incidence and mortality increase faster among progressively older males compared with females (for whom the incidence and mortality rates remain about the same from age 15 years) (Fig. 4.3). Gaps in case detection (number of new and relapse TB cases notified to WHO in a given year) and reporting are higher among males than females, and higher among children aged under 14 years than adults *(2)* (Fig. 4.4). Further interrogation of age and sex patterns of TB at the country level are warranted to better understand the progression of the epidemic and the contributing factors. For example, contrasting patterns in Kenya and the Philippines show how TB is experienced differently by these respective populations (Box 4.1). To explore these and other country patterns, see the interactive visuals and data that accompany this report (see https://www.who.int/data/health-equity/report_2021_hiv_tb_malaria).

FIG. 4.3. Global estimates of tuberculosis (TB) incidence and mortality, by sex and age (2020)



Source: World Health Organization.

FIG. 4.4. Global estimates of number of tuberculosis (TB) incident cases and case notifications, by sex and age (2020)

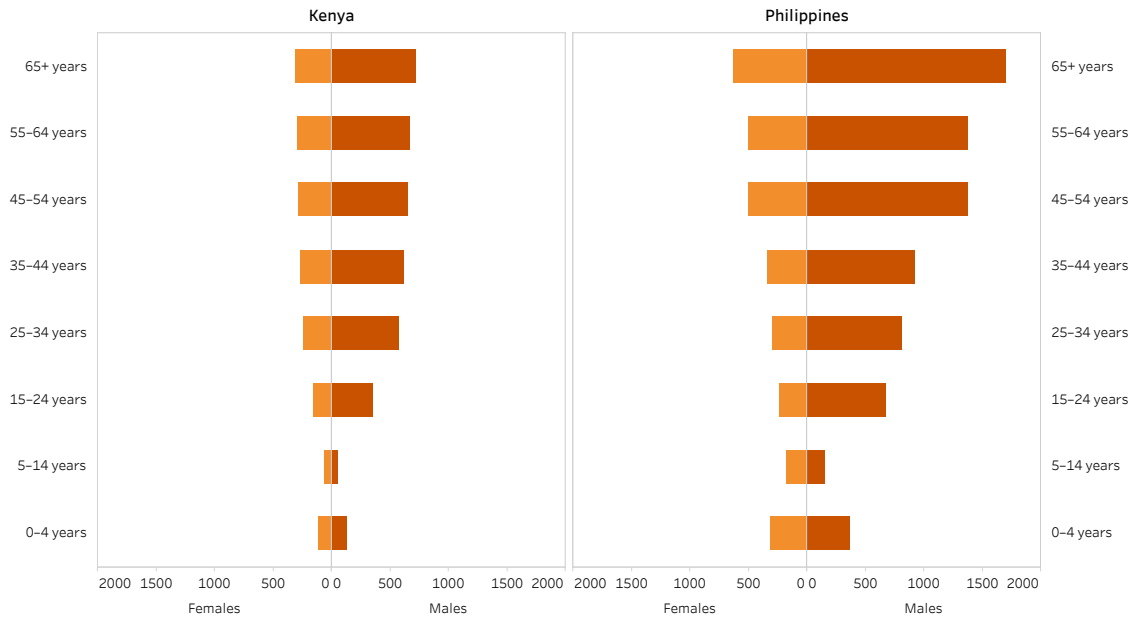


Source: World Health Organization.

BOX 4.1. Examples of age and sex patterns of TB

In Kenya, there are wide inequalities in incidence between females and males, which plateau above the age of 25 years (Fig. 4.5). By contrast, in the Philippines, wide sex-related inequalities in incidence rates become even wider with progressively older age *(2)*. TB incidence in Kenya is more affected by the HIV epidemic, and increased access to antiretroviral therapy has likely contributed to faster declines in TB incidence *(3)*.

FIG. 4.5. Estimates of tuberculosis (TB) incidence (new infections per 100 000 population) in Kenya and the Philippines, by sex and age (2020)



Source: World Health Organization.

4.1.2 Global commitments to end TB

Global commitments to address TB include reductions in TB disease burden and related financial burden; improved access to TB prevention, care and control services; and increased funding for research and innovation. The WHO End TB Strategy, endorsed by all Member States at the 2014 World Health Assembly, includes the following targets:

- 90% reduction in TB incidence by 2035 compared with 2015;
- 95% reduction in the annual number of TB-related deaths by 2035 compared with 2015;
- no families affected by TB face catastrophic TB-related costs by 2020 *(4)*.

Aligning with the milestones laid out in this strategy, SDG target 3.3 specifies an end to the TB epidemic and other communicable diseases by 2030, with an 80% reduction in TB incidence *(5)*.

At the first United Nations General Assembly high-level meeting on TB, held in September 2018, delegates pledged to provide leadership and work together to accelerate collective national and global actions, investments and innovations to combat TB *(6)*. Recognizing the urgent calls to action by the Moscow Declaration to End TB (adopted in 2018), the United

Nations General Assembly established commitments for the 2018–2022 period. Treatment and funding targets include 40 million people treated for TB; 1.5 million people treated for MDR-TB; 30 million people provided with TB-preventive treatment; funding of US$ 13 billion per year by 2022 for universal access to TB prevention, diagnosis, treatment and care; and funding of US$ 2 billion per year for TB research.

In 2020, the United Nations General Assembly reviewed progress towards achieving these goals. The report shows the world is off track to achieve the SDG and End TB Strategy targets on TB incidence, mortality and patient costs, and the United Nations high-level targets on TB treatment and preventive treatment and increased funding. The United Nations General Assembly has urged for more ambitious investments and actions to accelerate global progress towards the targets, especially in the context of the COVID-19 pandemic *(7)*.

In recent years progress has been insufficient to reach the milestones laid out in global targets. The WHO End TB Strategy calls for a 20% reduction in TB incidence rate between 2015 and 2020, but progress between 2015 and 2020 represented a decline of only 11%. TB deaths fell by 9% between 2015 and 2020, only a quarter of the way towards the 2020 milestone of a 35% reduction. Nearly half (47%) of people with TB faced catastrophic costs, whereas the WHO End TB Strategy target for 2020 was zero *(1)*. Of particular concern is the large number of people who develop TB but are not diagnosed – a situation that has been exacerbated by the COVID-19 pandemic (see Chapter 1).

The United Nations 2030 Agenda for Sustainable Development underscores the need for comprehensive actions across the entire set of SDGs, calling attention to improving the underlying conditions that put populations at risk for TB *(8, 9)*.

4.1.3 Inequalities and barriers to progress

TB is a disease of poverty and is associated with precarious living conditions, overcrowding, food and job insecurity, and weak health systems *(8)*. Vulnerability to TB is affected by nutritional status, HIV status, housing conditions, working conditions, access to health services, and lifestyle factors such as the use of alcohol, tobacco and other substances.

In Latin American and Caribbean populations, for example, TB has a greater burden in countries with higher incarceration rates and faster urban population growth; countries that reported more favourable TB outcomes had higher health expenditure per capita, better access to improved sanitation facilities, higher life expectancy at birth and higher TB detection rates *(10)*. Neighbourhoods in Brazilian cities that had worse living conditions and lower markers of social development reported higher TB incidence and mortality *(11, 12)*.

Subnational inequality in TB burden was evident across provinces of China, such that TB burden was found to be higher in poorer provinces and the extent of inequality between richer and poorer provinces increased between 1990 and 2016 *(13)*.

Across diverse settings, other factors associated with TB burden include age, economic status, education and place of residence. For example, in Malaysia, TB disproportionally affected people with lower levels of education, smokers, people who are single or unmarried, people who are unemployed, and younger adults *(14)*. TB mortality varied according to income, household density and race in a setting in South America, with TB mortality between 2004 and 2015 increasing among people who reported skin colour as "brown" but remaining stable in the general population *(15)*. Poverty, urban residence and HIV coinfection were found to be associated with worse TB treatment outcomes in the Republic of Moldova *(16)*. The odds of developing TB are almost five times greater for people living in urban slums compared with the general population *(17)*.

The burden of TB is consistently higher among men than women *(14, 18, 19)*, with some suggesting a role for biological and lifestyle factors that put men at greater risk. For example, men may be more likely to drink alcohol, smoke, use drugs and be incarcerated, and less likely to seek health care and adhere to TB treatment regimens *(14)*. Sex differences in the prevalence to notification

ratio, an indicator of the average time to notify a TB case, showed the ratio was systematically higher in men, suggesting women may be more effectively accessing diagnostic and treatment services *(18, 19)*. Across low- and middle-income countries, women were more likely to receive a timely TB diagnosis than men *(20)*.

TB in older adults and children and adolescents are concerns globally *(21, 22)*. Older adults are more likely to develop forms of TB that are more difficult to diagnose than conventional pulmonary TB, and more likely to experience a delay in diagnosis *(23)*. Treatment for TB in older adults is complicated by increased comorbidity and drug-related adverse events *(24, 25)*. Children aged under 2 years are at increased risk of developing serious forms of TB and at increased risk of death. In countries with a high TB burden, facilities where young children usually access health care often lack awareness and capacity for TB diagnosis and treatment *(22)*. Adolescents aged 10–19 years pose a risk for the transmission of TB, as they typically spend time in settings such as crowded schools and households. This age group may also face substantial stigma and be prone to increasing prevalence of comorbidities such as HIV and risky behaviours such as the use of alcohol, tobacco and other substances.

MDR/RR-TB continues to spread due to mismanaged TB treatment (e.g. premature treatment interruption) and person-to-person transmission, especially in crowded settings such as prisons and hospitals *(26)*. A global review of available data found previous TB disease and treatment to be the most influential risk factors for developing MDR-TB across settings, and there was a trend for increased MDR-TB among people aged 40 years and older, people without health insurance, and people who were unemployed *(27)*. The influence of other identified risk factors (gender, marital status, place of residence, history of incarceration, homelessness) varied across settings *(27)*. Geographical patterns of MDR/RR-TB prevalence demonstrate the burden is variable between countries and across subnational regions within countries *(28–30)*. In sub-Saharan Africa, for instance, the highest prevalence of new cases of MDR/RR-TB is in southern Africa and the lowest prevalence is in eastern Africa *(31)*.

Underdetection and underreporting are challenges for efforts to monitor and control the TB epidemic. In 2020, 5.8 million people were newly diagnosed with TB and notified (TB diagnosis reported within the national surveillance system and to WHO) out of the estimated 9.9 million people who developed the disease; this leaves a gap of over 4 million "missing" people with TB, or the difference between the estimated number of new cases and the number detected and reported *(1)*.

Undiagnosed TB is a major factor that drives transmission in communities. It is especially problematic in environments with low health system capacity, as people with TB may not have access to health care or, when accessing care, may not be tested and diagnosed. People at risk of TB may also simultaneously be prone to barriers to accessing TB diagnosis and treatment services (Box 4.2). For example, there are large case detection deficiencies among children for TB, including MDR/RR-TB, which are due in part to difficulty in attaining microbiological confirmation followed by drug susceptibility testing *(32)*.

Stigma surrounding TB is common and likely to be higher among people with lower levels of education, living in poverty, and with low awareness about TB *(39, 40)*. Stigma is reported by men and women, but the level, experience and consequences may manifest in different ways *(41)*. Stigma, fear of job loss, isolation and feeling avoided by other people all affect TB disclosure.

Predominant TB prevention measures include treatment for people with TB infection (TB preventive treatment) *(42)* and infection prevention and control to stop the transmission of *Mycobacterium tuberculosis* (e.g. administrative, environmental and personal protection measures in health-care settings) *(43)*. Vaccination of children with the bacille Calmette-Guérin (BCG) vaccine is effective against the most severe forms of TB among children *(44)*. WHO recommends TB preventive treatment for household contacts of people with TB, with an emphasis on children aged under 5 years and people living with HIV *(42, 45)*.

BOX 4.2. Barriers to diagnosis and treatment services

Barriers to accessing TB diagnosis and treatment services are exacerbated among certain groups. Some studies have reported women face greater barriers than men with regard to financial dependence, stigma (especially at the household level), health literacy, distance and transportation to health facilities, and lack of privacy in health systems *(33, 34)*. Men more often reported barriers related to financial losses from time away from work, and stigma in the workplace and community. Barriers to TB treatment initiation among children and youth stemmed from limited knowledge, attitudes and beliefs about TB, financial and geographical accessibility issues, centralization of services and health system delays *(35)*.

Across six countries in sub-Saharan Africa, where case detection and treatment initiation for MDR/RR-TB were predominantly voluntary, patient-related barriers included inability to pay (including transportation costs), negative perceptions of the public health sector (where TB services are accessible), loss to follow-up and death, and family, work and school commitments *(36)*.

Major challenges at the systems level include inadequate protocols for patient tracking, referrals and follow-up; lack of training among providers; and laboratory operational deficits.

In many parts of the world, population groups such as the working poor in urban settings prefer private-sector TB care due to the way public health services are organized and associated barriers. Countries with large private-health sectors have larger gaps in detection and notification, and the quality of private-sector TB care requires improvement. Achieving a balance between public and private approaches may lead to better detection and treatment outcomes *(37)*.

Further research is needed to understand why certain population groups are less likely to benefit from TB services. Across the cascade of TB care, five potential gaps have been identified as key points where people may drop out or have otherwise suboptimal experiences: case finding; diagnosis; linkages to care; retention in therapy and treatment adherence; and post-treatment TB recurrence-free survival *(38)*. These serve as entry points for studying barriers to access within populations, including key populations, and developing informed approaches to invest in and support enabling environments to improve TB service coverage and outcomes.

Despite widespread support for TB preventive treatment by national guidelines and policies, full implementation is hindered in many settings due to lack of funds to purchase medicines, concerns surrounding drug toxicities, health system capacity limitations, and lack of coordination between TB and HIV programming *(46)*. Further research and development priorities have been identified, including rapid point-of-care diagnostic testing; shorter and safer treatment regimens; and an effective TB vaccine that could be used across diverse populations and settings *(7)*.

Out-of-pocket spending for TB has declined across low- and middle-income countries overall, but it remains high in resource-constrained settings, negatively affecting access to care and treatment adherence *(47)*. When direct and indirect costs due to TB account for 20% or more of household income, they are defined as catastrophic as they pose barriers that can greatly affect the ability to access diagnosis and treatment, and to complete treatment successfully.

A study in Viet Nam found the majority of families affected by TB experience catastrophic costs (63%), with the major drivers being income loss and costs associated with special foods, nutritional supplements, travel and accommodation *(48)*. In Ghana, nearly two thirds of families affected by TB report catastrophic costs, and about 15% of households were pushed into poverty, despite policies guaranteeing free TB care in the public sector. For people with MDR/RR-TB, the costs were higher: after diagnosis, the median expenditure was almost three times greater due to higher non-medical costs such as food or nutritional supplements *(49)*. In China, financial hardship was the main concern among people with MDR/RR-TB, especially those who were married and part of the working class *(50)*.

The economic impact of TB at the household level has long-lasting effects, as households often remain vulnerable with limited recovery in terms of income and employment. In Malawi, barriers to economic recovery included financial insecurity, challenges rebuilding economic opportunities, residual physical morbidity and stigma *(51)*. A lengthy hospital stay and low socioeconomic status were associated with experiencing catastrophic costs in China, factors that could be offset by improved financial and social protection policies for people with MDR/RR-TB *(52)*.

4.1.4 Key populations

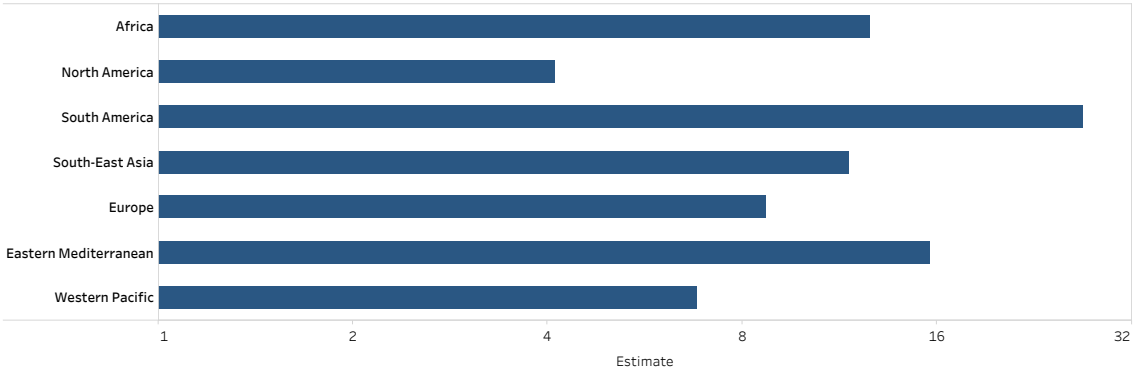
Certain groups have higher TB risks due to structural, environmental, biological and behavioural factors, or because they experience barriers to services stemming from criminalization, stigma and discrimination. Key populations for TB are broadly considered to be the most vulnerable, underserved and at risk, as they experience an increased impact from the disease and decreased access to services. The Global Fund identifies key populations for TB as people in prisons and other closed settings; people living with HIV; and migrants, refugees and indigenous populations *(53)*. The Stop TB Partnership additionally draws attention to key populations that vary from country to country, including miners; sex workers and their clients; health-care workers; children; elderly people; people living in urban poor areas; people who are gay, bisexual or transgender; people who use drugs or have alcohol dependency; and people with mental or physical disabilities *(54)*.

BOX 4.3. Comparisons of TB burden among prison populations across settings

Globally, reporting about TB in prisons tends to be incomplete and poorly reported. A systematic review and meta-analysis looking at 159 studies assessed the incidence and prevalence of TB in prison populations across WHO regions *(57)*. The study reported the highest incidence of TB in prison populations in the WHO African and South-East Asia Regions. The North America population of the WHO Region of the Americas,[1] Eastern Mediterranean Region and Western Pacific Region had the lowest incidence of TB in prison populations.

A comparison of the TB incidence in the prison population and the general population (incidence rate ratio) suggested that, overall, prison populations are more than 10 times more likely to report a new TB case. Across the regions, the incidence rate ratio was variable (Fig. 4.6) *(57)*. The South American population of the WHO Region of the Americas had the highest incidence rate ratio of 27, whereas the North American population had the lowest incidence rate ratio. In countries with an overall high burden of TB, the prevalence and incidence of TB was much higher among prison populations compared with the general population.

FIG. 4.6. Tuberculosis (TB) incidence ratio between prison populations and general population across World Health Organization (WHO) regions[a]



[a] Results were determined through a meta-analysis, including 3–12 studies (representing 22–98 cohorts) per WHO region. North American and South American populations were considered separately in the study analysis due to substantially different TB burdens among prison populations.

Source: based on data from Cords O, Martinez L, Warren JL, O'Marr JM, Walter KS, Cohen T, et al. Incidence and prevalence of tuberculosis in incarcerated populations: a systematic review and meta-analysis. Lancet Public Health. 2021;6(5):e300–e308.

A separate analysis considered TB case detection and treatment in prisons in 30 countries and areas in the WHO European Region *(58)*. The relative risk of TB in prisons compared with incidence in the general population varied. In Azerbaijan, Belgium, Kyrgyzstan, the Russian Federation and Ukraine, people in prisons were more than 20 times more likely to be reported as having TB than in the general population. Azerbaijan, Kyrgyzstan, the Republic of Moldova, the Russian Federation and Ukraine exceeded 1 TB case per 100 people in prison.

[1] North American and South American populations were considered separately in the study analysis due to substantially different TB burdens among prison populations.

Incarceration is a risk factor for TB. People who are incarcerated may come from situations where they are already at risk, and prison environments pose additional risks for developing TB *(14, 55)*. A review of global studies underscored that people in prison are at higher risk of TB than the general population in all settings, but especially in South America and the WHO African, Eastern Mediterranean and South-East Asia Regions (Box 4.3). In South Africa, for example, TB prevalence among incarcerated populations was estimated to be four times higher than the general population *(56)*.

Given the high burden of TB in prisons, incarcerated populations should be prioritized in TB programmes and strategies *(57, 58)*. Universal testing for active TB upon prison entry could help to ensure timely and appropriate treatment is initiated when necessary to limit transmission. In addition, greater efforts are warranted to improve the quality and quantity of data collected about TB in prison settings.

People living with HIV are about 18 times more likely to develop active TB disease than people in the general population *(59)*. In 2020, 8.0% of new TB cases occurred among people living with HIV, and 14% of TB deaths were among people living with HIV *(1)*. The growing HIV epidemic in the 1990s was a major factor behind the global resurgence of TB during this period, and the links between the two diseases are multifaceted *(60)*. In addition to multiple biological reasons that increase the risk of coinfection, HIV and TB share common ecological risk factors. These are associated with poverty (e.g. malnutrition, poor housing, dense populations), educational gaps, cultural barriers, and stigma and discrimination. The economic impact of HIV in many regions, and the more recent disruptions due to the COVID-19 pandemic, have exacerbated conditions of poverty and interrupted health systems *(60, 61)*.

There are clinical challenges associated with diagnosing, managing and treating TB in people living with HIV. Integrated approaches for the two diseases are being developed and implemented *(62)*. The 2018 United Nations General Assembly Political Declaration on the Fight against TB included a target to increase preventive treatment for TB among people living with HIV to 6 million by 2022 *(6)*.

Crisis situations, including natural disasters, armed conflict and forced population displacement, increase the risk of TB by up to 20-fold *(63)*. Migrant workers, tribal communities and indigenous people experience a higher burden of TB, although these situations remain understudied and little is known about the specifics of how the disease affects them *(64–66)*.

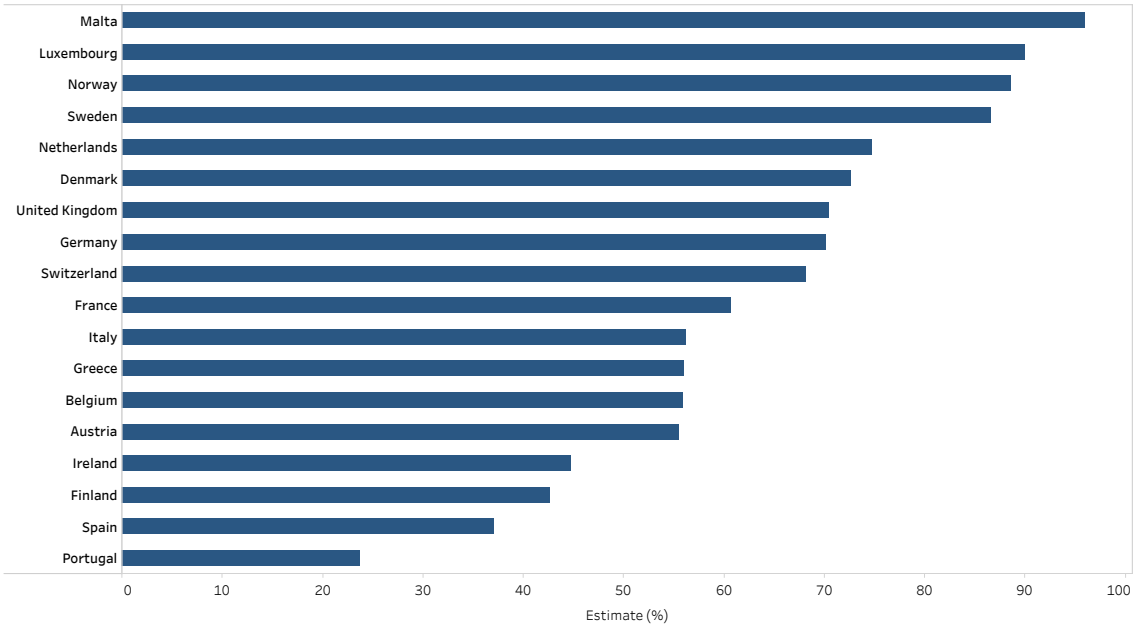
For countries in Europe with low TB incidence, TB among migrants is a public health challenge (Box 4.4). There are a number of contributing reasons why migration may be linked to TB risk *(67–69)*. Foreign-born adults originating from a country with high TB incidence are more likely to have acquired latent TB infection before migrating, putting them at long-term risk of TB reactivation of their prior infection *(70)*. Socioeconomic, political and environmental stressors often underlie migration, and migrants seeking asylum may be arriving from places with a high TB burden, and with weak or disrupted health systems *(71)*. Poor living conditions and social marginalization due to criminalization, stigma and discrimination, and financial issues are also drivers for the spread of infectious diseases, including TB.

Addressing the burden of TB in migrant populations requires action across the four domains of the WHO migrant health framework: policy and legal frameworks; monitoring migrant health; migrant-sensitive health systems; and partnerships, networks and multi-country frameworks *(72)*. As part of the WHO global action plan to promote the health of refugees and migrants, countries are called upon to increase the availability of disaggregated data about migrant health *(73)*. Although screening is part of TB prevention, especially in countries with a high burden of foreign origin disease, it is far from sufficient, due to the risk of delayed TB reactivation. Moreover, screening for TB among newly arrived migrants and resettled migrants who travel back to their country of origin is not applied systematically across countries, even within the same region *(74)*.

BOX 4.4. TB incidence among migrants in Europe

An analysis of TB in the WHO European Region compared the burden of disease among migrants across 18 countries *(58)*. Across countries, the proportion of all TB cases that were of foreign origin (among people who were not born in or did not have citizenship of the reporting country) was higher than those who were of non-foreign origin in the majority of countries (Fig. 4.7). Luxembourg, Malta, Norway and Sweden reported at least 85% of TB cases in the country of foreign origin, although these countries also had low overall numbers of TB cases (ranging from 50 in Luxembourg to 479 in Sweden). The largest numbers of TB cases notified by people of foreign origin were reported by France, Germany and the United Kingdom of Great Britain and Northern Ireland, where the proportion of foreign-origin cases was 61% (France) and 70% (Germany, United Kingdom).

FIG. 4.7. Percentage of all tuberculosis (TB) cases in the county that were of foreign origin in 18 countries in Europe (2019)



Source: based on data from Tuberculosis surveillance and monitoring in Europe data. Copenhagen: European Centre for Disease Prevention and Control and WHO Regional Office for Europe; 2021 (https://www.ecdc.europa.eu/en/publications-data/tuberculosis-surveillance-and-monitoring-europe-2021-2019-data, accessed 19 April 2021).

4.2 Approach

The analysis of inequalities in TB covers indicators related to burden, detection, prevention, knowledge and attitudes, and social protection (Table 4.1). The selection of indicators, dimensions of inequality and countries for analysis was determined with consideration of the availability of comparable data across countries. For this reason, certain relevant TB indicators (notably, prevalence of TB among people living with HIV, TB preventive treatment and other preventive measures, and TB treatment and outcome indicators) and dimensions of inequality were not included in the analysis. A lack of data precluded analysis of inequalities within key populations.

Data sources for the TB indicators include WHO annual estimates *(2, 74)*, TB prevalence surveys *(75)*, and country-reported data[1] about the proportion of people with

[1] This includes routine surveillance data or data from national surveys.

TABLE 4.1. Overview of disaggregated data used for tuberculosis (TB) analysis

			Inequality dimension						Countries with available data	
Category	Indicator	Source	Sex	Economic status	Education	Place of residence	Age	TB drug resistance	Latest situation[a]	Change over time[b]
Burden	TB incidence (new infections per 100 000 population)[c]	WHO	✔						186[d]	
	TB mortality (deaths per 100 000 population)[c]	WHO	✔						180[d]	
	TB prevalence (cases per 100 000 population)	TB prevalence surveys				✔			20	
	People with MDR/RR-TB (%)	Country reported to WHO	✔						85[d]	
Detection	Prevalence to notification ratio (years)	TB prevalence surveys and country-reported case notifications	✔						28	
	Case detection rate (%)	WHO and country-reported case notifications	✔				✔		109–116[e]	
Prevention	BCG immunization coverage among children aged 1 year (%)	DHS, MICS, RHS	✔	✔	✔	✔			67–90[e]	56–74[e]
Knowledge and attitudes	People who report TB is spread through coughing (%)	DHS	✔						16	9
	• Females	DHS		✔	✔	✔	✔		18–19[d]	13
	• Males	DHS		✔	✔	✔	✔		15–17[e]	9–10[e]
	People who would want a family member's TB kept secret (%)	DHS	✔						12	8
	• Females	DHS		✔	✔	✔	✔		13–14[e]	10
	• Males	DHS		✔	✔	✔	✔		11–13[e]	8–9[e]
Social protection	Families affected by TB facing catastrophic costs due to TB (%)	TB patient cost surveys		✔				✔	6–21[e]	

BCG: bacille Calmette-Guérin; DHS: Demographic and Health Surveys; MDR/RR-TB: multidrug- or rifampicin-resistant TB; MICS: Multiple Indicator Cluster Surveys; RHS: Reproductive Health Surveys; WHO: World Health Organization.

[a] Data for the latest situation are the most recent available data. Modelled annual estimates from WHO are from 2020; country-reported data about the proportion of people with TB with MDR/RR-TB are from 2011–2019; survey estimates for detection, prevention, knowledge and attitudes, and social protection indicators reflect the most recent survey conducted between 2011 and 2020.

[b] Data for change over time estimates from DHS, MICS and RHS reflect the most recent survey conducted between 2011 and 2020, and a previous survey conducted between 2001 and 2010, with a 5- to 15-year gap between the two surveys.

[c] Although age-disaggregated data were available for TB incidence and mortality indicators, inequalities by age for these indicators are affected by expected age-related progression of the disease and, therefore, patterns of disease by age are presented as part of the disease context.

[d] Does not include countries where male/female ratios could not be calculated due to zero values.

[e] The number of countries with available data may vary within indicator depending on the availability of information for the inequality dimension.

MDR/RR-TB and TB case notifications (reported annually to WHO by national TB programmes) *(2)*. Data for the BCG indicator were derived from nationally representative household surveys – DHS, MICS and RHS, sourced from the WHO Global Health Observatory Health Equity Monitor *(76)*. TB knowledge and attitudes indicators were sourced from DHS surveys. Data from TB patient cost surveys were extracted from country reports.

Burden is monitored through TB incidence, prevalence and mortality rates (per 100 000 population), with a fourth burden indicator specifying the percentage of people with TB who have MDR/RR-TB. Prevalence to notification ratio and case detection rate are indicators of TB case detection, or the effectiveness of national TB programmes in finding, diagnosing and treating people with TB. Prevalence to notification ratio gives the average time, expressed in years, to notify a TB case and is calculated based on prevalence estimates from TB prevalence surveys and the number of TB case notifications to the national TB programme. The higher the ratio, the longer the time for a prevalent case to be notified to the national TB programme.

Case detection rate is the proportion of estimated new and relapse TB cases that are detected and reported within a given year, calculated as the number of TB case notifications divided by the estimated incident cases. The gap between incident cases and notified cases is commonly referred to as "missing" people with TB.

The prevalence to notification ratio and the case detection rate indicators are subject to uncertainty.[1] The prevalence to notification ratio is less biased because it is based on prevalence survey estimates, while case detection rate uses incidence estimates; however, the prevalence to notification ratio is available for fewer countries.

BCG immunization coverage among children aged 1 year is an indicator of prevention of severe forms of TB in children. Correct knowledge about TB was reflected by the percentage of people aged 15–49 years who had heard of TB and who correctly reported that TB can spread through the air when coughing. Negative attitudes and stigma regarding TB were measured by the percentage of people who said they would want it to remain a secret if a member of their family received a TB diagnosis.

Given that both indirect and direct costs associated with TB may be considerable and result in delayed diagnosis, the percentage of families affected by TB facing catastrophic costs due to TB (costs accounting for 20% or more of household income) is included as an indicator of social protection.[2] Additional metadata about all indicators are available in Annex 7.

The availability of disaggregated data (by sex,[3] economic status, education, place of residence, age and TB drug resistance status) is shown in Table 4.1. For the BCG immunization coverage among children aged 1 year and knowledge and attitudes indicators, data disaggregation by education includes three subgroups (no education, primary education, and secondary or higher education), but the analysis takes into consideration the two subgroups with the lowest and highest levels of education. For BCG coverage, education subgroups are based on the level of education of the child's mother. TB drug resistance is considered as a dimension of inequality for social protection, as it may be a source of discrimination or lead to poor outcomes. This inequality dimension consists of two subgroups: people with drug-resistant TB and people with drug-susceptible TB. Other dimensions of inequality are described in Chapter 2.

Patterns of TB burden according to age were presented as part of the disease context, as expected age-related progression of the disease is not considered a primary source of inequity. For assessments of place of residence inequality in TB prevalence, the sampling protocol for the TB prevalence surveys (from which place of residence data were extracted) was not always powered

[1] TB case notifications are subject to underreporting (especially in countries that lack policies on mandatory notifications and other measures to ensure reporting of detected cases by all care providers) and overreporting (particularly among children).

[2] The catastrophic costs indicator analysed in this report is not the same as the SDG indicator for catastrophic health expenditures. See Box A3.1 in Annex 3.

[3] For sex-disaggregated data, most sources reported data by biological sex (females and males). This language was adopted throughout the results section. The lack of data availability reflecting diverse gender identities is a limitation.

to measure prevalence differences between rural and urban areas, and the results of this analysis should be interpreted with caution.

The analysis includes countries with data available for all subgroups for a particular indicator and dimension of inequality. Information about the analysis methods, including the inequality thresholds applied to describe situations of high and low inequality, is provided in Chapter 2. Briefly, sex-related inequality in the three burden indicators and the prevalence to notification ratio are reported here as the ratio between male and female estimates (a relative summary measure of inequality). Inequalities in case detection rate, prevention, knowledge and attitudes, and social protection indicators were reported as the difference between two subgroups (an absolute summary measure of inequality). The global assessment is based on the overall median of measures of inequality for all countries with available data. To assess trends in high-burden or high-funding settings, a subanalysis of countries prioritized by the Global Fund[1] was conducted for all indicators.

For more detailed information about the methods used in this analysis, see Chapter 2 and Annex 3.

ADDITIONAL RESOURCES FOR DATA EXPLORATION, INCLUDING INTERACTIVE VISUALS AND DATA, ACCOMPANY THE REPORT (see https://www.who.int/data/health-equity/report_2021_hiv_tb_malaria).

[1] These countries are prioritized because they are high burden or receive high levels of funding (see Annex 3).

4.3 Results

4.3.1 Burden

KEY FINDINGS

- Overall, TB incidence and mortality rates were moderately higher among males than females, with male incidence and mortality rates more than double that of females in more than a quarter of countries.
- Sex-related inequality (based on the male/female ratio) in the proportion of TB cases with MDR/RR-TB showed divergent patterns across countries, sometimes favouring females and sometimes favouring males.
- Overall, the prevalence of TB tends to be higher in urban settings than rural settings.

Inequalities in TB burden indicators were assessed in up to 186 countries. Table 4.2 gives an overview of the number of countries reporting high and low inequality for the four indicators.

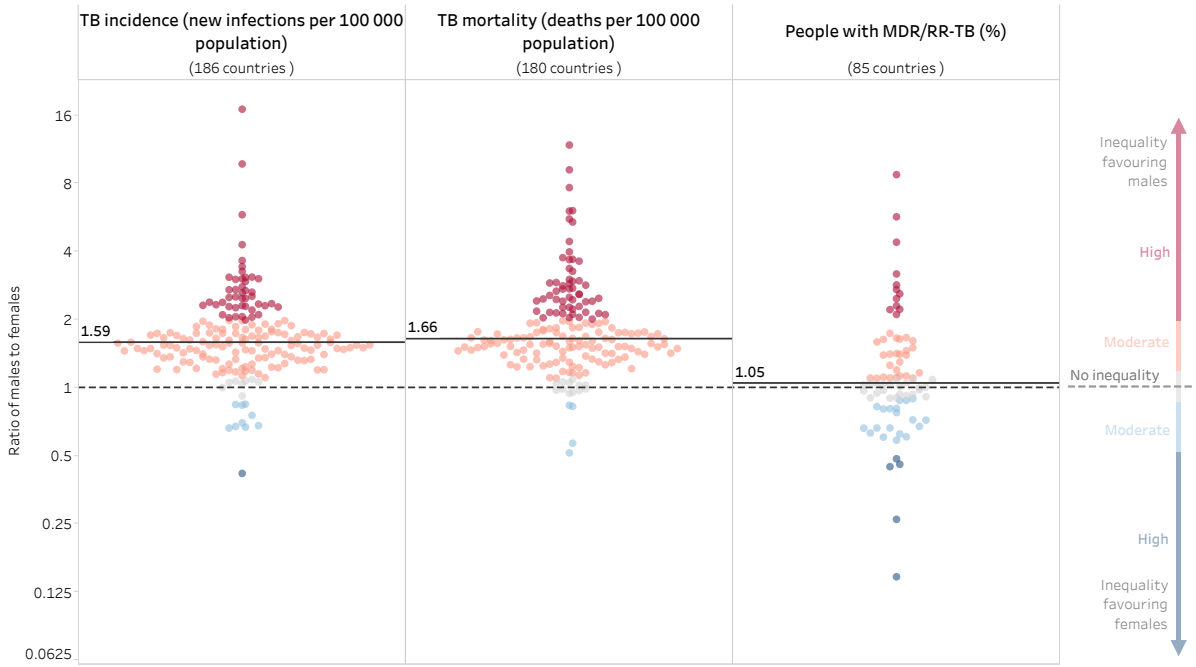
Globally, there were moderate sex-related inequalities in TB incidence and mortality across countries, with an overall higher burden in males than females (Fig. 4.8). In more than a quarter of countries, TB incidence or mortality was at least twice as high in males than females (this was the case in 47 of 186 countries for incidence and 57 of 180 countries for mortality). In countries where the male/female ratio was low, overall TB burden tended

TABLE 4.2. Overview of high and low inequality in tuberculosis (TB) burden indicators across study countries

Indicator	Dimensions of inequality explored	Countries included in analysis	Countries with high inequality	Countries with low inequality
TB incidence	Sex	186	47	8
TB mortality	Sex	180	57	12
TB prevalence	Place of residence	20	5	2
People with MDR/RR-TB	Sex	85	17	20

MDR/RR-TB: multidrug- or rifampicin-resistant TB.

FIG. 4.8. Relative sex-related inequality in tuberculosis (TB) burden indicators: latest situation (2011–2020)



MDR/RR-TB: multidrug- or rifampicin-resistant TB.
Each country is represented by multiple circles (one for each indicator).
Solid horizontal lines indicate the median across countries.
The dashed horizontal line indicates the ratio value of no inequality (1).

Source: World Health Organization and country reports.

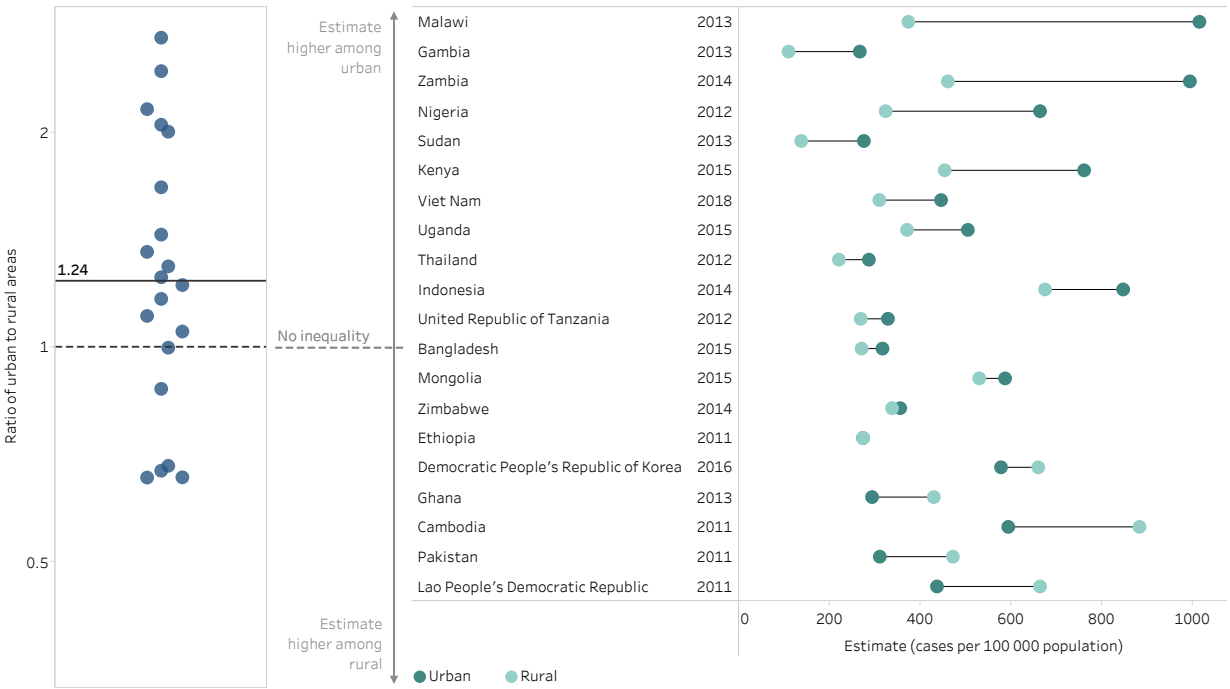
to be relatively low (below the global median), except for Papua New Guinea, where the male/female ratio was low alongside high national incidence and mortality rates.

There was no overall sex-related inequality in the proportion of MDR/RR-TB among people with TB globally, but the situation across countries was mixed. A fifth of countries (17 of 85) reported high relative sex-related inequality. In 12 countries, MDR/RR-TB was at least twice as common in males; in 5 countries, MDR/RR-TB was at least twice as common in females. (Note that in 8 of 17 countries that reported high relative sex-related inequality, the burden of MDR/RR-TB was less than 2% in both female and male subgroups.) Sex-disaggregated data about MDR/RR-TB were not available for an earlier time period, and thus change over time could not be assessed.

Overall, the prevalence of TB in urban settings was 1.2 times higher than in rural settings (Fig. 4.9).[1] Prevalence estimates were higher in urban than in rural areas in two thirds of countries (14 of 20). In five countries (Gambia, Malawi, Nigeria, Sudan, Zambia), TB prevalence was at least twice as high in urban than in rural areas. In five countries (Cambodia, Democratic People's Republic of Korea, Ghana, Lao People's Democratic Republic, Pakistan) prevalence rates were higher in rural than in urban settings.

[1] The sampling of TB prevalence surveys is not always powered to accurately measure differences between rural and urban areas.

FIG. 4.9. Relative place of residence inequality in tuberculosis (TB) prevalence and disaggregated data in 20 countries with available data: latest situation (2011–2020)



Each country is represented by one circle on the left graph and two circles on the right graph (one for each subgroup).
On the left graph, the solid horizontal line indicates the median across countries and the dashed horizontal line indicates the ratio value of no inequality (1).
Source: TB prevalence surveys.

4.3.2 Detection

KEY FINDINGS

- Overall, TB case detection (measured as the prevalence to notification ratio) tended to be moderately better among females than males.
- There was moderate age-related inequality in the TB case detection rate overall, with rates being at least 20 percentage points higher among adults than children in half of countries..

Inequalities in TB detection indicators were assessed in up to 116 countries. Table 4.3 gives an overview of the number of countries reporting high and low inequality for the two indicators.

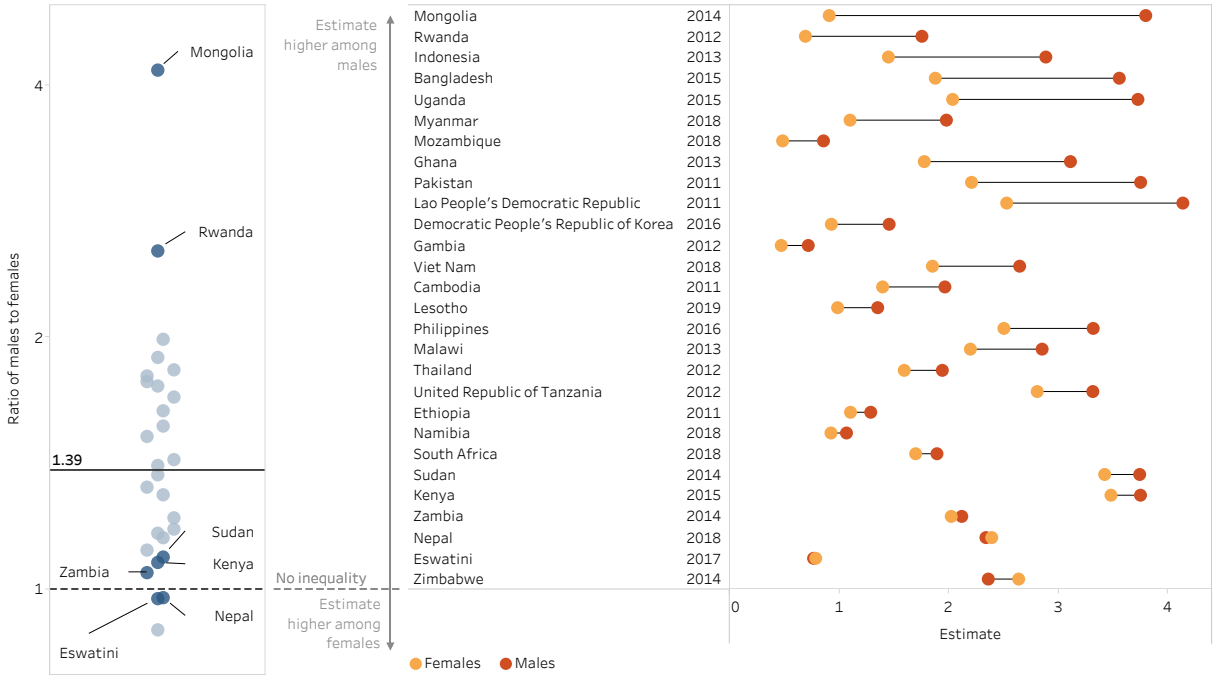
TB case detection reported as the prevalence to notification ratio demonstrated moderate inequality overall across 28 countries, with better case detection in females than males (Fig. 4.10). In Mongolia and Rwanda, the prevalence to notification ratio suggested case detection was at least twice as fast among females as among males. In nearly a fifth of countries (5 of 28; Eswatini, Kenya, Nepal, Sudan, Zambia), the time taken for a prevalent case to be notified to the national TB programme was the same or similar across both sexes.

TABLE 4.3. Overview of high and low inequality in tuberculosis (TB) detection across study countries

Indicator	Dimensions of inequality explored	Countries included in analysis	Countries with high inequality by at least one dimension	Countries with low inequality across all dimensions
Prevalence to notification ratio	Sex	28	2	5
Case detection rate	Sex, age	109–116[a]	54	24

[a] 109 countries had data disaggregated by age, and 116 countries had data disaggregated by sex.

FIG. 4.10. Relative sex-related inequality in tuberculosis (TB) prevalence to notification ratio and disaggregated data in 28 countries with available data: latest situation (2011–2020)

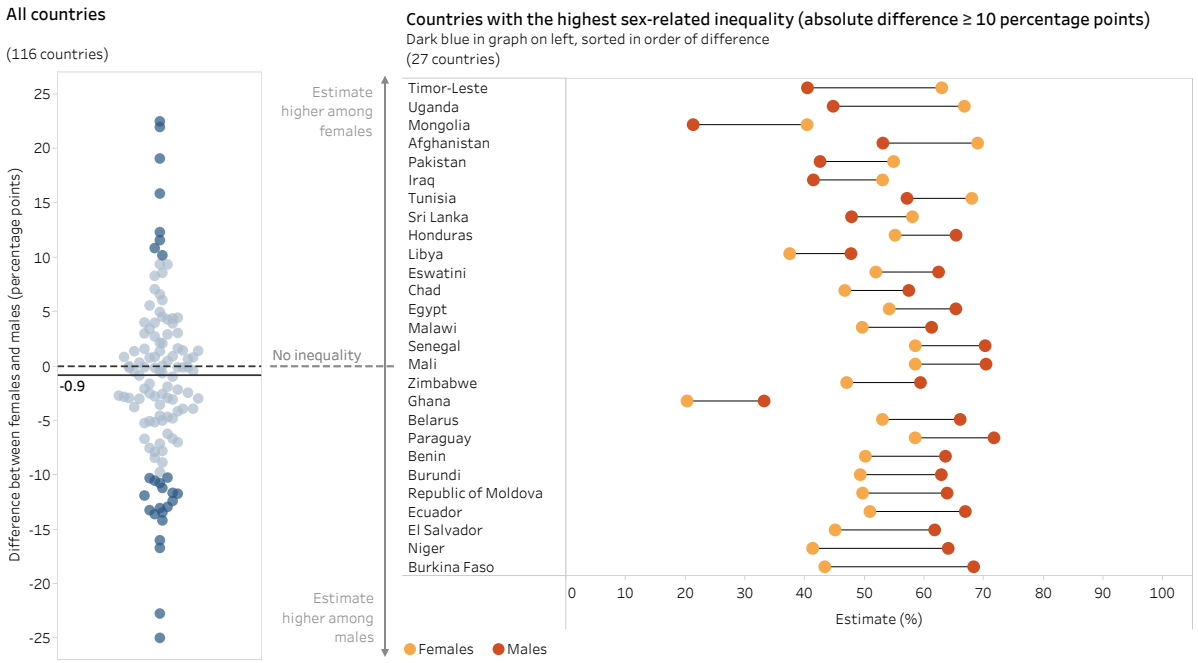


Each country is represented by one circle on the left graph and two circles on the right graph (one for each subgroup).
On the left graph, the solid horizontal line indicates the median across countries and the dashed horizontal line indicates the ratio value of no inequality (1).
Source: TB prevalence surveys and country-reported case notifications.

Overall, TB detection, measured by the case detection rate, showed no sex-related inequality, with the majority of countries reporting differences of less than 5 percentage points.[1] There were, however, divergent patterns observed across some countries, with 8 countries demonstrating at least 10 percentage points better case detection rate among females than males and 19 countries demonstrating at least 10 percentage points better case detection rate among males than females (Fig. 4.11).

[1] This result differs from that obtained using the prevalence to notification ratio, not because of the composition of countries included in the analysis but due to differences between the prevalence to notification ratio and case detection rate measures. The prevalence to notification ratio is less biased because it is based on prevalence survey estimates (case detection rate uses incidence estimates), but it is available for fewer countries.

FIG. 4.11. Absolute sex-related inequality in tuberculosis (TB) case detection rate in all countries and disaggregated data in countries with the highest sex-related inequality: latest situation (2020)

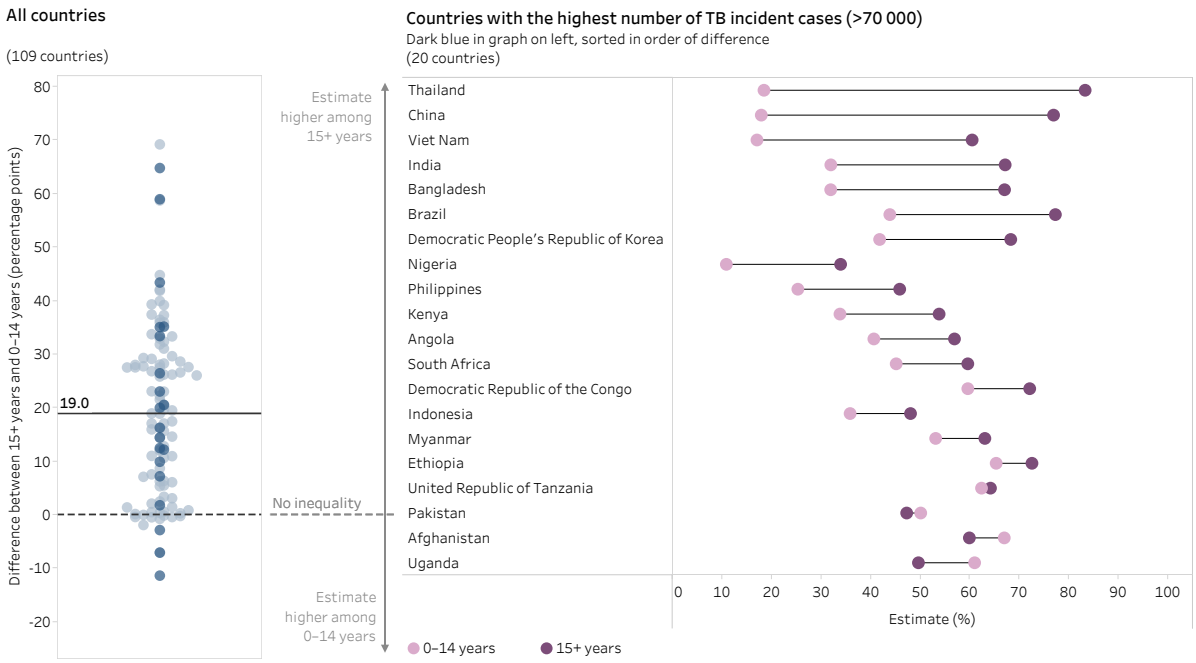


Each country is represented by one circle on the left graph and selected countries are represented by two circles on the right graph (one for each subgroup). Countries shown on the right graph are dark blue on the left graph.
On the left graph, the solid horizontal line indicates the median across countries and the dashed horizontal line indicates no inequality (0).

Source: World Health Organization and country-reported case notifications.

Moderate age-related inequalities were reported in the case detection rate, with better rates among adults aged 15 years and older than children aged 0–14 years. Across 109 countries, there was a median difference of 19 percentage points between adults and children (Fig. 4.12), with almost half of countries (52 of 109) having more than 20 percentage points higher rates among adults. There was a large variation in age-related inequality in the case detection rate among the 20 countries with the highest TB incident cases in 2020.

FIG. 4.12. Absolute age-related inequality in tuberculosis (TB) case detection rate in all countries and disaggregated data in countries with the highest number of TB incident cases: latest situation (2020)



Each country is represented by one circle on the left graph and selected countries are represented by two circles on the right graph (one for each subgroup). Countries shown on the right graph are dark blue on the left graph.
On the left graph, the solid horizontal line indicates the median across countries and the dashed horizontal line indicates no inequality (0).

Source: World Health Organization and country-reported case notifications.

4.3.3 Prevention

KEY FINDINGS

- BCG immunization coverage was high overall (global median over 90%), with a fifth or more of countries demonstrating substantially higher coverage among the richest and most educated people.
- The following countries had high levels of economic-related inequality that were unchanged or had increased over the previous 10 years: Benin, Cameroon, Central African Republic, Côte d'Ivoire, Ethiopia, Guinea, Haiti, Lao People's Democratic Republic, Madagascar, Mali, Nigeria, Pakistan, Timor-Leste, Yemen.

Inequalities in BCG immunization coverage were assessed in up to 90 countries. Table 4.4 gives an overview of the number of countries reporting high and low inequality for this indicator.

The coverage of BCG immunization in children aged 1 year showed low inequalities by economic status, place of residence and sex, and moderate inequalities by education, according to global median differences (Fig. 4.13). Eight countries demonstrated consistently high levels of inequality by economic status, education and place of residence (Angola, Central African Republic, Chad, Côte d'Ivoire, Ethiopia, Nigeria, Papua New Guinea, Yemen).

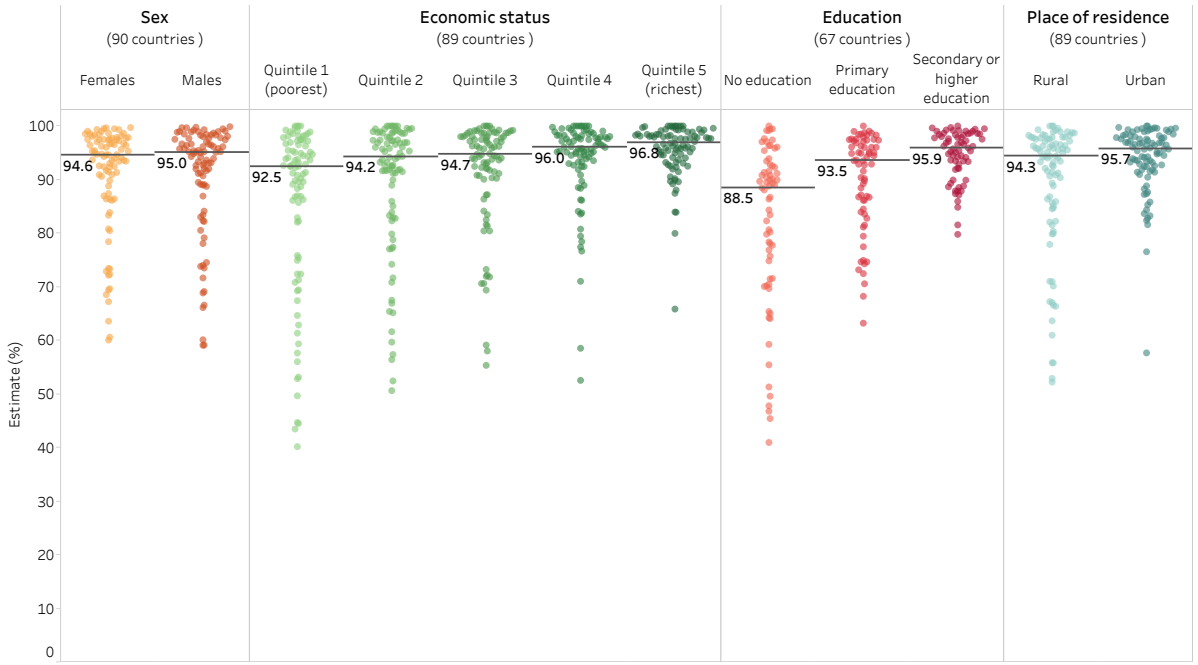
TABLE 4.4. Overview of high and low inequality in tuberculosis (TB) prevention among children across study countries

Indicator	Dimensions of inequality explored	Countries included in analysis	Countries with high inequality by at least one dimension	Countries with low inequality across all dimensions
BCG immunization coverage among children aged 1 year	Sex, economic status, education, place of residence	67–90[a]	23	25

BCG: bacille Calmette-Guérin.

[a] 67 countries had data disaggregated by education, 89 countries had data disaggregated by economic status, 89 countries had data disaggregated by place of residence, and 90 countries had data disaggregated by sex.

FIG. 4.13. Bacille Calmette-Guérin (BCG) immunization coverage among children aged 1 year, by sex, economic status, education and place of residence: latest situation (2011–2020)



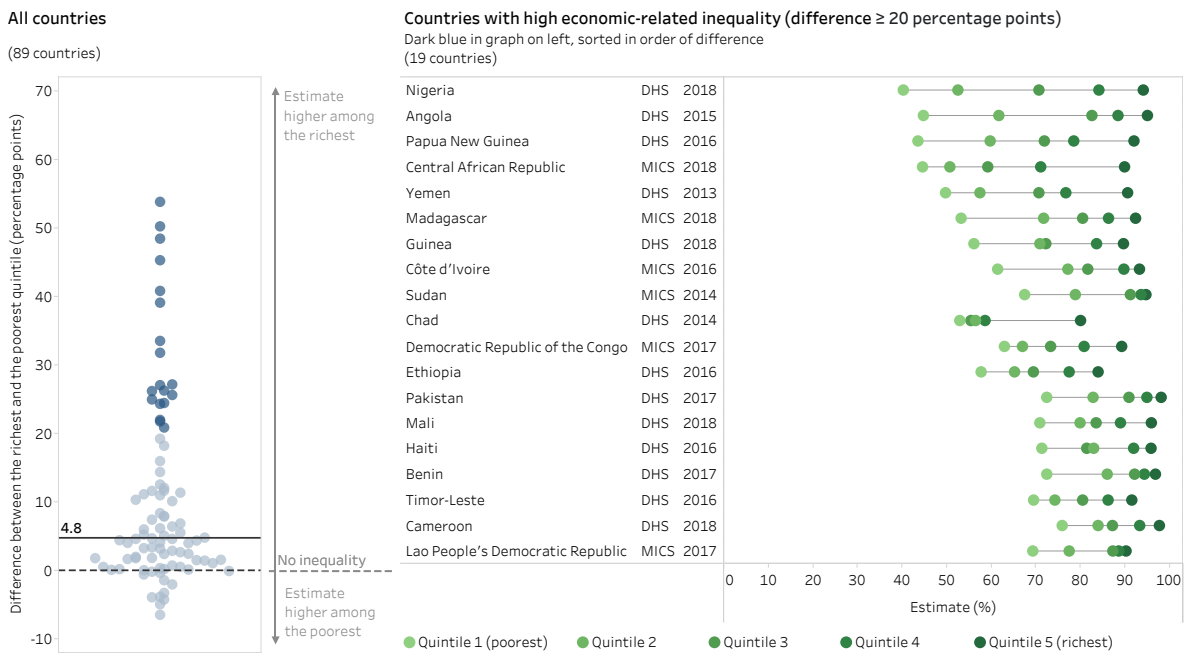
Each country is represented by multiple circles (one for each subgroup).
Solid horizontal lines indicate the median across countries. The difference between the median values of two subgroups evident on the figure is distinct from the overall median difference across countries (reported in the text and other resources that accompany this report and used to assess the overall level of inequality as low, moderate or high).

Source: Demographic and Health Surveys, Multiple Indicator Cluster Surveys and Reproductive Health Surveys.

High levels of economic-related inequality were evident in a fifth of countries, with 19 of 89 countries reporting coverage at least 20 percentage points higher in the richest than the poorest quintile (Fig. 4.14). The majority of countries with high economic-related inequality in BCG coverage were in the WHO African Region.

In terms of education, 15 of 67 countries had high inequality favouring children whose mothers had secondary or higher education compared with children whose mothers had no education. Seven of the countries with high levels of education-related inequality demonstrated no change or an increase in inequality over the past decade (Central African Republic, Côte d'Ivoire, Jordan, Lao People's Democratic Republic, Madagascar, Pakistan, Yemen). Other countries, including India, Kenya and Namibia, achieved low or moderately low education-related inequality due to large decreases in inequality over the past decade (Box 4.5). According to the latest situation, in the majority of countries there was low inequality on the basis of place of residence or sex. Nine of 89 countries had higher BCG immunization coverage in urban than rural areas by a margin of at least 20 percentage points, while no country reported high levels of sex-related inequality.

FIG. 4.14. Absolute economic-related inequality in bacille Calmette-Guérin (BCG) immunization coverage among children aged 1 year in all countries, and disaggregated data in countries with high economic-related inequality: latest situation (2011–2020)



DHS: Demographic and Health Surveys; MICS: Multiple Indicator Cluster Surveys.
Each country is represented by one circle on the left graph and selected countries are represented by five circles on the right graph (one for each subgroup). Countries shown on the right graph are dark blue on the left graph.
On the left graph, the solid horizontal line indicates the median across countries and the dashed horizontal line indicates the difference value of no inequality (0).
Source: Demographic and Health Surveys, Multiple Indicator Cluster Surveys and Reproductive Health Surveys.

BOX 4.5. Different patterns of decreasing education-related inequality

India, Kenya and Namibia all reduced education-related inequalities in BCG immunization coverage among children aged 1 year in the past 10 years by 20 percentage points or more, so that inequalities in the latest situation are low (Namibia) or moderately low (India, Kenya). Patterns of change during this period were very different between the four countries:

- In Namibia, coverage increased among the least educated subgroup, and slightly decreased among the most educated subgroup. There was no education-related inequality in the latest situation (2013).
- In Kenya, coverage among the least educated and the most educated subgroups increased, with faster gains among the least educated subgroup. Education-related inequality was 8.8 percentage points in Kenya in the latest available data (2014).
- In India, coverage increased among the least educated subgroup, and remained the same among the most educated subgroup. There is a gap of 8.2 percentage points in the latest available data (2015).

4.3.4 Knowledge and attitudes

KEY FINDINGS

- There were moderate to high inequalities in TB knowledge in females and males, favouring the older, richest, most educated and urban subgroups, which showed little change over time. There were no differences between TB knowledge in females and males, overall.
- Overall, there were low or moderate inequalities in TB attitudes according to sex, age, economic status, education and place of residence.

Inequalities in TB knowledge and attitudes indicators were assessed in up to 19 countries. Table 4.5 gives an overview of the number of countries reporting high and low inequality for the two indicators.

TB knowledge, measured by the percentage of the population who know TB is spread through coughing, tended to be similar in females and males across 16 countries. One country (Kenya) reported a difference in knowledge between females and males that exceeded 20 percentage points. Across the 10 countries where data were available to assess change over time, there was little change in sex-related inequality.

There were high or moderate inequalities in TB knowledge for other dimensions of inequality, favouring the older, richest, most educated and urban subgroups. Nearly two thirds of countries had high inequality for at least one dimension of inequality in males, and more than half of countries had high inequality for at least one dimension in females. Education-related inequalities in knowledge were particularly high among females and males, with a median difference between the most and least educated of around 20 percentage points (Fig. 4.15). The knowledge gap between education subgroups exceeded 20 percentage points among males in 9 countries; among females, education-related inequality was high in 8 countries. In five countries (Ethiopia, Lesotho, Myanmar, Pakistan, Zambia), the knowledge gap between education subgroups was over 20 percentage points for females and males.

Patterns of inequality by place of residence were similar in females and males, demonstrating moderate inequality favouring urban areas. In one country (Pakistan), there was a gap in knowledge among males in urban and rural areas that exceeded 20 percentage points. Inequalities among males were largely unchanged over the previous decade; however, there were moderate decreases in inequalities related to economic status and place of residence for females.

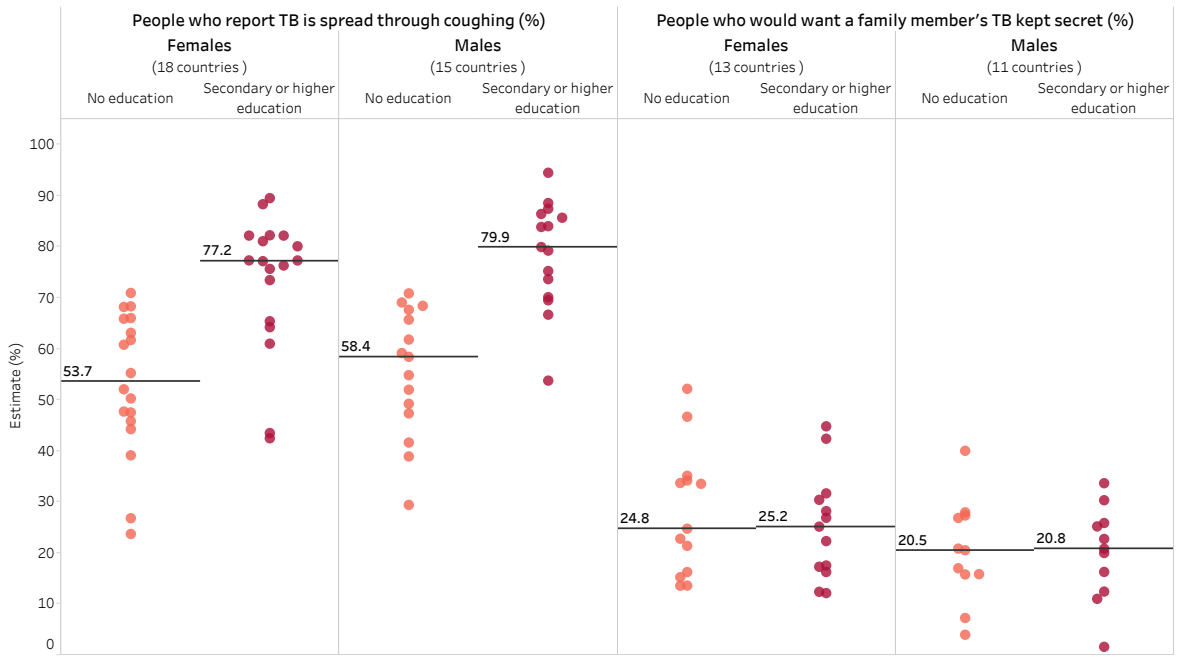
Overall, the prevalence of accepting attitudes about TB was moderately higher among males than females across 12 countries, with 1 country (Kyrgyzstan) reporting high sex-related inequality of more than 20 percentage points. Among males there was moderate age-related inequality in attitudes about TB overall, with people aged 35–49 years less likely to want to keep a family member's TB a secret than people aged 15–19 years. In Malawi, the gap between age subgroups in males exceeded 20 percentage points. There was low inequality overall related to economic status, education and place of residence in females and males. In Armenia and

TABLE 4.5. Overview of high and low inequality in tuberculosis (TB) knowledge and attitudes across study countries

Indicator	Sex	Dimensions of inequality explored	Countries included in analysis	Countries with high inequality by at least one dimension	Countries with low inequality across all dimensions
People who report TB is spread through coughing	Females and males	Sex	16	1	5
	Females	Economic status, education, place of residence, age	18–19[a]	10	0
	Males	Economic status, education, place of residence, age	15–17[b]	11	0
People who would want a family member's TB kept secret	Females and males	Sex	12	1	5
	Females	Economic status, education, place of residence, age	13–14[c]	0	3
	Males	Economic status, education, place of residence, age	11–13[d]	3	2

[a] 18 countries had disaggregated data by education, and 19 countries had disaggregated data by economic status, place of residence and age.
[b] 15 countries had disaggregated data by education, and 17 countries had disaggregated data by economic status, place of residence and age.
[c] 13 countries had disaggregated data by education, and 14 countries had disaggregated data by economic status, place of residence and age.
[d] 11 countries had disaggregated data by education, and 13 countries had disaggregated data by economic status, place of residence and age.

FIG. 4.15. Tuberculosis (TB) knowledge and attitudes indicators among females and males, by education: latest situation (2011–2020)



Each country is represented by multiple circles (one for each indicator subgroup).
Solid horizontal lines indicate the median across countries. The difference between the median values of two subgroups evident on the figure is distinct from the overall median difference across countries (reported in the text and other resources that accompany this report and used to assess the overall level of inequality as low, moderate or high).

Source: Demographic and Health Surveys.

Kyrgyzstan, however, there was high inequality related to economic status among males. India and Timor-Leste had low inequality across all dimensions for females and males. There was little overall change in inequalities in TB attitudes over the past decade.

4.3.5 Social protection

KEY FINDINGS

- Across countries, a large proportion of families affected by TB reported catastrophic costs due to TB, ranging from 19.2% of households in Lesotho to 92.0% of households in Solomon Islands (median 54%).
- In almost all countries, catastrophic costs were over 20 percentage points higher among the poorest households compared with the richest, and among people with drug-resistant TB compared with people with drug-susceptible TB.

Inequalities in families affected by TB facing catastrophic costs due to TB were assessed in up to 21 countries. Table 4.6 gives an overview of the number of countries reporting high and low inequality for this indicator.

Catastrophic costs due to TB were evident in all 21 countries with available data. Costs include direct medical payments for diagnosis and treatment, as well as direct non-medical payments (e.g. transportation and lodging) and indirect costs (e.g. lost income). Overall, the median percentage of families affected by TB incurring catastrophic costs was 54%, ranging from 19.2% in Lesotho to 92.0% in Solomon Islands. Economic-related inequalities in catastrophic costs were large. Across six countries, there was a median difference of 46 percentage points between households in the poorest and richest quintiles. In five of six countries, the gap between the richest and poorest was more than 20 percentage points. In the Lao People's Democratic Republic, Nigeria and Viet Nam, over 80% of the poorest households experienced catastrophic costs, compared with 40% or less of the richest households (Fig. 4.16).

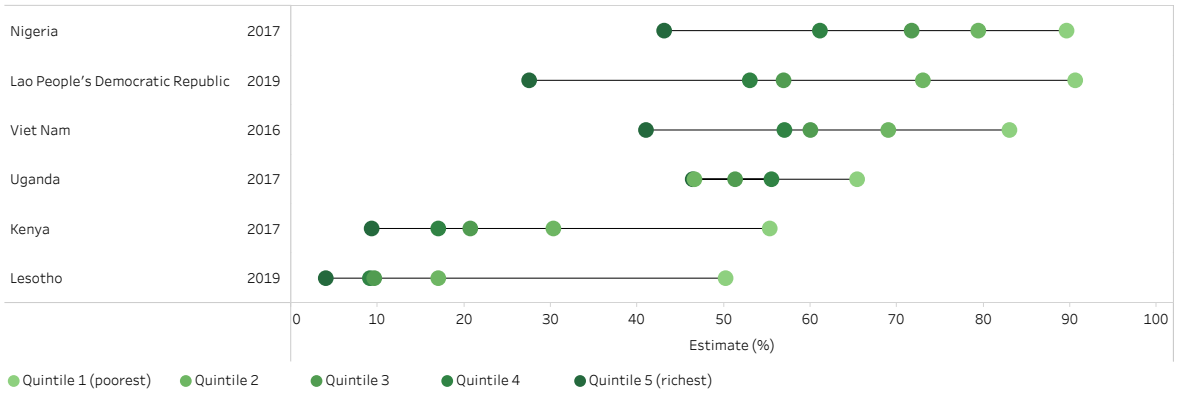
High inequalities were evident between families affected by drug-resistant TB or drug-susceptible TB, with a median difference of 36 percentage points across 19 countries (favouring families affected by drug-susceptible TB) and a gap of over 20 percentage points in all but 3 of the 19 countries (Fig. 4.17). The percentage of families facing catastrophic costs when a person had drug-resistant TB was consistently high across the 19 countries (over 80% in all but 3 countries). The percentage of families facing catastrophic costs due to drug-susceptible TB was variable across countries, ranging from 17.2% in Lesotho to 79.0% in Zimbabwe. The gap was widest in Lesotho, where there was a 75 percentage point difference in catastrophic costs between families affected by drug-resistant TB (92.0%) and drug-susceptible TB (17.2%). The types of expenses associated with catastrophic costs due to TB were distributed differently across study countries (Box 4.6).

TABLE 4.6. Overview of high and low inequality in tuberculosis (TB) social protection across study countries

Indicator	Dimensions explored	Countries included in analysis	Countries with high inequality by at least one dimension	Countries with low inequality across all dimensions
Families affected by TB facing catastrophic costs due to TB	Economic status, TB drug resistance	6–21[a]	21[b]	0

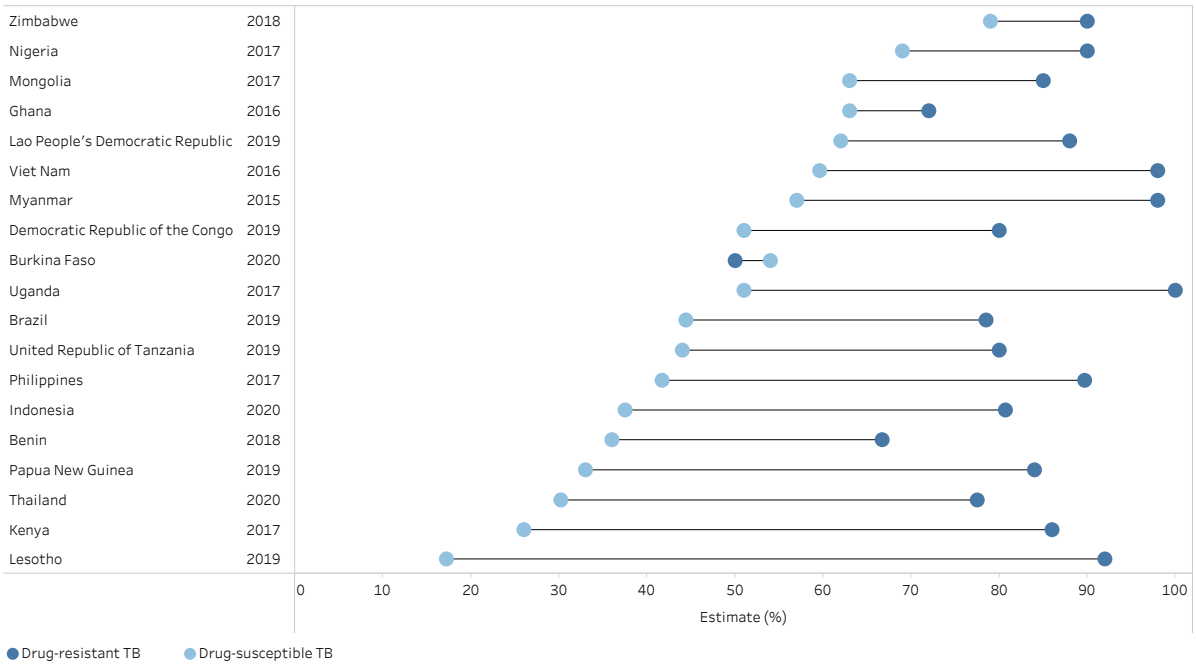
[a] 6 countries had data disaggregated by economic status, 16 countries had data disaggregated by TB drug resistance, and 21 countries had data for national average.
[b] National average was included in the analysis, and countries were considered to have high inequality if 20% or more of families affected by TB reported catastrophic costs due to TB.

FIG. 4.16. Families affected by tuberculosis (TB) facing catastrophic costs due to TB in six countries, by economic status: latest situation (2011–2020)



Circles represent population subgroups within each country.
Source: TB patient cost surveys.

FIG. 4.17. Families affected by tuberculosis (TB) facing catastrophic costs due to TB in 19 countries, by TB drug resistance status: latest situation (2011–2020)

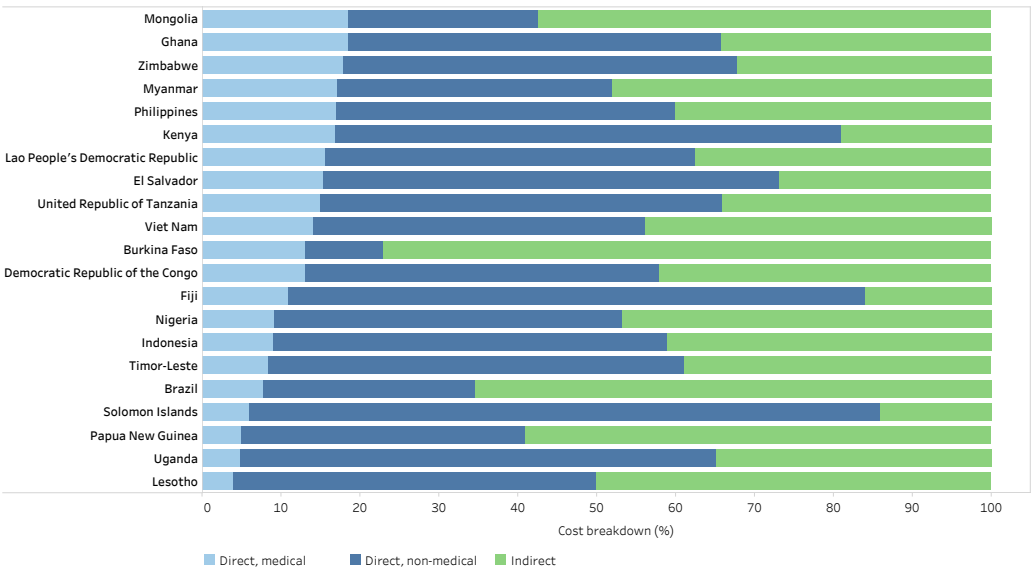


Circles represent population subgroups within each country.
Source: TB patient cost surveys.

BOX 4.6. Components of catastrophic costs due to TB

Catastrophic costs associated with TB were categorized as direct medical expenses (e.g. medicines, health-care fees), direct non-medical expenses (e.g. transportation, food) and indirect expenses (e.g. lost or reduced income while seeking or staying in care). Across 21 study countries, the relative contributions of these expenses varied (Fig. 4.18) *(1)*. Direct medical costs associated with TB were uniformly lower than non-medical or indirect costs, comprising 4–19% of total costs. Direct medical costs were highest in Ghana and Mongolia, and accounted for less than 10% of total costs in Brazil, Indonesia, Lesotho, Nigeria, Papua New Guinea, Solomon Islands, Timor-Leste and Uganda. Direct non-medical costs comprised the largest share of total costs in El Salvador, Fiji, Ghana, Indonesia, Kenya, the Lao People's Democratic Republic, Solomon Islands, Timor-Leste, Uganda, the United Republic of Tanzania and Zimbabwe. Indirect costs were the largest burden in Brazil, Burkina Faso, Lesotho, Mongolia, Myanmar, Nigeria, Papua New Guinea and Viet Nam.

FIG. 4.18. Contribution of expenses associated with catastrophic costs due to tuberculosis (TB) in 21 countries (2015–2021)



Source: TB patient cost surveys.

Assessing the proportional contributions of these expenses can help to indicate approaches to reduce the financial burden on households. In countries with high direct medical costs, "free TB care" policies may help to mitigate the catastrophic nature of these expenses. Reducing the financial burden of TB may require consideration of whether TB services are provided through hospitalization or outpatient care models; the frequency of attendance at health facilities; the extent to which decentralized services can be provided at the community level; and ease of access to health facilities *(1)*.

4.3.6 Patterns of inequality in high-burden or high-funding countries

The global patterns of inequality presented above are largely the same among a subset of Global Fund high-burden or high-funding priority countries. Patterns of inequality were assessed in a subset of 26 countries prioritized by the Global Fund because they have a high burden of disease or receive high levels of funding. Compared with the global findings, these countries were slightly less likely to report high sex-related inequality (male/female ratio) in TB burden indicators. Elevated sex-related inequalities, all showing higher burden among males, were evident in 5 of 26 countries (19%) for TB incidence, 4 of 26 countries (15%) for TB mortality, and 1 of 14 countries (7%) for MDR/RR-TB.

The countries demonstrated a similar overall pattern to the global findings for detection, prevention and social protection indicators. As an example, a closer look at the situation of inequality in Lesotho is provided in Box 4.7.

BOX 4.7. Mini story: Lesotho

Lesotho is a small landlocked country of 2.1 million people in southern Africa *(77)*. Alongside high HIV prevalence of 22.2% of adults aged 15 years and older *(78)*, Lesotho reports one of the highest TB incidence rates in the world, at 650 incident cases per 100 000 population in 2020 *(79)*. TB incidence decreased markedly between 2010 and 2015 (by over 40%), though progress was not sustained at this rate and the country fell short of achieving the End TB 2020 milestone of a 20% reduction in the 2015 TB incidence rate *(1)*.

Between 2000 and 2017, the annual growth rate of total TB spending in Lesotho was high, at 12.8% (compared with 4.1% across 28 high-burden countries) *(47)*. Nearly half of the US$ 14 million national TB budget for 2021 is covered by international funders (46%), 29% is funded domestically and 25% is unfunded *(79)*.

In 2020, TB treatment coverage was 33% *(79)*. Compared with other countries in the WHO African Region, Lesotho has a higher percentage of testing for MDR/RR-TB among new cases (90% compared with 50% regionally) and previously treated cases (90% compared with 86% regionally) *(1, 79)*. There is further work to be done, however, to reduce delays between MDR/RR-TB detection and treatment initiation *(80)*.

In the analysis for this report, we found that the burden of TB in Lesotho is disproportionately higher in males than females. TB incidence and mortality rates in males were over twice as high as in females in 2020. There were 259 confirmed cases of MDR/RR-TB, with a higher percentage of MDR/RR-TB in males with TB (29.5%) than females with TB (3.4%). The case notification rate was 1.4 times as fast among females than males. Men's participation as migrant workers, primarily as mineral miners in South Africa, puts them at risk of contracting and spreading TB *(81)*. The frequent movement of Basotho miners to and from South Africa and across districts is a challenge for TB case management and tracking of treatment outcomes *(81)*.

In Lesotho, knowledge of TB increases with education and with economic status. In 2014, there was a gap of 39.4 percentage points between the proportion of males who reported TB is spread through coughing in the most and least educated subgroups (88.6% and 49.2%, respectively),[1] and a gap of 33.4 percentage points between the richest and poorest subgroups (87.2% and 53.8%, respectively). Among females, the gaps were slightly smaller but still substantial, at 23.5 percentage points for education and 16.4 percentage points for economic status.

With 19% of families affected by TB reporting catastrophic costs due to the disease, the overall level of catastrophic costs due to TB was lower in Lesotho compared with other study countries. There were, however, high inequalities on the basis of economic status and TB drug resistance. Lesotho has a policy of free TB services, and the direct medical costs associated with TB are relatively low (see Box 4.6). Village health workers are involved in the treatment and care of people with TB in home settings, and serious cases are referred to higher levels of the health system *(81)*. The initiation of treatment for drug-resistant TB is only available at a specialized hospital in the capital city of Maseru *(80)*.

[1] Population share of the subgroup with no education is 11% among males and 1% among females, while for the subgroup with secondary or higher education it is 43% among males and 59% among females.

4.4 Discussion

The results of this analysis show global patterns of within-country inequality in selected TB indicators and dimensions of inequality where data were available. Throughout this process, significant gaps in the availability of globally comparable data became evident, pointing to a need for dedicated efforts to improve the collection of disaggregated data across a range of TB indicators and across countries. Nevertheless, the results demonstrate the existence of inequalities in TB burden, detection, prevention, knowledge and attitudes and social protection indicators, with variable patterns across countries.

Over the past decade, the global burden of TB has remained higher among males than females. Across countries, males tend to have higher levels of TB incidence and mortality and report worse case detection than females. Due to a lack of data availability, sex-related differences across other TB-related services and outcomes were not included in the analysis. Sex-related differences in TB burden are partly explained by biological factors *(82–84)* and social behavioural factors *(85)*. These findings, however, suggest a need for further research to delineate the root causes of these inequalities, especially in countries with elevated sex-related inequality. Further study is also warranted to consider how differentiated approaches to TB diagnosis and treatment for men and women may be appropriately deployed in different settings. In addition, although MDR/RR-TB is a major threat to the progress achieved in many countries, divergent national patterns of sex-related inequality and other setting-specific risk factors require further study.

The prevalence of TB was moderately higher in urban than rural areas across countries. Noting limitations with the availability of data from rural populations and potential issues with the significance of the comparisons, this finding indicates the need for expanded investigation of urban–rural inequalities across other aspects of TB service use (where globally comparable data are currently lacking). Further research is needed to identify factors associated with place of residence differences in TB prevalence, as both urban slums and rural areas may have risk factors for tuberculosis (e.g. high levels of poverty, undernutrition, overcrowding, air pollution). Some reports suggest, however, that people with TB living in rural areas face more challenges in getting a timely diagnosis and accessing or adhering to treatment *(86)*.

In terms of TB prevention, the only indicator included in the analysis was BCG immunization coverage among children aged 1 year – a vaccine that prevents severe forms of TB in children but does not protect against acquiring the infection or developing or transmitting the disease. The findings in this report demonstrate that although BCG immunization coverage is high globally, inequalities persist in some countries (including countries with a high TB burden). These inequalities adversely affect children aged 1 year who belong to the poorest households, who live in rural areas, or whose mothers have low levels of education. Where warranted, addressing BCG immunization coverage gaps in coordination with national immunization programmes can ensure the benefits of the vaccine reach all children. Moreover, the collection of standardized data across countries about other prevention indicators, alongside relevant dimensions of inequality, is needed to enable further global analyses.

Catastrophic costs among people affected by TB are a common issue globally, with a median of 54% of families affected by TB spending at least 20% of income on TB-related expenses. The proportion of families experiencing catastrophic costs tends to be even higher among those who are poor or have drug-resistant TB. High catastrophic costs demonstrate the high vulnerability of people affected by TB and call into question the comprehensiveness of TB financing schemes, and the extent to which health systems and broader social protection measures provide universal coverage of TB-related services with guaranteed financial protections *(87)*. Due to limited data availability, the analysis of catastrophic costs attributed to TB in this report included a small number of countries. The findings suggest, however, that this is an urgent concern, particularly among people who are already poor or affected by MDR/RR-TB. Expanded data collection

efforts are planned and under way to enable further investigation and intervention across a larger number of study countries.

In general, our exploration of inequalities in TB indicates a need for more high-quality and comprehensive datasets to enable more extensive inequality monitoring at global, national and subnational levels. This requires expanding the collection of data pertaining to key TB indicators (especially among the most disadvantaged populations) and relevant dimensions of inequality across all countries (and especially those with a high burden of TB). The 2020 *WHO operational handbook on tuberculosis* recommends three core indicators for monitoring the provision of TB preventive treatment across all countries: contact investigation coverage, treatment initiation, and treatment completion *(88)*. Notably, there is a lack of comparable data at the global level pertaining to key populations such as people who are incarcerated, people living with HIV and other comorbidities, migrants, refugees and indigenous populations (although these data may be collected at the national level in some cases). Strategies are required to overcome challenges associated with systematically defining and accessing key populations for data collection efforts.

Systematic approaches to identify and reach populations at highest risk are paramount to ending the TB epidemic. The 2020 report of the United Nations General Assembly on progress towards achieving global TB targets and implementation underscores the importance of resolving underreporting challenges and advancing universal health coverage to ensure all people with TB have access to affordable good-quality care *(7)*. Ethics, equity and protection of human rights are core principles of the WHO End TB Strategy. A robust system to monitor inequalities is critical to ensure these principles can inform the implementation of the strategy.

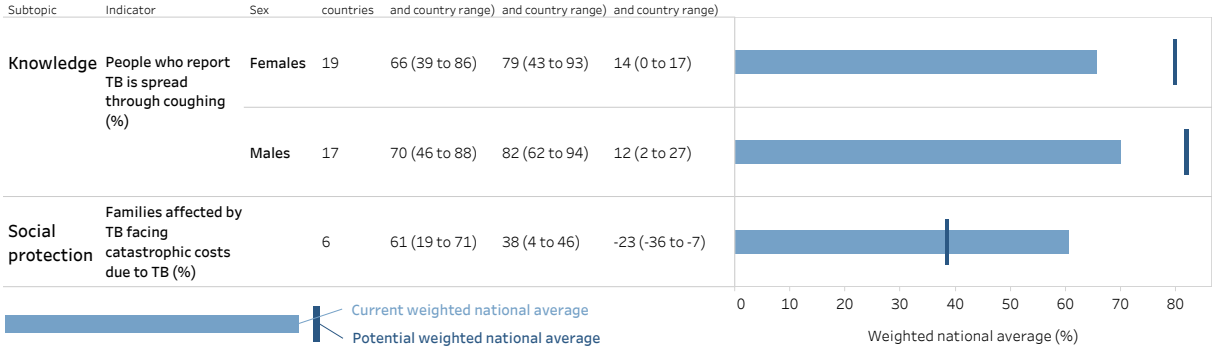
4.5 Addressing inequality

Reducing inequalities in TB is a key part of the global response to end TB. Fig. 4.19 demonstrates the potential for improvement that could be achieved at the global level if within-country economic-related inequalities were eliminated – that is, if the national average for each country were equal to the level of coverage in the richest 20% of the population.[1] The most notable potential improvement was observed for the percentage

[1] For an overview of the methods used to calculate PAR, see Chapter 2.

FIG. 4.19. Potential improvement in national average by eliminating economic-related inequality in selected tuberculosis (TB) indicators (2011–2020)

Subtopic	Indicator	Sex	Number of countries	Current national average (global weighted average and country range)	Potential national average (global weighted average and country range)	Potential for improvement (global weighted average and country range)
Knowledge	People who report TB is spread through coughing (%)	Females	19	66 (39 to 86)	79 (43 to 93)	14 (0 to 17)
		Males	17	70 (46 to 88)	82 (62 to 94)	12 (2 to 27)
Social protection	Families affected by TB facing catastrophic costs due to TB (%)		6	61 (19 to 71)	38 (4 to 46)	-23 (-36 to -7)



The potential for improvement (dark blue vertical line) represents the overall weighted average that would be possible if, in each country, the whole population had the same level of coverage as the most advantaged subgroup (richest quintile).
The current weighted average is indicated by the light blue bar. The overall average is calculated based on the above-mentioned number of countries for each indicator and weighted by the relevant population size.
For the TB knowledge indicator, higher averages are desirable; for the social protection indicator, lower averages are desirable.

Source: Demographic and Health Surveys and TB patient cost surveys.

of families affected by TB facing catastrophic costs.[1] The current national averages across six countries range from 19% to 71%, with an overall weighted average of 61% of households reporting catastrophic costs. If the proportion of households experiencing catastrophic costs were reduced to that of the richest subgroup in all six countries, the overall weighted average would be reduced to 38% of households reporting catastrophic costs. Among females and males, there would be 14 and 12 percentage point improvements, respectively, in the percentage of people with correct knowledge about how TB is spread if economic-related inequality were eliminated.

Approaches to address inequalities in TB should be responsive to the unique needs and realities of the populations they seek to target. The results of inequality monitoring of TB indicators, alongside other forms of qualitative and quantitative evidence, can help to inform such strategies. The landscape of TB inequalities suggests a complex web of causality because of the way the social determinants of TB operate *(89)*. Given these complexities and the current state of research and evidence, recommendations to address determinants of TB tend to be generic, based on expert opinion and low quality of evidence *(90)*.

Developing policies to reduce inequalities in TB burden is an even more daunting challenge as the drivers that give shape and direction to the epidemic are mostly beyond the health sector. Evidence from some modelling suggests more aggressive policies on poverty reduction and social protection may have profound effects in reducing TB burden *(91, 92)*. For example, workplace interventions for hazardous occupations such as mining are warranted to promote safer conditions and enable access to prevention and treatment services (Box 4.8).

Further research is needed to determine the extent to which reductions in TB burden through structural interventions contribute to reducing inequalities in this burden. This research should not deter steps to reduce inequalities in TB burden through other interventions tackling social determinants such as health and human rights literacy. The following examples showcase approaches, programmes and interventions that integrate equity considerations in global and national responses to TB.

BOX 4.8. Workplace interventions in the mining industry

Occupational hazards inside mines create a high-risk environment for TB transmission – confined, poorly ventilated spaces with silica dust exposure – but the poor living conditions outside mines and high HIV prevalence in mining communities also put workers at risk *(93)*. Miners are among the groups most impacted by TB. Within this group, the risk profiles are varied based on factors such as time spent as a miner, work history, living situation, mental health and familial support *(94)*.

Efforts to address TB in current and former miners require a unified approach involving mining companies, governments, international labour organizations and civil society groups *(95)*. Key interventions to stop the spread of TB and improve outcomes include active case-finding efforts (e.g. through biannual chest X-rays); immediate treatment of active TB, concurrent treatment of latent TB and management of HIV; improved living conditions to reduce room density; improved ventilation and dust control; and nutrition programmes *(95, 96)*.

In 2012, South Africa was one of 15 countries to sign the Declaration on Tuberculosis in the Mining Sector, committing to improve treatment and care for current and former miners with TB and their families *(97)*. Worker safety measures for miners and access to health care have been improving in some mining communities. The Government of South Africa and some large mining companies in the country have taken measures to improve access to health care and compensation among those affected by TB. The Government has launched one-stop service centres in mining communities to provide advice about pensions, benefits and compensation, and to facilitate access to care among former miners. Efforts involving multiple stakeholders are also under way to establish a database of mine workers with TB, a common treatment protocol for mine workers with TB, and a referral system between the mining companies and the health sector *(95)*.

4.5.1 Community-, rights- and gender-based approaches

Community-, rights- and gender-based approaches to TB help to ensure TB programmes, and the legal environments in which they are delivered, are oriented to

[1] The catastrophic costs indicator analysed in this report is not the same as the SDG indicator for catastrophic health expenditures. See Box A3.1 in Annex 3.

promote and protect human rights and gender equality *(90)*. Such approaches prioritize non-discrimination, the right to health, transparency and accountability in how programmes are designed, implemented, monitored and evaluated. They take into account gender norms and principles, while informing and empowering disadvantaged groups and key populations to advocate for their rights and interests. Given that gender-related factors play a role in sex-related inequalities in TB burden and detection, further exploration of gender-responsive approaches is warranted in some countries.

Through no fault of their own, people living with or affected by TB may lack a complete understanding of their rights and may not be able to assert them without professional assistance *(98)*. Inequalities in TB intersect with rights violations when, for example, certain groups of people systematically fail to receive a timely and adequate TB diagnosis treatment, when they face restricted access to information about TB, or when their privacy is not maintained. The 2019 Declaration of Rights and Responsibilities of People Affected by TB, developed by TB People (a network of people who have had TB and affected communities) is an important step in protecting the legal rights of people affected by TB *(99)*. The Declaration enshrines the rights of people affected by TB in existing global and regional human rights laws, including the right to a life free from TB through equitable access to TB prevention, diagnosis and treatment, free from stigma and discrimination.

Community-, rights- and gender-based assessment tools, developed and implemented by the Global Fund and the Stop TB Partnership, help countries to consolidate national data and information about key populations, gender and human rights barriers as a basis to inform more strategic investments and planning in response to TB *(100)*. In 2018, Indonesia carried out an extensive community-, rights- and gender-based study focused on two populations with a higher risk of being affected by TB: people living in high-density poor settings and people coinfected with HIV and TB *(101)*. The findings of the assessment resulted in a series of recommendations, such as strengthening regulation for intersectoral policies and joint programmes for TB control, providing sensitization training on gender topics to stakeholders involved in national TB strategic planning, conducting research for more inclusive diagnosis and treatment options, promoting the involvement of people affected by TB across stages of TB policy development, and addressing identified barriers to information.

4.5.2 Social protection programmes

Social protection, poverty alleviation, universal health coverage and actions on determinants of TB are all components of the WHO End TB Strategy *(4)*. Social protection programmes address diverse needs among people affected by TB, in the form of economic support, actions to address food security and nutrition, psychological support, health education, social mobilization, and training for volunteers to be patient supporters. TB is associated with catastrophic costs, especially among poor households. Social support can benefit TB outcomes by reducing the direct, indirect and coping costs borne by people affected by TB, thereby increasing their capacity to access health care and leading to better treatment adherence and success *(102)*.

In Brazil, prominent Government social protection programmes include the cash transfer programme Bolsa Familia and the Family Health Strategy, which facilitates access to health care through a patient-centred approach including home visits for directly observed treatment, short-course (DOTS) by community health agents, reminders about skipped appointments, and facilitated access to clinics. Although these programmes do not have a dedicated focus on TB (Bolsa Familia enrols families with low monthly incomes; the Family Health Strategy targets poor neighbourhoods), they have been found to have a positive impact on TB treatment outcomes and mortality *(103, 104)*. In urban poor areas, for example, coverage by the Family Health Strategy improved TB treatment success by 14% among incident TB cases and 35% among recurrent cases *(105)*.

In Myanmar, a social protection programme rolled out by a non-profit-making organization during the COVID-19 pandemic has benefited people with MDR/RR-TB. The COVID-19 pandemic resulted in disruptions of TB services

in Myanmar, especially among people with MDR/RR-TB. A mobile payment platform was launched across 12 townships to provide socioeconomic support through monthly cash transfer payments and psychosocial support through tele-counselling during the time of diagnosis. These interventions have helped people with MDR/RR-TB and reduced loss to follow-up *(106)*.

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5

Malaria

5. Malaria

Despite considerable gains in reducing the global burden of malaria over the past two decades, the disease continues to take a heavy toll on poor rural populations who lack access to health services. The WHO Global Technical Strategy for Malaria 2016–2030 provides guidance for the control and elimination of malaria, citing equity as a central principle.

This chapter characterizes within-country inequalities in malaria, covering indicators related to malaria burden, prevention, and testing and treatment. It overviews the context and describes the methodological approach and the results of the analysis. The chapter discusses the implications of the findings and describes the impact of addressing inequality and examples of strategies.

5.1 Context

5.1.1 Epidemiological profile

Global malaria case incidence and mortality rates were lower in 2020 than in 2000 *(1)*. Between 2000 and 2020, an estimated 1.7 billion malaria cases and 10.6 million malaria deaths were averted. The number of malaria deaths has dropped steadily over the past two decades, from 896 000 in 2000 to 562 000 in 2015 to 558 000 in 2019. In 2020, estimated malaria deaths increased to 627 000 partly as a result of the malaria service disruptions that took place during the COVID-19 pandemic. Malaria remains a pressing health problem for young children (Box 5.1).

Progress in reducing malaria has stalled or reversed in recent years, especially in high-burden settings *(1)*. There were 241 million malaria cases globally across 84 endemic countries in 2020, the same as in 2000 but more than in 2015 (224 million cases). The global malaria case incidence declined from 81 cases per 1000 population at risk in 2000 to 59 per 1000 in 2015 and 2020. As of 2020, the WHO African Region accounted for 95% of malaria cases. Five countries accounted for about half of all cases globally: Nigeria (27%), the Democratic Republic of the Congo (12%), Uganda (5%), Mozambique (4%) and Burkina Faso (3%). The global burden of malaria is illustrated in Figs 5.2 and 5.3.

5.1.2 Global commitments to end malaria

Acknowledging the complex and changing nature of the disease and disease vectors, malaria has been addressed as part of wider global health and development strategies over the past two decades *(1)*. In the early 2000s malaria was included in MDG 6, with target 6c aiming to halt and begin to reverse the incidence of malaria by 2015 *(2)*, launching a number of global efforts.

The Roll Back Malaria Partnership to End Malaria (RBM Partnership), founded in 1998, was instrumental in coordinating action across diverse partners to reduce and eliminate malaria *(3)*. At the African Summit on Roll Back Malaria in April 2000, African leaders signed the Abuja Declaration, committing to halve mortality from malaria in Africa by 2010. The Declaration aimed to ensure that by 2005, 60% of people at risk for malaria were protected or treated appropriately *(4)*.

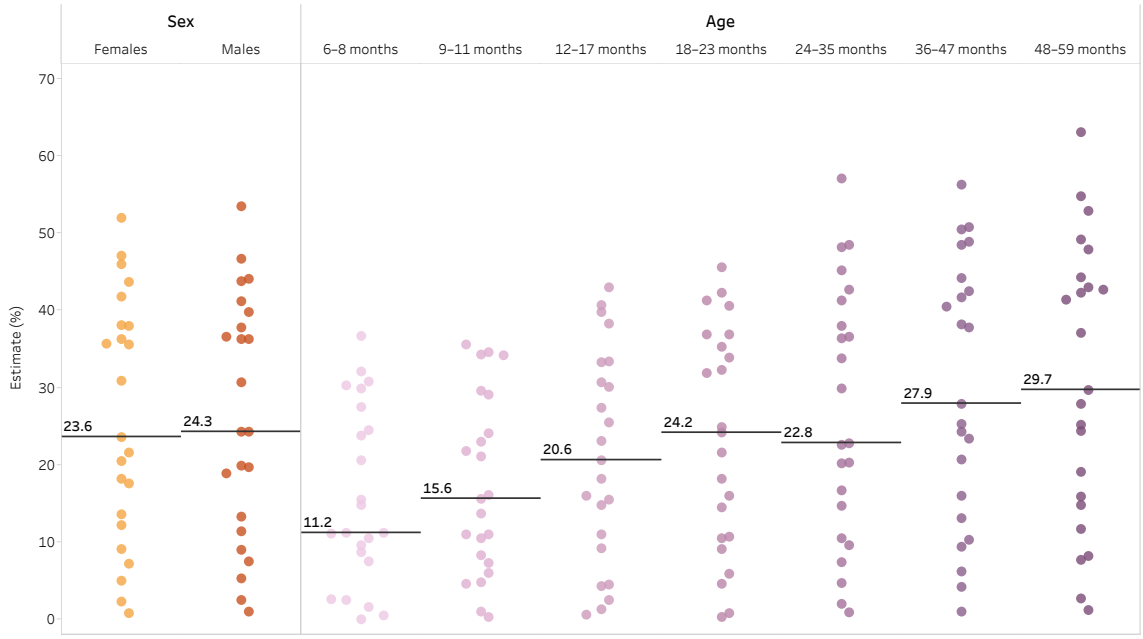
In 2002, the Global Fund was established to enable large-scale funding to meet the health-related MDGs *(5)*. The Global Malaria Action Plan for a malaria-free world 2008–2015, developed by the RBM Partnership, was endorsed by world leaders during the 2008 MDG Summit *(6)*. The Action Plan served as an advocacy tool and evidence-based strategy for effective prevention and treatment measures. It also provided funding estimates for global targets.

In 2015, the United Nations Agenda for Sustainable Development was adopted, recognizing health and its determinants as an integral and indivisible part of sustainable development. Malaria is embedded in SDG 3 to end the epidemics of AIDS, TB and malaria by 2030 (which specifies indicator 3.3.3, malaria incidence per 1000 population) *(7)*.

BOX 5.1. Malaria across age and sex groupings in children aged under 5 years

Data about the prevalence of malaria in children aged under 5 years were available for 23 countries (Fig. 5.1). According to the median of values across countries, prevalence was lowest among children aged 6–8 months and highest among children aged 36–47 months and 48–59 months. In female and male children, the prevalence of malaria was 24%.

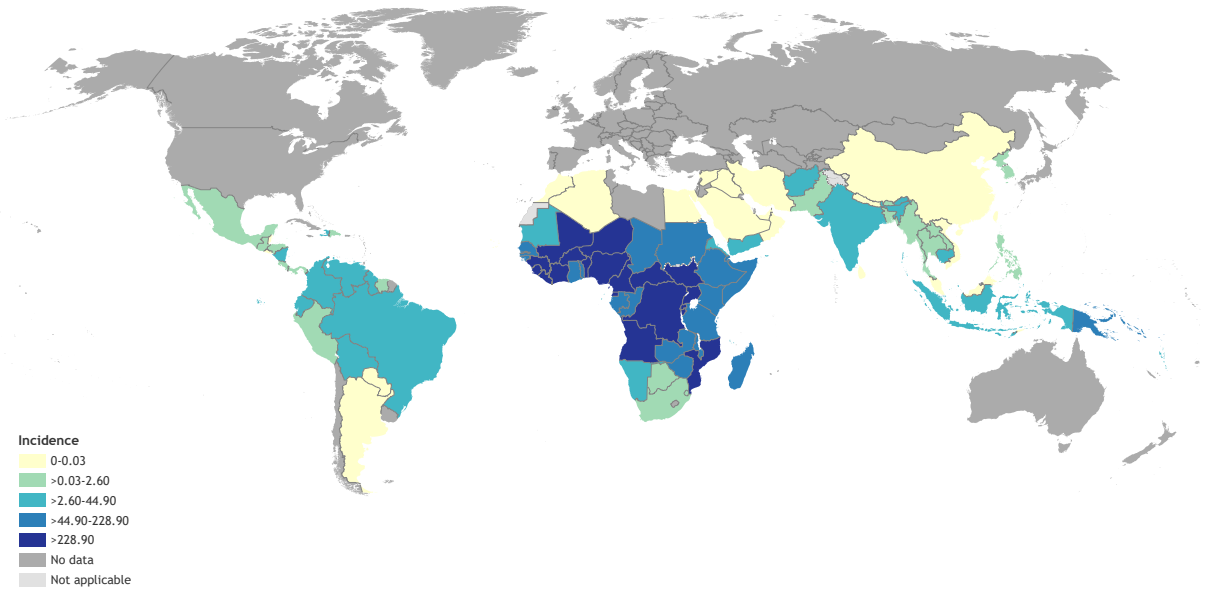
FIG. 5.1. Malaria prevalence in children aged under 5 years (according to rapid diagnostic testing) in 23 countries, by sex and age: latest situation (2011–2020)



Each country is represented by multiple circles (one for each subgroup).
Solid horizontal lines indicate the median across countries.

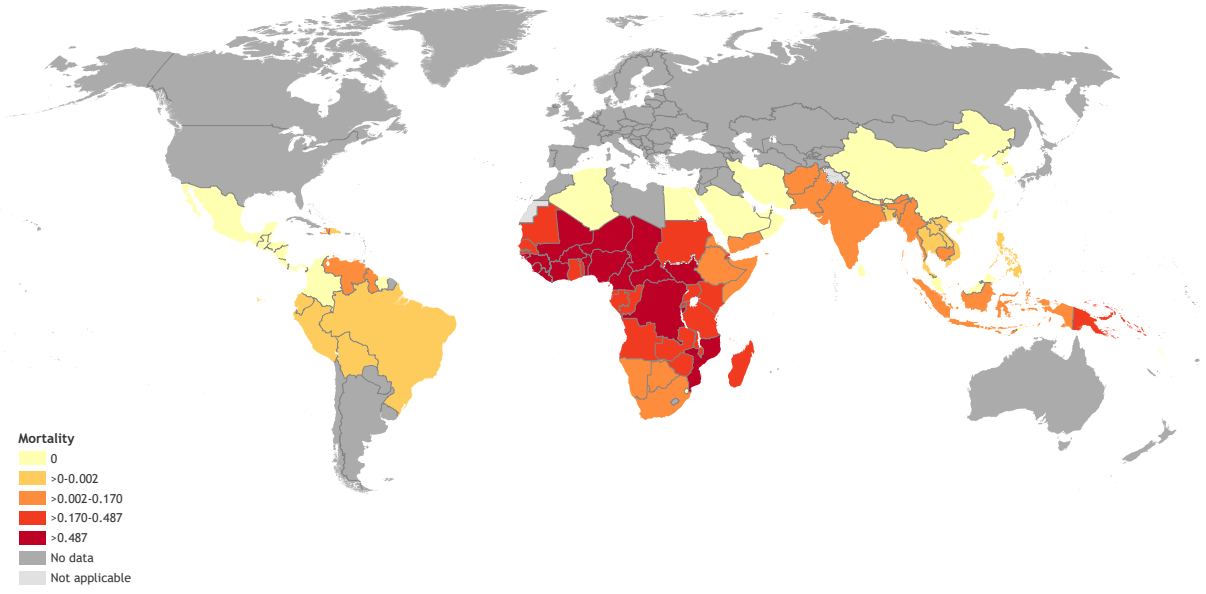
Source: Demographic and Health Surveys and Malaria Indicator Surveys.

FIG. 5.2. Malaria incidence (cases per 1000 population at risk) in 98 countries: latest situation (2020)



Source: World Health Organization.

FIG. 5.3. Malaria mortality (deaths per 1000 population at risk) in 93 countries: latest situation (2020)



Source: World Health Organization.

The RBM Partnership Action and Investment to Defeat Malaria 2016–2030 (AIM) for a malaria-free world and the WHO Global Technical Strategy for Malaria 2016–2030 are complementary strategies that provide direction for scaling up responses and increasing investments during the SDG timeframe. AIM is a continuation of the Global Malaria Action Plan, presenting priority actions and emphasizing the role of inclusive approaches, multisectoral responses, partnerships, accountability and investment *(8)*.

The WHO Global Technical Strategy for Malaria 2016–2030 envisions a world free of malaria, aiming to achieve by 2030 at least 90% reduction in malaria mortality rates globally, compared with 2015; at least 90% reduction in malaria case incidence globally, compared with 2015; elimination of malaria from at least 35 countries where malaria was transmitted in 2015; and prevention of re-establishment of malaria in all countries that are malaria-free *(9)*. In recognition of stalled progress and emergent challenges over the past five years, including COVID-19, a 2021 update was issued to reaffirm global commitments to the strategy and realign the response approach. The update emphasizes data-driven targeting of interventions and advocates for strengthening underlying health systems and ensuring gender-responsive, equity-oriented and human rights-based responses *(10)*.

The WHO and RBM Partnership High Burden to High Impact Approach was launched in 2018 to address stalled global progress in ending malaria, starting with 11 high-burden countries: 10 in sub-Saharan Africa (Burkina Faso, Cameroon, Democratic Republic of the Congo, Ghana, Mali, Mozambique, Niger, Nigeria, Uganda, United Republic of Tanzania) and India. The approach entails a targeted, country-led response based on interventions tailored to local settings. It is centred around four key elements: political will, strategic information, better guidance, and coordinated response *(11)*.

The RBM Partnership Strategic Plan for 2021–2025 outlines priorities for the coming period, including enhanced quality and effectiveness of malaria response programming, increased funding, and scaled-up research and development *(12)*.

The key malaria control interventions recommended by WHO include vector control, chemoprevention, diagnostic testing and treatment and surveillance (Box 5.2).

BOX 5.2. Malaria control measures

The two main vector control measures recommended by WHO are insecticide-treated nets and indoor residual spraying *(9, 13)*. Insecticide-treated nets have been a large contributor to malaria control *(14, 15)*, and universal coverage of insecticide-treated nets among populations at risk has been pursued through mass campaigns and other scaled-up routine delivery channels *(16)*.

The routine provision of intermittent preventive treatment in pregnancy (IPTp), a method of chemoprevention, is recommended for all pregnant women in affected areas of sub-Saharan Africa without significant resistance to sulfadoxine/pyrimethamine *(17)*. IPTp helps to prevent maternal and infant mortality, anaemia and adverse effects of malaria in pregnancy. Intermittent preventive treatment for infants, delivered through the Expanded Programme on Immunization, is recommended for infants at risk of malaria in Africa *(18)*. Seasonal malaria chemoprevention for children is recommended in areas of sub-Saharan Africa with highly seasonal moderate to high malaria transmission *(9)*. Early diagnostic testing is essential to ensure appropriate and timely treatment for effective disease management. Young children in malaria-endemic areas who have a fever require prompt care-seeking, diagnostic testing and treatment.

Ongoing malaria surveillance is warranted in all malaria-endemic countries and in countries that have eliminated malaria but remain susceptible to re-establishment of transmission *(19)*. Depending on characteristics of malaria transmission and the priorities of national malaria programmes, the purpose of surveillance activities differs. In settings where transmission is high and the aim is to reduce malaria morbidity and mortality, malaria surveillance may be integrated into routine health information systems to track trends, assess risk stratification and plan resource allocations. In settings where malaria transmission is low and the aim is to eliminate malaria, surveillance activities typically focus on identifying, investigating and eliminating foci of transmission; preventing and curing infections; and confirming elimination. In settings where malaria has been eliminated, surveillance is done to prevent the re-establishment of the disease *(19)*.

5.1.3 Inequalities and barriers to progress

Challenges persist in the countries where malaria is concentrated. These countries have some of the least resourced health systems, and face issues with governance, accountability and resource limitations *(20)*. Unreliable or insufficient data may result in inadequate understanding of malaria epidemiology and the impact of key interventions *(21, 22)*. Financing for malaria control programmes, although having increased greatly since the early 2000s, falls short of the financing required to achieve international targets for malaria control and elimination – a gap that has been growing since 2017 *(1, 20)*. In some areas, biological threats, such as parasite gene deletions, parasite resistance to antimalarial medicines, and vector resistance to insecticides, have compromised the use of established preventive, treatment and testing approaches *(1)*.

Malaria is a climate-sensitive disease, with temperature, precipitation and humidity having a direct effect on transmission. The existing and potential impacts of climate variability and climate change on malaria are not fully understood *(23)*. Climate and environmental conditions can directly influence the distribution of malaria through mosquito and malaria parasite reproduction and proliferation *(24)*. Indirectly, climate change may create socioeconomic conditions that affect malaria risk, for example by impacting livelihoods or health system functioning. Malaria transmission is linked to characteristics of ecosystems, infrastructure and settlements – factors that, through humans and human activities, may protect against or enhance transmission *(25)*. For example, climate change is likely to affect the boundaries and density of malarial vectors, exacerbating the effects of malaria and expanding the population vulnerable to infection in some areas *(26)*. In Brazil, patterns of movement and migration due to successive resource extractive projects in the Amazon have put workers at risk for malaria, although more recent projects have taken adequate precautions to mitigate the impact of malaria, including early diagnosis and treatment *(27)*.

Inequalities in malaria are evident across multiple dimensions of inequality. Proximity to mosquito breeding sites is a large determinant of malaria risk in endemic settings *(28)*, but people who are socioeconomically disadvantaged (poor, low levels of education, poorly constructed homes, work in agriculture) have a higher risk of infection *(29)*. In central India, for example, characteristics associated with having one or more cases of malaria in the household include younger or male heads of household, more family members cohabitating, thatched roof or mud house construction, improper water supply, low income, and scheduled tribe; outdoor sleeping habits in rural and tribal communities were particularly risky *(30)*. In Uganda, people at greatest risk of malaria during pregnancy included women who belonged to the poorest households, who lived in traditional homes, and who had low levels of education *(31)*.

Within poor communities, the very poorest children are more likely to have malaria than the least poor children *(32)*. In rural Uganda, the relationship between household wealth and malaria infection was mediated by housing type and food insecurity *(33)*. Historical data suggest that avoiding malaria during childhood may benefit labour productivity and socioeconomic prospects in adulthood. In Colombia, Mexico and the United States of America, people born after the launch of large-scale malaria eradication campaigns tended to have higher income and literacy *(34)*. Between 2005 and 2015, the scale-up of malaria control interventions was shown to generally reduce coverage gaps between rich and poor people in many countries, although there was variation in the technical capacity of programmes to identify and deliver services to poor people *(35)*.

Education attainment may help protect against malaria by increasing knowledge and uptake of prevention services. Attending school provides an opportunity for children to learn about malaria-safe behaviours, and avoiding malaria enables greater attendance *(36)*. Education attainment is linked to increased employment opportunities, better housing and better access to health care.

The role of online sources in providing malaria education is increasingly apparent. Campaigns such as World Malaria Day have been found to prompt people in countries with high malaria disease burden to seek additional online information about the disease *(37)*.

Differences in malaria exposure risk and behaviours between men and women may yield sex-related inequalities. Across cultures, men and women may have different customs and arrangements that determine who works outdoors, who sleeps outdoors, and who in the family is prioritized for sleeping under an insecticide-treated net. In Ghana, for example, men are more likely to be out at night and more likely to sleep outdoors without an insecticide-treated net than women and children *(38)*. Encouragingly, a study of countries in sub-Saharan Africa found that when there are not enough insecticide-treated nets for everyone in a household, those most at risk of malaria (children aged under 5 years and women of reproductive age) are usually prioritized *(39)*.

Urban areas are usually associated with lower malaria risk than rural areas. As malaria endemic areas become increasingly urbanized and characterized by human migration, however, malaria risks in urban areas are becoming apparent, especially in low socioeconomic settlements in peri-urban areas *(40, 41)*. Certain malaria vectors that thrive in urban environments, such as *Anopheles stephensi*, have established in countries in east Africa, prompting increased mosquito surveillance and targeted vector control in the region *(42)*.

People who live in rural and urban areas may exhibit differences in malaria prevention behaviours, health-seeking and access to care. In Nigeria, for example, where young children in rural areas were more likely to have had a fever in the previous two weeks than children in urban areas, rural mothers were more likely to delay care-seeking for febrile children and administration of antimalarial medicines than those in urban areas. Lower levels of education and poorer knowledge of malaria in people in rural areas may have been a contributing factor *(43)*. Limited access to the health system by populations in remote rural areas is a common challenge in many malaria-endemic countries.

Arriving at a better understanding of the barriers to preventing and controlling malaria is a first step to identifying the reasons why some groups may be at higher risk of malaria. A review of studies from sub-Saharan African countries found that misconceptions about the cause and transmission of malaria, the incorrect belief that malaria cannot be prevented, and the use of ineffective prevention measures were common barriers to malaria prevention *(44)*. Barriers to malaria control include concerns about the safety and efficacy of conventional medicines *(44)* and reliance on informal health-care providers with little knowledge of malaria *(45)*. Barriers related to the implementation of malaria prevention and treatment measures persist even in settings where knowledge about malaria is high *(46)*.

These barriers are primarily related to socioeconomic and cultural factors that compromise access to adequate modern treatment facilities. Among poor and rural people in south Asia, for example, the cost of malaria-related services prevents poor people from seeking care. At higher levels of the health system, barriers to the uptake of IPTp were identified as poor implementation of policies, medication stockouts, gaps in provider knowledge and skills, and insufficient monitoring and evaluation *(47)*.

Malaria Matchbox, a toolkit designed to improve the equity of malaria programmes, outlines a systematic approach to assessing barriers in malaria to make services available, accessible and acceptable to all (Box 5.3).

BOX 5.3. Malaria Matchbox

Malaria Matchbox is a qualitative analytical framework for assessing and promoting equity in malaria programmes and improving the quality, effectiveness and outreach of malaria responses *(48)*. The methodology uses data about access and use of health services to identify opportunities to strengthen malaria programming across the continuum from control to elimination. It guides users to consider the root causes of health inequities across different contexts and populations, with consideration of how biological, social, economic, cultural and gender-related factors shape malaria outcomes and responses. Malaria Matchbox encourages the development of malaria strategies that are integrated across multiple relevant sectors, equitable (reaching populations at risk) and people-centred (reflecting the needs and realities of priority populations). The approach is designed to support ongoing national malaria programmes and analyses such as Malaria Programme Reviews and High Burden High Impact assessments.

5.1.4 Underserved populations

Underserved populations in the malaria response include refugees, migrants, internally displaced people and indigenous populations – identities that are frequently held concurrently. These populations are underserved because they have been traditionally excluded from disease control efforts and tend to have compromised access to health and malaria prevention efforts and control services. In some settings, for example, they may not be meaningfully considered by the laws, policies and legal frameworks that facilitate access to health and malaria services *(49)*.

Diverse migrant populations, such as miners, agriculture workers, labourers, travellers and soldiers, may be at higher risk of infection, and their movement may contribute to the transmission and spread of malaria *(50, 51)*. In the Americas, for example, gold mining is associated with high malaria incidence in specific municipalities *(52)*. Migrant and mobile populations require special health system arrangements to ensure they have access to malaria prevention and treatment options, such as engaging the private and informal private sectors, and enabling shared data, surveillance and response *(53)*.

A study of migrant populations in the Greater Mekong Subregion found a lack of concrete, reliable and adequate documentation of migrant populations in the region, such that efforts to understand and act on health challenges faced by this population were impeded *(49)*. The study recommendations underscored the importance of regionally coordinated approaches to sharing data about the health of migrant populations, including a need for strengthened collection of disaggregated data about the health of migrants through national health surveillance systems.

Targeted malaria control strategies require an in-depth understanding of the characteristics and risk factors experienced by underserved population groups. A study of mobile workers and indigenous peoples in a remote area of Cambodia, for example, characterized groups of people based on occupation (present and past), current and previous place of residence, and ethnicity to identify specific aspects of their shared circumstances that put them at risk of malaria *(54)*. Local indigenous people who were migrant forest farmers had prolonged stays in farms and fields that reduced their ability to be reached by malaria control strategies during these periods. Khmer migrants working on rubber plantations and mines were mostly unregistered and therefore not included in the malaria prevention and control efforts by village health workers.

Indigenous populations have poorer health than non-indigenous populations across many health domains, including disproportionally high levels of malaria *(55)*. Indigenous populations carry greater risks due to aspects of their way of life, surrounding natural habitat, or lack of access to health services. They also commonly experience stigma, lack of representation in data collection, and exclusion from health programmes. In Brazil, most cases of malaria are concentrated in the Amazonas state, which also has the highest proportional indigenous population in the country *(56)*. Compared with non-indigenous children, malaria has a larger impact on indigenous children in this state, who were more likely to have malaria and more likely to have serious illness *(57)*.

5.2 Approach

This analysis includes malaria indicators related to burden, prevention, and testing and treatment (Table 5.1). The health indicators, dimensions of inequality and countries were selected in consideration of data availability and do not represent a comprehensive assessment of the state of inequality in malaria. For instance, disaggregated data for WHO estimates of malaria incidence and mortality were not available, and these indicators were not included in the inequality analysis. Data were not available to assess inequalities in malaria within underserved populations.

Data are derived from DHS and MIS, nationally representative household surveys available through the DHS Program STATcompiler tool *(58)*.

The analysis of inequalities in malaria covers nine indicators related to malaria burden, prevention, and

TABLE 5.1. Overview of disaggregated data used for malaria analysis

Category	Indicator	Source	Inequality dimension					Countries with available data	
			Sex	Economic status	Education	Place of residence	Age	Latest situation[a]	Change over time[b]
Burden	Malaria prevalence in children aged < 5 years (according to rapid diagnostic testing) (%)[c]	DHS, MIS	✔	✔	✔	✔		23	7–8[d]
Prevention	Prevalence to notification ratio (years)	DHS, MIS		✔		✔		30	24
	Households with at least one insecticide-treated net (%)	DHS, MIS		✔		✔		30	24
	Households with at least one insecticide-treated net for every two people (%)	DHS, MIS	✔	✔		✔	✔	30	24
	Children aged < 5 years sleeping under insecticide-treated net (%)	DHS, MIS		✔	✔	✔		30	23–24[d]
	Pregnant women sleeping under insecticide-treated net (%)	DHS, MIS		✔	✔	✔		28	19
Testing and treatment	Prompt care-seeking for children aged < 5 years with fever (%)	DHS, MIS	✔	✔	✔	✔	✔	28	15
	Malaria diagnostic use in children aged < 5 years with fever (%)	DHS, MIS	✔	✔	✔	✔	✔	38	9
	Prompt treatment of children aged < 5 years with fever with antimalarial medicines (%)	DHS, MIS	✔	✔	✔	✔	✔	36	24

DHS: Demographic and Health Surveys; MIS: Malaria Indicator Surveys.

[a] Data for the latest situation reflect the most recent survey conducted between 2011 and 2020.
[b] Data for change over time reflect the most recent survey conducted between 2011 and 2020, and a previous survey conducted between 2001 and 2010, with a 5- to 15-year gap between the two surveys.
[c] Although age-disaggregated data were available for the malaria prevalence indicator, inequalities by age for this indicator are affected by expected age-related progression of the disease and, therefore, patterns of disease by age are presented as part of the disease context.
[d] Number of countries with available data may vary within indicator depending on the availability of information for the inequality dimension.

testing and treatment. Burden is assessed through malaria prevalence in children aged under 5 years according to rapid diagnostic testing. Prevention indicators encompass vector control measures (percentage of households with at least one insecticide-treated net; percentage of households with one insecticide-treated net for every two people; percentage of children sleeping under an insecticide-treated net; percentage of pregnant women sleeping under an insecticide-treated net); and an indicator of chemoprevention (percentage of women using three or more doses of IPTp).[1]

Testing and treatment indicators pertain to children aged under 5 years with fever in the 2 weeks preceding the survey and are expressed as percentages: prompt care-seeking for fever (same or next day), malaria diagnostic use with fever, and prompt treatment of fever with antimalarial medicines (children with fever who took an antimalarial the same or next day).

Detailed metadata about all indicators are available in Annex 7.

The malaria indicators are disaggregated by up to five dimensions of inequality: sex, economic status, education, place of residence and age. Education subgroups are based on the level of education of the woman or the child's mother where relevant. Age disaggregation was included only if age was considered a dimension of inequality, such as prevention and testing and treatment indicators pertaining to children aged under 5 years. Age was not included in the analysis for

[1] IPTp coverage reported in household surveys relies on self-reported information about the type of medicine and number of doses, and therefore is subject to respondents' ability to recall these details.

malaria prevalence, as it is considered descriptive of the epidemiologic nature of the disease (see Box 5.1). Where applied, age-related difference is a comparison between children aged under 12 months and children aged 48–59 months. The subgroups for other dimensions of inequality were similarly constructed throughout the report: sex (female and male),[1] economic status (wealth quintiles) and place of residence (rural and urban).

For each indicator and dimension, only countries with data available for all subgroups were included. For insecticide-treated net indicators, the analysis was limited to countries from the WHO African Region, where insecticide-treated nets are the main vector control measure and distributed to a large number of people.[2] For the IPTp indicator, the analysis was limited to countries from the WHO African Region that have adopted IPTp to reduce the burden of malaria during pregnancy. The countries included in the analysis represent at least 72% (up to 94%) of the global malaria cases and global malaria deaths in 2020.

The indicators for which inequality was assessed were all measured as percentages. Inequality was evaluated using measures of absolute inequality. The difference between two subgroups was used to assess the latest situation of inequality, and the change in difference between two subgroups was used to assess the change in inequality over time. For global analysis of the latest situation and change over time, assessments are based on the median difference across countries. To assess trends in high-burden or high-funding settings, a subanalysis of countries prioritized by the Global Fund[3] was conducted for all indicators.

Details about the analysis methods, including the inequality thresholds applied to describe situations of high and low inequality, are provided in Chapter 2 and Annex 4.

[1] For sex-disaggregated data, most sources reported data by biological sex (females and males). This language was adopted throughout the results section. The lack of data availability reflecting diverse gender identities is a limitation.

[2] In a limited number of subnational settings, the use of indoor residual spraying as a malaria vector control measure may be more common than insecticide-treated nets.

[3] These countries are prioritized because they are high burden or receive high levels of funding. These countries are identified in Annex 4.

ADDITIONAL RESOURCES FOR DATA EXPLORATION, INCLUDING INTERACTIVE VISUALS AND DATA, ACCOMPANY THE REPORT (see https://www.who.int/data/health-equity/report_2021_hiv_tb_malaria).

5.3 Results

5.3.1 Burden

KEY FINDINGS

- Malaria prevalence in children aged under 5 years showed high economic-related inequality. In the majority of countries, prevalence was at least 20 percentage points higher in the poorest children than the richest children.
- Overall, malaria tended to be more prevalent among young children whose mothers have lower education and who live in rural areas.
- In all countries, the prevalence of malaria was similar in female and male children.
- Over the previous 10 years, inequalities in malaria prevalence showed little change overall.

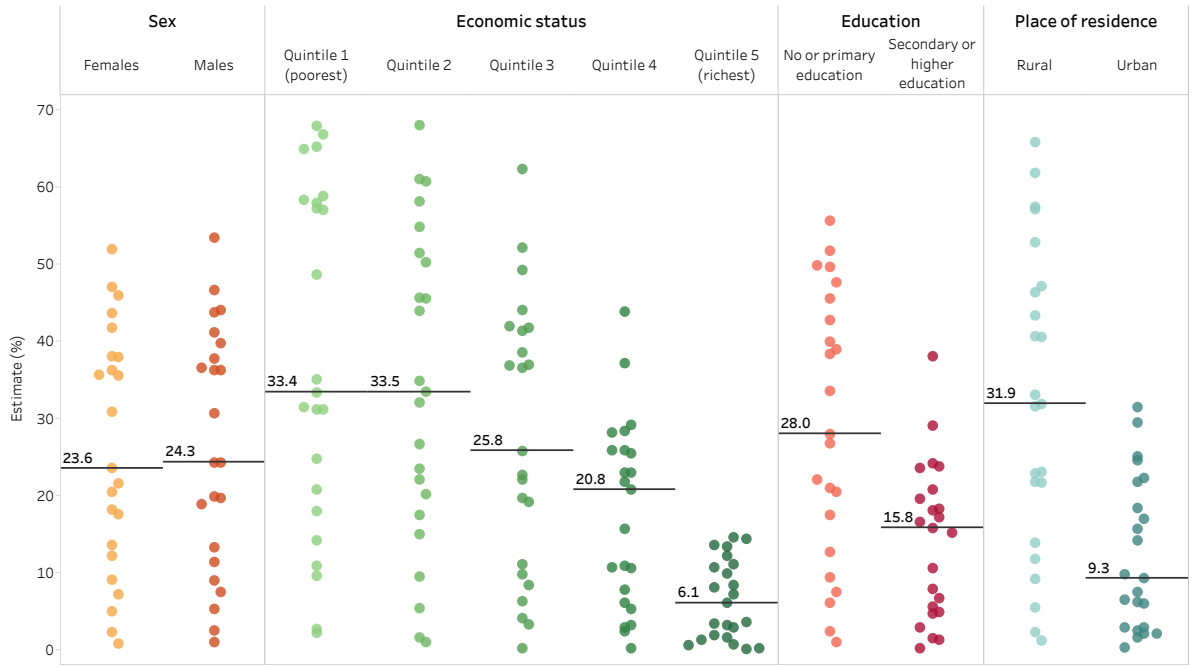
Inequalities in malaria prevalence in children were assessed in 23 countries. Table 5.2 gives an overview of the number of countries reporting high and low inequality for this indicator.

Based on data for 23 African countries (representing 83.2% of global malaria cases and 84.8% of deaths in 2020), malaria prevalence in children aged under 5 years tended to be higher among children from poorer households, those whose mothers had lower levels of education, and those in rural areas. There was little difference between female and male children (Fig. 5.4). Fourteen countries reported high inequality by at least one dimension of inequality, but seven countries had high inequalities according to three dimensions (economic status, education, place of residence; Burundi, Guinea, Liberia, Malawi, Mozambique, Nigeria, Togo). These countries all reported high national average malaria prevalence (ranging from 36.2% in Nigeria to 46.9% in Guinea).

TABLE 5.2. Overview of high and low inequality in malaria burden across study countries

Indicator	Dimensions of inequality explored	Countries included in analysis	Countries with high inequality by at least one dimension	Countries with low inequality across all dimensions
Malaria prevalence in children aged < 5 years (according to rapid diagnostic testing)	Sex, economic status, education, place of residence	23	14	2

FIG. 5.4. Malaria prevalence in children aged under 5 years (according to rapid diagnostic testing) in 23 countries, by sex, economic status, education and place of residence: latest situation (2011–2020)

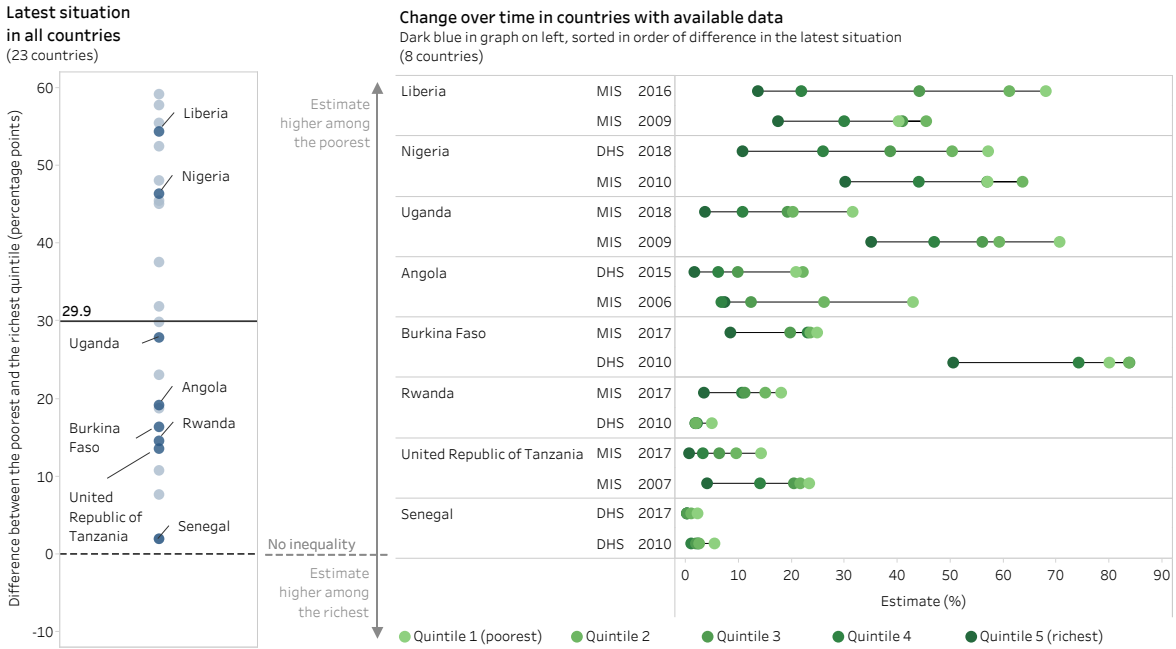


Each country is represented by multiple circles (one for each subgroup).
Solid horizontal lines indicate the median across countries. The difference between the median values of two subgroups evident on the figure is distinct from the overall median difference across countries (reported in the text and other resources that accompany this report and used to assess the overall level of inequality as low, moderate or high).

Source: Demographic and Health Surveys and Malaria Indicator Surveys.

Across 23 countries, the median difference between the richest and poorest quintiles amounted to 30 percentage points, with 14 of 23 countries reporting high levels of economic-related inequality. Two countries (Gambia, Senegal) reported low rich–poor differences of 2 percentage points. The national malaria prevalence in young children in these countries is low, however (2.4% in Gambia, 0.9% in Senegal). Patterns over the previous 10 years suggested little change in economic-related inequality overall across the eight countries with available data, although the situation by country varied (Fig. 5.5). In Burkina Faso and Uganda, for instance, malaria prevalence improved substantially in all wealth quintiles, with a narrowing of inequality in Burkina Faso. In Liberia, economic-related inequality widened between 2009 and 2016, as prevalence increased in the three poorest quintiles.

FIG. 5.5. Absolute economic-related inequality in malaria prevalence in children aged under 5 years (according to rapid diagnostic testing) and disaggregated data at two time points in countries with available data: latest situation (2011–2020) and change over time (2001–2010 and 2011–2020)



DHS: Demographic and Health Surveys; MIS: Malaria Indicator Surveys.
Each country is represented by one circle on the left graph and selected countries are represented by five circles on the right graph (one for each subgroup). Countries shown on the right graph are dark blue on the left graph.
On the left graph, the solid horizontal line indicates the median across countries and the dashed horizontal line indicates the difference value of no inequality (0).
Source: Demographic and Health Surveys and Malaria Indicator Surveys.

Overall, inequalities related to education and place of residence were moderate. Across 23 countries, there was a median difference of 13 percentage points in malaria prevalence between the most educated (secondary or higher education) and least educated (no or primary education). In a third of countries (8 of 23), the most educated subgroup reported malaria prevalence at least 20 percentage points lower than that of the least educated subgroup. There was a median difference of 19 percentage points between urban and rural areas, with nearly half of countries (11 of 23) reporting at least 20 percentage points higher malaria prevalence in rural than urban areas.

Sex-related inequality in malaria prevalence was not evident. All 23 countries reported female–male differences of less than 5 percentage points. There was little change in inequality according to education, place of residence and sex over the previous decade, overall.

5.3.2 Prevention

KEY FINDINGS

- Overall, there were low to moderate levels of within-country inequality in malaria prevention indicators.
- At the country level, the direction of inequality varied for economic status and place of residence. For example, insecticide-treated net ownership favoured the richest subgroup in some countries and the poorest subgroup in other countries. Five countries reported high economic-related inequalities, where one or more of the two indicators related to insecticide-treated net ownership was at least 20 percentage points higher in the richest households than the poorest (Burundi, Kenya, Malawi, Niger, Rwanda). Six countries reported high inequalities in the opposite direction, with a gap of at least 20 percentage points favouring the poorest households (Gabon, Gambia, Ghana, Nigeria, Senegal, Togo).
- For children sleeping under an insecticide-treated net, all countries reported low levels of sex-related inequality and low or moderate levels of age-related inequality, with little change over time.
- Among pregnant women, use of insecticide-treated nets and three or more doses of IPTp was about the same or higher among the poorest (compared with richest), the least educated (compared with most educated) and rural settings (compared with urban settings) in the majority of countries. In several countries, high economic-related inequality in insecticide-treated net use by pregnant women was unchanged or had increased over the previous decade. In Kenya, use of insecticide-treated nets by pregnant women increased faster among the richest than the poorest between 2003 and 2015, resulting in a gap of 32.0 percentage points.

Inequalities in malaria prevention indicators were assessed in up to 30 countries. Table 5.3 gives an overview of the number of countries reporting high and low inequality for the five indicators.

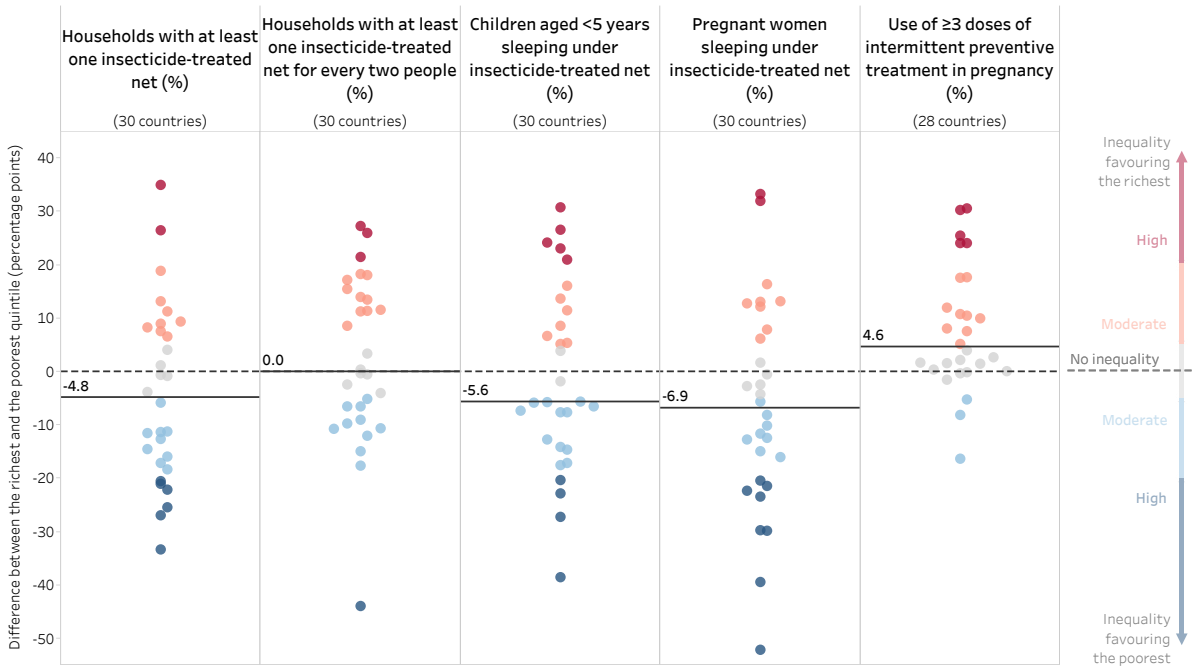
The 30 countries in the WHO African Region included in the analysis of insecticide-treated net coverage or use represent 90.5% of the 2020 global malaria cases and 91.9% of deaths. The 28 countries included in the analysis of use of three or more doses of IPTp represent 88.7% of the 2020 global malaria cases and 91.0% of deaths.

Malaria prevention indicators tended to demonstrate low inequality overall, with little change over the past decade for most indicators. For all five prevention indicators, the overall median difference across study countries for all dimensions of inequality was 7 percentage points or less (Fig. 5.6 shows economic-related inequality across all indicators). The situations within countries, however, demonstrated variation in the directionality of inequality. For example, 11 countries reported high economic-related inequality for 1 or both of the 2 indicators related to insecticide-treated net household ownership.

TABLE 5.3. Overview of high and low inequality in malaria prevention indicators across study countries

Indicator	Dimensions of inequality explored	Countries included in analysis	Countries with high inequality by at least one dimension	Countries with low inequality across all dimensions
Households with at least one insecticide-treated net	Economic status, place of residence	30	9	3
Households with at least one insecticide-treated net for every two people	Economic status, place of residence	30	4	3
Children aged < 5 years sleeping under insecticide-treated net	Sex, economic status, place of residence, age	30	9	1
Pregnant women sleeping under insecticide-treated net	Economic status, education, place of residence	30	10	2
Use of ≥3 doses of intermittent preventive treatment in pregnancy	Economic status, education, place of residence	28	5	10

FIG. 5.6. Absolute economic-related inequality in malaria prevention indicators: latest situation (2011–2020)



Each country is represented by multiple circles (one for each indicator).
Solid horizontal lines indicate the median across countries.
The dashed horizontal line indicates the difference value of no inequality (0).

Source: Demographic and Health Surveys and Malaria Indicator Surveys.

In five countries, coverage was at least 20 percentage points higher in the richest subgroup (Burundi, Kenya, Malawi, Niger, Rwanda); in six countries, coverage was at least 20 percentage points higher in the poorest subgroup (Gabon, Gambia, Ghana, Nigeria, Senegal, Togo). In Ghana, Togo and Zimbabwe, the coverage of households with at least one insecticide-treated net was substantially higher in rural compared with urban areas, whereas Burundi reported substantially higher coverage of this indicator in urban areas.

Similar divergent patterns of inequality related to economic status and place of residence were reported for use of insecticide-treated nets by children. Age-related inequality in use of insecticide-treated nets among children was low or moderate in all countries. Each country had low sex-related inequality among children (the percentages of female and male children sleeping under an insecticide-treated net were about the same).

For pregnant women sleeping under an insecticide-treated net, there was evidence that the poorest, least educated and rural subgroups had equal or higher coverage in many countries (compared with the richest, most educated and urban subgroups). Four times as many countries reported high economic-related inequality favouring the poorest subgroups (8 of 30 countries) than the richest subgroups (2 of 30 countries; Burundi, Kenya). For use of three or more doses of IPTp, 11 of 28 countries reported low inequality by economic status, and around half had low inequalities by education (13 of 28) and place of residence (14 of 28). Five countries demonstrated high inequalities in use of three or more doses of IPTp favouring the richest subgroups (Angola, Cameroon, Guinea, Mozambique, Togo), and one country had high inequality favouring urban areas (Togo).

5.3.3 Testing and treatment

KEY FINDINGS

- Prompt care-seeking for children aged under 5 years with fever was at least 20 percentage points higher in the richest quintile than the poorest quintile in over half of study countries, with moderate reduction in inequality over the past 10 years, overall. Where data were available, five countries with high economic-related inequality demonstrated no change or increased inequality over the past decade (Angola, Liberia, Nigeria, Pakistan, Rwanda), and one country reported a decrease in inequality (Timor-Leste).
- Across 28 countries, the median differences in care-seeking for children with fever were about 10 percentage points higher in the most educated subgroup (versus least educated) and urban areas (versus rural), with little change over the previous decade.
- Inequalities related to wealth, mother's education and place of residence in malaria diagnostic use and prompt treatment in children indicators were low to moderate, overall, with little change over time.
- Nearly all countries reported low sex- and age-related differences for testing and treatment in children. Overall, there was little change in sex- and age-related inequality over time.

Inequalities in malaria testing and treatment indicators were assessed in up to 38 countries. Table 5.4 gives an overview of the number of countries reporting high and low inequality for the three indicators.

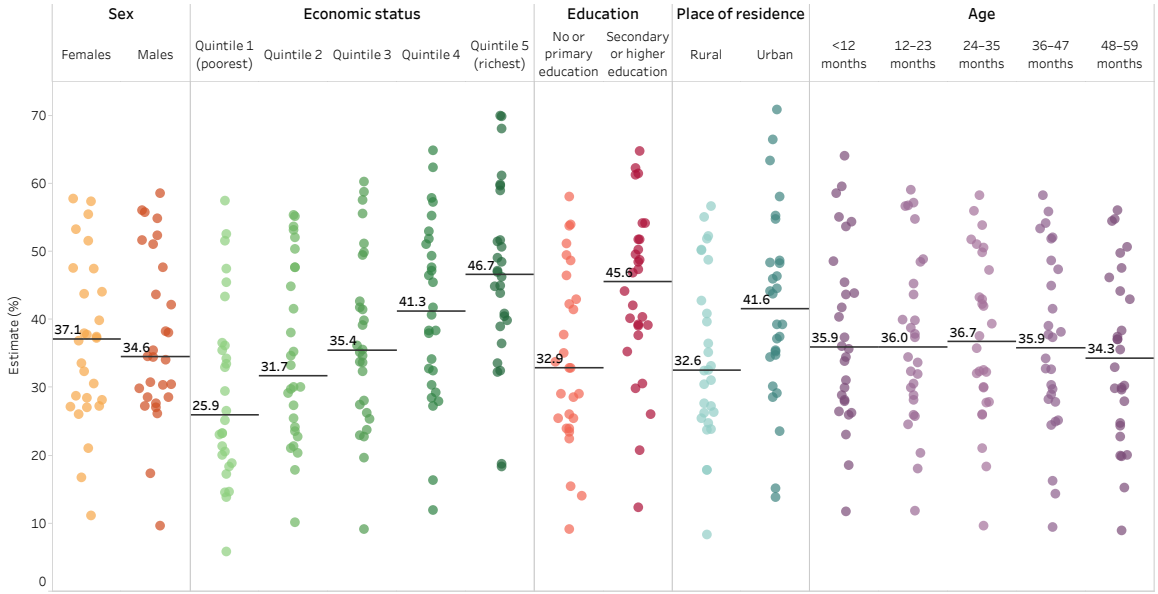
The countries included in the analysis of inequalities in testing and treatment indicators represent the majority of 2020 global malaria cases and deaths. The 28 countries with data about prompt care-seeking in children with fever account for 72.0% of global cases and 72.2% of deaths. The 38 countries with data about malaria diagnostic use in children with fever account for 93.0% of global cases and 93.6% of deaths. The 36 countries with data about prompt treatment of children with fever account for 92.9% of global cases and 93.6% of deaths.

Prompt care-seeking for children aged under 5 years with fever demonstrated variable levels of inequality across dimensions of inequality (Fig. 5.7). There were high inequalities by economic status, to the detriment of children in the poorest households. Across 28 countries, there was a median difference of 21 percentage points between the richest and poorest subgroups, with over half of countries reporting a gap of 20 percentage points or more (Fig. 5.8). Across countries, however, patterns of inequality were variable over time (Box 5.4). Low economic-related inequality in prompt care-seeking was evident in about a fifth of countries (6 of 28). Inequalities by mother's education and place of residence were less pronounced globally (with a median difference between the advantaged and disadvantaged subgroups of around 10 percentage points across 28 countries for both dimensions). There was low inequality by age and sex, globally. Two countries (Mali, Senegal) reported more than 20 percentage points higher coverage among the subgroup with secondary or higher education than the subgroup with no or primary education. Across all dimensions, the extent of inequality globally was unchanged or moderately reduced over the past 10 years.

TABLE 5.4. Overview of high and low inequality in malaria testing and treatment across study countries

Indicator	Dimensions of inequality explored	Countries included in analysis	Countries with high inequality by at least one dimension	Countries with low inequality across all dimensions
Prompt care-seeking for children aged < 5 years with fever	Sex, economic status, education, place of residence, age	28	16	1
Malaria diagnostic use in children aged < 5 years with fever	Sex, economic status, education, place of residence, age	38	7	4
Prompt treatment of children aged < 5 years with fever with antimalarial medicines	Sex, economic status, education, place of residence, age	36	3	6

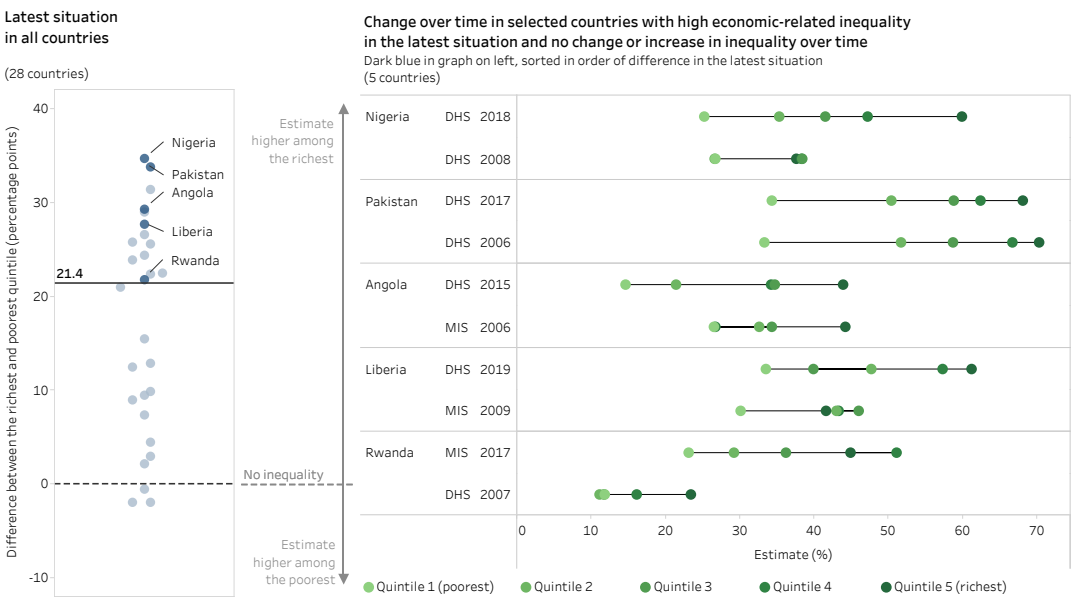
FIG. 5.7. Prompt care-seeking for children aged under 5 years with fever in 28 countries, by sex, economic status, education, place of residence and age: latest situation (2011–2020)



Each country is represented by multiple circles (one for each subgroup).
Solid horizontal lines indicate the median across countries. The difference between the median values of two subgroups evident on the figure is distinct from the overall median difference across countries (reported in the text and other resources that accompany this report and used to assess the overall level of inequality as low, moderate or high).

Source: Demographic and Health Surveys and Malaria Indicator Surveys.

FIG. 5.8. Absolute economic-related inequality in prompt care-seeking for children aged under 5 years with fever and disaggregated data at two time points in selected countries: latest situation (2011–2020) and change over time (2001–2010 and 2011–2020)



DHS: Demographic and Health Surveys; MIS: Malaria Indicator Surveys.
Each country is represented by one circle on the left graph and selected countries are represented by five circles on the right graph (one for each subgroup). Countries shown on the right graph are dark blue on the left graph.
On the left graph, the solid horizontal line indicates the median across countries and the dashed horizontal line indicates the difference value of no inequality (0).

Source: Demographic and Health Surveys and Malaria Indicator Surveys.

BOX 5.4. Different patterns of increasing economic-related inequality in prompt care-seeking for children aged under 5 years with fever

According to the latest available national data, 15 countries had high levels of inequality in the percentage of prompt care-seeking for children aged under 5 years with fever. Care-seeking in the richest quintile was at least 20 percentage points higher than in the poorest quintile. Five of these countries (Angola, Liberia, Nigeria, Pakistan, Rwanda) had data available about change over time (Fig. 5.8). The wealth-disaggregated data reveal diverse patterns of change in these countries over the previous decade. In four countries, absolute inequality increased over time, while one country saw little change:

- In Angola, the percentage of prompt care-seeking in the poorest quintiles decreased over time, while the percentage in the richest quintiles remained about the same.
- In Liberia and Nigeria, the percentage of prompt care-seeking in the poorest quintile remained about the same, while there were substantial increases in care-seeking among the two richest quintiles.
- In Rwanda, the percentage of prompt care-seeking increased across all wealth quintiles, with faster gains among the richest.
- In Pakistan, inequality remained about the same across the 10-year period, with little change in any of the wealth quintiles.

The use of malaria diagnostics in children aged under 5 years with fever and prompt treatment of children with fever with antimalarial medicines indicators showed low or moderate levels of inequality by sex, economic status, mother's education, place of residence and age, globally. With a few exceptions, countries tended to report low or moderate levels of inequality by these dimensions of inequality. High levels of economic-related inequality in use of malaria diagnostics was evident in six countries, favouring the richest children (Angola, Congo, Democratic Republic of the Congo, Kenya, Papua New Guinea, United Republic of Tanzania). The countries that reported high economic-related inequality in prompt treatment included Niger (where the richest households reported more prompt treatment) and Burundi and Zambia (where the poorest households reported more prompt treatment). A large majority of countries (around 90% or more) reported low inequality by sex for testing and treatment indicators among children.

5.3.4 Patterns of inequality in high-burden or high-funding countries

The patterns of inequality in a subset of 19 countries prioritized by the Global Fund due to their high burden of disease or high levels of funding were compared with patterns in the global findings. Across all indicators, the subset of high-burden or high-funding countries demonstrated similar patterns of inequality.

5.4 Discussion

Action to hasten malaria reduction and elimination efforts has stalled over the past decade, with little change in inequality, globally. This analysis demonstrates that the burden of malaria disproportionally affects boys and girls from poor, low-educated, rural backgrounds in the majority of study countries. Efforts targeted to accelerate improvements in these subgroups are warranted. To this end, malaria prevention, testing and treatment interventions may be considered equitable when they achieve higher coverage among people with a higher malaria burden (poor households, people with low levels of education, rural communities).

The malaria prevention indicators related to insecticide-treated net coverage showed divergent inequality patterns across countries. Prompt care-seeking for children aged under 5 years with fever was considerably lower in the poorest households in more than half of countries. In countries where coverage (for any indicator) was lower among the poorest, least educated and rural populations, or where coverage was the same across subgroups, more can be done to intensify action among the subgroups that are most adversely affected. For instance, in Burundi, nearly half of available data about prevention and testing and treatment indicators demonstrated moderate or high levels of inequality favouring the richest, most educated and urban subgroups.

Consideration of how to improve access and uptake among the other subgroups where malaria is more prevalent is needed. Conversely, situations with higher coverage among poorer, less educated and rural

populations may be indicative of policies or programmes that have effectively reduced coverage inequities by targeting traditionally disadvantaged subgroups (Box 5.5).

Expanded monitoring of inequalities in malaria can lead to a better understanding of the situation and provide evidence to inform remedial action. Monitoring can be broadened to include a focus on populations that are at

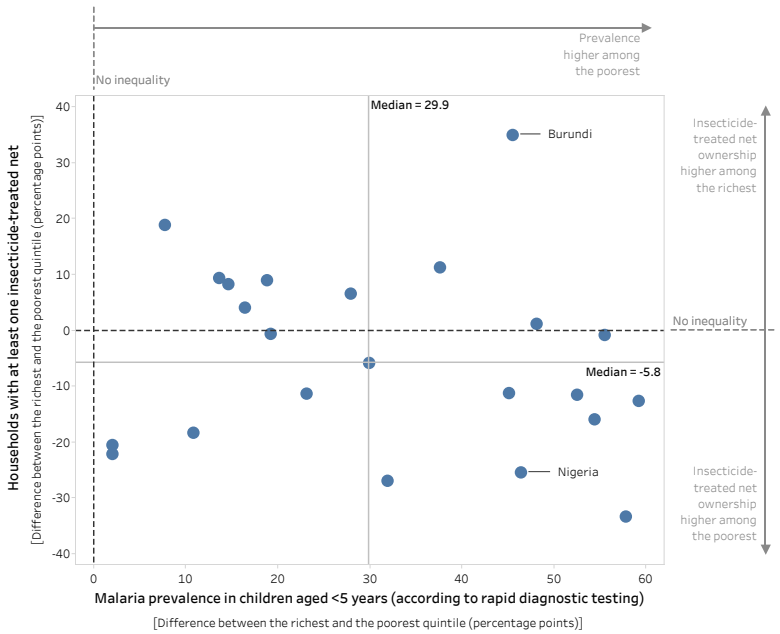
BOX 5.5. Contrasting patterns of inequality in malaria prevention indicators in Burundi and Nigeria

According to the latest available DHS data, the national prevalence of malaria in children aged under 5 years was similar in Burundi (37.9% in 2016) and Nigeria (36.2% in 2018), although the two countries reported different coverage of malaria prevention interventions (Figs 5.9 and 5.10). In both countries, there were large inequalities in prevalence, with at least 20 percentage points higher prevalence among the poorest, least educated and rural subgroups. Patterns of inequality in malaria intervention indicators, however, suggested divergent situations in the two countries.

In Burundi, indicators related to insecticide-treated net ownership and use showed higher coverage among the richest, most educated and urban subgroups. The percentage of households with at least one insecticide-treated net was 35 percentage points higher among the richest versus the poorest.

Nigeria, in contrast, reported inequalities in insecticide-treated net ownership and coverage favouring traditionally disadvantaged subgroups, indicative of an equity-oriented intervention rollout. The percentage of pregnant women sleeping under an insecticide-treated net was at least 20 percentage points higher among the poorest than the richest, the least educated than the most educated, and rural than urban.

FIG. 5.9. Absolute economic-related inequality in malaria prevalence in children aged under 5 years (according to rapid diagnostic testing) and households with at least one insecticide-treated net in 23 countries: latest situation (2011–2020)

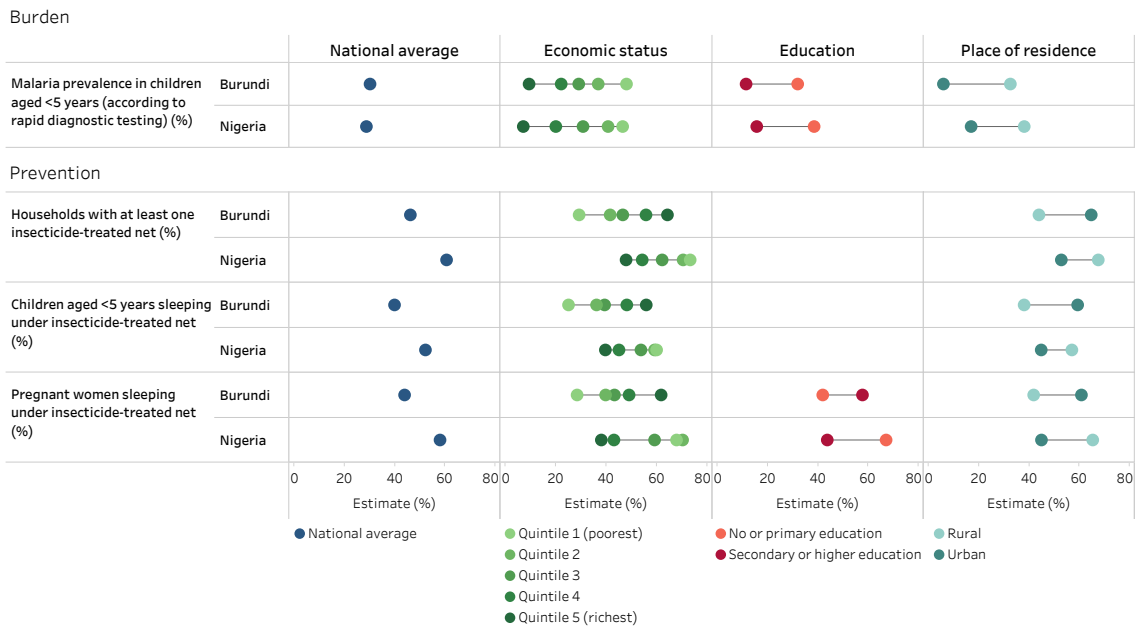


Each country is represented by one circle.
Solid grey lines indicate the median across countries.
The dashed horizontal line indicates the difference value of no inequality (0).

Source: Demographic and Health Surveys and Malaria Indicator Surveys.

BOX 5.5. *continued*

FIG. 5.10. Malaria burden and prevention indicators in Burundi (2016) and Nigeria (2018), by economic status, education and place of residence: latest situation



Each country is represented by multiple circles (one for national average and one for each subgroup).

Source: Demographic and Health Surveys.

In Burundi, the National Malaria Control Strategic Plan for 2013–2017 promoted universal coverage of insecticide-treated nets through distribution to the entire population every 3 years, and continuous routine distribution to certain populations, such as pregnant women, children aged under 1 year, patients in hospital and people residing in institutions. Routine distribution of nets occurred during points of contact with the health system – for example, to pregnant women during antenatal care visits and to young children at immunization clinics *(59)*.

In Nigeria, universal coverage of insecticide-treated nets has been pursued through a combination of mass campaigns every 3 years and continuous distribution. Campaigns include an intensified focus on certain states that are selected with consideration of, among other factors, malaria burden and net use and coverage. Continuous distribution of nets occurs through antenatal care visits and immunization clinics, schools and community-based distribution channels *(60)*. The country has secured loans to ensure all states are targeted in forthcoming campaigns.

higher risk of malaria transmission, that tend to have more frequent or severe malaria, or that experience decreased access to malaria care and services. Some subgroups may require closer inspection and further disaggregation to better appreciate patterns of inequality. The methods in this report use simple disaggregation, not controlling for other factors. Therefore, the findings do not explain why inequalities exist, but rather highlight areas of potential concern. Further analyses are required to determine the extent to which reported inequalities may be accounted for by rural/urban differences (noting that urban areas tend to have higher economic status, and rural areas generally have higher transmission). To understand the situation in more detail, further investigations at the country level are

needed to determine the extent to which different factors drive pertinent forms of inequalities in malaria and inform how to selectively invest to alleviate inequalities.

The analysis here is limited by the availability of comparable data across countries. To enable global comparisons, malaria data should be collected in a systematic and harmonized manner across countries. This allows for country-specific analysis, and for benchmarking the performance of a country against comparable settings to examine progress and learn lessons from better-performing areas. Further explorations are warranted within specific populations that may be at risk, such as refugees, migrants, internally displaced people and indigenous populations *(61)*, and people affected by climate change, food insecurity and inadequate housing *(24, 25, 62)*.

Opportunities for strengthened and expanded inequality monitoring include collecting comparable data across a larger number of malaria-endemic countries, for a larger number of malaria indicators, and for a broader range of health determinants. Data about malaria indicators should be linked to information about relevant dimensions of inequality to permit data disaggregation and health inequality monitoring. Countries may also explore how health inequality monitoring can be integrated into national malaria strategic plans.

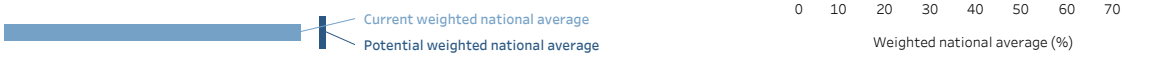
5.5 Addressing inequality

Identifying and addressing inequalities in malaria can contribute to overall improvements across populations. Eliminating economic-related inequality within countries stands to increase the overall coverage of selected malaria prevention, testing and treatment services (Fig. 5.11).[1] The indicator with the greatest potential improvement is prompt care-seeking for children aged

[1] For an overview of the methods used to calculate PAR, see Chapter 2.

FIG. 5.11. Potential improvement in national average by eliminating economic-related inequality in selected malaria indicators (2011–2020)

Subtopic	Indicator	Number of countries	Current national average (global weighted average and country range)	Potential national average (global weighted average and country range)	Potential for improvement (global weighted average and country range)
Prevention	Households with at least one insecticide-treated net (%)	30	68 (31–92)	70 (31–92)	1 (0–18)
	Households with at least one insecticide-treated net for every two people (%)	30	37 (11–71)	40 (11–71)	3 (0–16)
	Children aged <5 years sleeping under insecticide-treated net (%)	30	53 (9–79)	56 (9–83)	3 (0–16)
	Pregnant women sleeping under insecticide-treated net (%)	30	55 (6–84)	57 (6–84)	2 (0–18)
	Use of ≥3 doses of intermittent preventive treatment in pregnancy (%)	28	25 (6–61)	30 (6–71)	6 (0–18)
Testing and treatment	Prompt care-seeking for children aged <5 years with fever (%)	28	48 (10–58)	60 (18–70)	12 (0–22)
	Malaria diagnostic use in children aged <5 years with fever (%)	38	19 (3–66)	24 (3–70)	5 (0–20)
	Prompt treatment of children aged <5 years with fever with antimalarial medicines (%)	36	18 (0–43)	22 (0–43)	3 (0–12)



The potential improvement (dark blue vertical line) represents overall weighted average that would be possible if, in each country, the whole population had the same level of coverage as the most advantaged subgroup (richest quintile).
The current weighted average is indicated by the light blue bar. The overall average is calculated based on the above-mentioned number of countries for each indicator and weighted by the relevant population size.

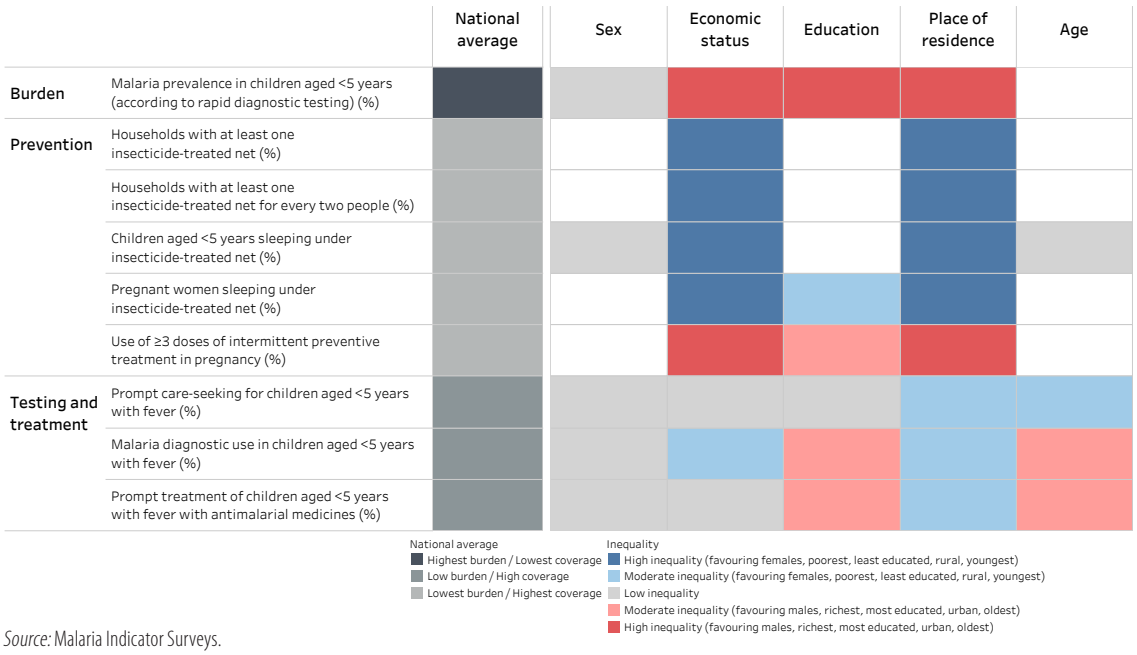
Source: Demographic and Health Surveys and Malaria Indicator Surveys.

BOX 5.6. Equity-oriented malaria control efforts in Togo

Togo is a small country in the WHO African Region where malaria transmission is high *(9)*. Malaria incidence in Togo reduced from 445.8 per 1000 in 2000 to 228.9 per 1000 in 2020, but it remains concerning for its impact on health and the socioeconomic development of the country *(1)*.

In 2017, the national prevalence of malaria in children aged under 5 years in Togo was high, at 43.9%. Togo reported a sizeable gap in malaria prevalence of 57.8 percentage points between children in the richest (7.2%) and poorest (65.0%) wealth quintiles, and with large inequalities in prevalence on the basis of education and place of residence. Alongside this higher burden among traditionally disadvantaged subgroups, however, ownership and use of insecticide-treated nets were consistently higher among poor, least educated and rural people. People living in rural areas also demonstrated moderately higher levels of use of malaria diagnostics in children aged under 5 years with fever than urban residents. Coverage of three or more doses of IPTp remained higher among pregnant women who were richer, more educated and living in urban areas. There were low inequalities in testing and treatment indicators based on economic status, education and sex. Age-related inequalities in testing and treatment indicators were moderate (Fig. 5.12).

FIG. 5.12. Country heatmap of inequality in malaria indicators in Togo (2017)



Source: Malaria Indicator Surveys.

Nationally, the Programme National de Lutte contre le Paludisme has developed and implemented sequential strategic plans spanning 2001–2022 in alignment with the guidelines of the WHO Global Technical Strategy against Malaria, including widespread malaria control interventions to achieve malaria elimination targets *(63)*. For example, the country launched an insecticide-treated net distribution campaign in 2004 that was considered highly successful in improving net ownership, particularly in poorer wealth quintiles *(64)*. A subsequent campaign in 2011, with a goal of universal coverage, also achieved high net ownership among vulnerable populations *(65)*.

Since 2008, the capacity of the Togolese health system to detect and treat malaria has improved. Mobile clinics have been created, malaria diagnosis and treatment have become cost-free, and community health workers deployed in remote villages have been trained to detect and treat simple malaria cases and refer serious cases to higher levels of the health system *(66, 67)*. Malaria reporting systems have also been strengthened, as the programme compiles monthly digital data about malaria indicators, gathered from across community, district, regional and central levels of the health system *(67)*.

under 5 years with fever. The current national averages across 28 countries range from 10% to 58%, with a weighted average of 48%. If the national average in each country was equal to the level of coverage in the richest 20% of the population, however, there would be a 26% relative improvement in the overall weighted average. There would be average improvements of at least 5 percentage points for use of malaria diagnostics for children aged under 5 years and use of three or more doses of IPTp if economic-related inequality were eliminated. For insecticide-treated net indicators, where country patterns of inequality were mixed, there was little to no economic-related inequality globally. (In one country, Togo, a third of available data illustrated high levels of inequality, mostly skewed towards greater intervention coverage among the poorest and rural subgroups (Box 5.6).) Nevertheless, in countries where the richest people have higher coverage than the poorest people, eliminating economic-related inequalities would increase the national average.

Malaria response efforts have been and are increasingly focused on reaching poor, least educated and rural households in remote malaria-affected areas. The effective and equitable delivery of primary health-care interventions is a cornerstone of strategies to reduce malaria *(9)*. Strengthening health systems in malaria-affected areas involves making integrated health services, including those specific to malaria, accessible and acceptable to hard-to-reach populations. Malaria prevention and control programmes based on decentralization and risk stratification have made major contributions to the rapid reduction of malaria in endemic areas *(68)*.

The following examples illustrate integrated approaches to strengthen health-care access among remote populations and targeted responses to address malaria through community volunteer networks.

5.5.1 Integrated community care management of childhood illness

In their efforts to eliminate malaria, a common challenge for many countries lies in reaching remote communities with limited access to formal health care. The integrated community case management strategy, endorsed by UNICEF and WHO in 2004, has been widely adopted in low- and middle-income countries to facilitate the timely diagnosis and management of malaria and other childhood diseases in remote areas *(69)*. Integrated community case management involves training and supporting community health workers to deliver detection, treatment and referral services for childhood illnesses in the community in areas where access to health facilities is limited. In the case of suspected malaria (children presenting with fever in a malaria-endemic area), rapid diagnostic testing is done, and positive tests result in the provision of oral antimalarial medicines *(70)*. The impact of integrated community case management on malaria outcomes requires further study, but there is evidence that the approach is likely to increase care-seeking when compared with usual facility-based services *(71)*.

In 2013, WHO launched an accelerated scale-up of integrated community case management in the Democratic Republic of the Congo, Malawi, Mozambique, Niger and Nigeria through the Rapid Access Expansion programme *(72)*. These projects, supported by international nongovernmental organizations, ministries of health and WHO, were targeted towards children in areas where there were few other child health interventions. An evaluation of six project sites reported an average 10% decline in mortality in children aged under 5 years over the course of the evaluation period (spanning 2010 or 2013 to 2017), ranging from a 0.2% decline in Mozambique to a 15.2% decline in the Democratic Republic of the Congo *(73)*. Across the sites, an estimated 380 child lives were saved with malaria treatment, 1020 child lives saved with pneumonia treatment and 2470 saved with diarrhoea treatment.

In a few places, vertical malaria-focused community health worker programmes have contributed to significant reductions in malaria. Honduras and the Lao People's Democratic Republic both receive funding from the Global Fund for vertical malaria community health worker programmes *(74)*. Between 2015 and 2019, the Lao People's Democratic Republic reported a 75% reduction in malaria cases and a 10-fold decline in malaria test positivity. Over the same period, Honduras had a 90% reduction in malaria cases, and a reduction in the slide positivity rate from 2.4% to 0.2% (indicating a decrease in both active and passive cases).

The success of these programmes, however, prompts consideration of their relevance moving forward. As the burden of malaria declines, the demand for vertical malaria community health worker programmes becomes less pronounced. The sustainability of these programmes may rely on their successful integration with the larger health system, whereby the role of community health workers is broadened to ensure they remain motivated and engaged with the community, which in turn enables the more rapid identification of the few remaining malaria cases.

5.5.2 Targeting malaria responses and the role of voluntary collaborator networks

Malaria risk stratification is a common approach to identify priority areas for malaria prevention and control, based on relevant risk factors and established methodologies *(75)*. Risk stratification and the strategic use of information is a component of the high burden to high impact approach and is being expanded to help define better targeting of interventions for maximal impact *(11)*. Up-to-date and reliable data about the geographical distribution and frequency of malaria cases in a country can actively inform the deployment of volunteer networks, distribution of laboratory and supervisory personnel, and targeting of vector control activities *(76)*. In Colombia, for example, data about malaria at the municipal level were used to assess and stratify risks geographically, resulting in recommendations on how to target malaria elimination plans *(77)*.

Historically, voluntary collaborator networks have been part of successful targeted malaria responses in Latin American countries. They play a role in the collection of data for malaria surveillance systems, and support malaria prevention and control efforts in areas where the disease burden and risks are highest. Since the 1950s, malaria responses in El Salvador have been strengthened by networks of community volunteers *(76, 78)*. Originally, these networks had the purpose of testing and treating all febrile individuals with antimalarial medicines. By the late 1970s, the networks had expanded and strengthened and were reorganized to maintain a greater presence in areas with higher malaria risk and burden. At different stages of the country's malaria response, community volunteers have been involved in collecting blood smears, providing treatment, and assisting with data collection and record keeping. Integrated data collection activities ensured the networks remained focused on high-priority areas and activities. Community participation in malaria case detection and treatment helps to ensure the experiences and needs of high-priority populations are considered in malaria programmes and activities. In 1992, community volunteers diagnosed 90% of malaria cases detected in the country. In 2021, the country received WHO certification for being malaria-free for three consecutive years. As malaria in El Salvador abates, the role of community volunteers is being expanded from malaria diagnosis and surveillance to include other infectious diseases.

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6

Social determinants of health

6. Social determinants of health

The social determinants of health, including economic, political, environmental, cultural and commercial determinants of health, have major impacts on people's health, including outcomes related to HIV, TB and malaria. At the population level, social determinants of health include factors related to the health system and broader markers of development. The health of a population, in turn, also affects aspects of development.

This chapter explores social determinants of health in the context of HIV, TB and malaria. It introduces the topic, and assesses the associations between HIV, TB and malaria burden and selected social determinants of health. Conclusions and recommendations are then offered.

6.1 Social determinants of health

Social determinants of health refer to the set of conditions in which people are born and where they grow, live, work and age *(1)*. Complex social and political circumstances result in structural conditions, which in turn have implications for health inequalities. For example, low levels of essential health service coverage or primary school completion, and high levels of income inequality, gender inequality or poverty may indirectly contribute to a higher burden of disease through downstream impacts on health behaviours, health service use and direct impacts on health status. These are not completely understood but are likely to be mediated through stress physiological pathways *(2)*.

Action on the social determinants of health benefits from multisectoral and intersectoral collaboration across a range of actors to address health and well-being challenges that emanate from non-health sectors, and to enhance policy coherence and governance for health *(3)*. To this end, the 2030 United Nations Agenda for Sustainable Development emphasizes the integrated and indivisible nature of health and development and calls for intersectoral action to sustainably improve conditions that affect human health *(4)*.

Global initiatives to end the epidemics of AIDS, TB and malaria increasingly recognize the important role of strong underlying health systems and health-enriching environments. The Global Fund Strategy 2017–2022 invests more than US$ 1 billion annually to build resilient and sustainable systems for health (Box 6.1). This includes

BOX 6.1. Community and health systems strengthening

Building strong and resilient community systems and health systems helps to promote enabling and responsive environments for health and ensure more people have access to the health services they need. Community systems strengthening refers to the development of informed, capable and coordinated communities that work to achieve improved health through their involvement in the design, delivery, monitoring and evaluation of services and activities for health, including HIV, TB and malaria *(7)*. Resilient health systems are necessary for countries to progress towards universal health coverage and are the foundation of effective, efficient and sustainable responses to HIV, TB, malaria and other health threats *(8)*.

The Global Fund Strategy 2017–2022 commits to investing in community and health system strengthening *(6)*. It identifies seven operational objectives:

- strengthen community responses and systems;
- support reproductive, maternal, newborn, child and adolescent health and platforms for integrated service delivery;
- strengthen global and national procurement and supply chain systems;
- leverage critical investments in human resources for health;
- strengthen data systems for health and countries' capacities for analysis and use;
- strengthen and align to robust national health strategies and national disease-specific strategic plans;
- strengthen financial management and oversight.

The post-2022 Global Fund Strategy will maintain a focus on community engagement ("maximizing the engagement and leadership of most affected communities to leave no one behind") and health systems ("maximizing people-centered integrated systems for health to deliver impact, resilience and sustainability") *(9)*.

activities such as training and supporting community health workers; helping policy-makers identify and address the root causes of human rights and gender barriers; mobilizing domestic resources for health; and strengthening data systems and data use *(5, 6)*.

Within disease-specific programmes, multisectoral entry points to support improved outcomes have gained attention. In the UNAIDS *Getting to zero inequity* report, the vision of reaching zero new HIV infections, zero discrimination and zero AIDS-related deaths is pursued through working with other sectors to focus on stigma, discrimination, criminalization, gender inequality and other social determinants of health relevant to the response to HIV and AIDS *(10)*.

The WHO Multisectoral Accountability Framework for TB defines the commitments, actions, monitoring and reporting processes and review mechanisms for multisectoral government and stakeholder engagement at global, regional and country levels *(11)*.

The Roll Back Malaria Action and Investment to Defeat Malaria 2016–2030 Framework positions tackling malaria as part of a wider health and development agenda, citing how the reduction of malaria contributes to greater productivity and growth, reduced poverty, women's empowerment and stronger health systems *(12)*.

A wide range of upstream social determinants play a role in setting the course of the HIV, TB and malaria epidemics. For example, laws and policies that promote and protect human rights can help to benefit the well-being of people living with HIV and lower the risks for key populations at risk of HIV infection *(13)*. Punitive or non-supportive laws reinforce stigma and discrimination, and people may be prevented from accessing and using health services that are vital to protecting their health and ending the AIDS epidemic. In 92 of 151 reporting countries, there are laws that criminalize HIV transmission, non-disclosure or exposure, which deters people from talking openly about their HIV-positive status or using available HIV testing and treatment services *(13)*. Gender equality, gender-based violence, access to education, employment conditions and social protection mechanisms also have important indirect implications for HIV *(13)*.

The global TB burden would be reduced greatly by accelerating efforts to end extreme poverty and expand social protection coverage in line with the targets for SDG 1. According to an analysis of data from 192 countries, achieving these targets would result in a reduction of TB incidence by 84.3% by 2035 *(14)*. There is a long history of non-pharmaceutical interventions on the social environment to control TB. The experience of TB reduction in the United Kingdom in the nineteenth century, before the availability of chemotherapeutic agents for the disease, formed the basis for Thomas McKeown's work and hypotheses on the importance of social medicine *(15)*.

Achieving universal health coverage, specified as part of target 3.8 of SDG 3, would also have benefits for the provision of TB care and prevention services, and is important to sustaining an end to the epidemic *(16)*. The progressive realization of universal health coverage requires expanding essential health services alongside the alleviation of financial hardship.

The malaria epidemic is most pronounced in countries with worse development indicators. For instance, over 80% of cases occur in countries with low human development scores (based on an index of health, education and standard of living indicators), while less than 1% of cases are in countries with very high human development scores (recognizing that climatic environment has a role to play) *(17)*. Around 75% of cases occur in countries with low or very low governance effectiveness scores *(17)*. The performance of the health system may also serve as a determinant of malaria burden (noting that countries with lower malariogenic potential[1] may in turn have stronger health systems). Three quarters of cases of malaria occur in countries where health expenditure as a percentage of gross domestic product (GDP) is 5% or less *(17)*. In an assessment of 105 countries with cases of malaria between 2000 and 2016, countries with stronger health systems (based on a scoring of the

[1] Malariogenic potential refers to the risk of importation in areas receptive to transmission.

six WHO health systems building blocks) tended to have larger reductions in malaria incidence *(18)*.

Although trends are evident across countries, the extent to which given social determinants of health and health-related risk factors contribute to the burden of disease varies by country and disease. Across 30 countries with high TB burden, the number of TB cases attributed to five health-related risk factors (alcohol use disorders, diabetes, HIV infection, smoking, undernourishment) was variable. For instance, in Pakistan, the greatest number of TB cases was attributed to undernourishment, whereas in South Africa, the largest number of TB cases was attributed to HIV infection *(19)*. Countries with stronger health systems tended to make greater progress in reducing malaria, but there were no apparent patterns in which components of the health system were most important, suggesting the need for context-specific strategies tailored to the characteristics of the country *(18)*.

Despite the evidence on the importance of acting on social determinants to tackle the HIV, TB and malaria epidemics, and the increasing recognition and investment for doing so, such efforts still remain marginal and poorly funded compared with support for vertical programmes. The SDG 3 targets for elimination of the three diseases are unachievable without assigning dramatically greater attention to social determinants and inequities within affected populations. Work remains to be done to scale up a social determinants approach to the control and elimination of these diseases.

6.2 Disease burden and social determinants of health analysis

6.2.1 Approach

Assessing associations between health indicators and social determinants of health across countries can reveal avenues for further study. Analyses for this report systematically examined correlations between disease incidence and mortality indicators and selected social determinants of health indicators (Table 6.1). The selection of relevant social determinants of health was informed by a literature review, existing monitoring frameworks, and consultation with experts. Sixteen relevant indicators were selected to address a range of social determinants of health, encompassing demographic characteristics, environmental quality, livelihoods and skills, health system coverage and inputs, health outcomes and risk factors, and social and economic inclusion. The metadata for the indicators are available in Annex 7.

The analysis investigated relationships between HIV, TB and malaria burden indicators and single determinant indicators using bivariate correlation analysis. For more detailed information about the methods used in this analysis, refer to Annex 5.

ADDITIONAL RESOURCES FOR DATA EXPLORATION, INCLUDING INTERACTIVE VISUALS AND DATA, ACCOMPANY THE REPORT (see https://www.who.int/data/health-equity/report_2021_hiv_tb_malaria).

TABLE 6.1. HIV, tuberculosis (TB) and malaria incidence and mortality and social determinants of health indicators included in correlation analyses

	Indicator
HIV, TB and malaria incidence and mortality	HIV incidence (new infections per 1000 population) AIDS-related mortality (deaths per 1000 population) TB incidence (new infections per 100 000 population) TB mortality (deaths per 100 000 population) Malaria incidence (cases per 1000 population at risk) Malaria mortality (deaths per 1000 population at risk)
Social determinants of health	Demography: • Average annual rate of population change (%) • Net migration rate Environmental quality: • Population with primary reliance on clean fuels and technology (%) Livelihoods and skills: • GDP per capita, PPP (current international $) • Population living in slums (%) • Poverty headcount ratio at international $1.90 a day (2011 PPP) (% of population) • Primary school completion rate (%) Health system coverage and inputs: • Government health expenditure per capita, PPP (international $) • Universal health coverage service coverage index[a] Health risk factors: • HIV incidence (new infections per 1000 population)[b] • Mortality rate attributed to cardiovascular disease, cancer, diabetes or chronic respiratory disease (%) • Prevalence of undernourishment (%) • Total alcohol per capita consumption in people aged ≥ 15 years (litres of pure alcohol) Social and economic inclusion: • Gender inequality index[c] • Gini index for income inequality • Inequality-adjusted human development index

GDP: gross domestic product; PPP: purchasing power parity.

[a] The universal health coverage service coverage index is made up of 14 tracer indicators related to reproductive, maternal, newborn and child health; infectious diseases; noncommunicable diseases; and service capacity and access. HIV, TB and malaria indicators (1 per disease, relating to prevention or treatment) comprise 3 of the 14 tracer indicators.

[b] HIV incidence was considered in the analysis of TB burden only.

[c] The Gender inequality index covers five indicators related to reproductive health, empowerment and economic status.

6.2.2 Results

6.2.2.1 HIV

HIV incidence and AIDS-related mortality are significantly associated with a number of social determinants of health (Table 6.2). The strength of these associations was variable. A comprehensive table of results is available in Annex 6.

The relationship between HIV incidence and the Gini index for income inequality is illustrated in Fig. 6.1. Based on data from 80 countries, as income inequality is more pronounced, countries tend to have higher HIV incidence (statistically significant based on *P* value < 0.001). This association remains significant and is more pronounced for a subset of 24 countries from the WHO African Region, highlighted in Fig. 6.1.[1] The five countries with the highest national HIV incidence (2–6 cases per 1000 population) all had a Gini index value of 45 or higher and are located in the southern part of the WHO African Region (Botswana, Eswatini, Lesotho, Mozambique, Namibia). Eight countries, however, had elevated Gini index values of 45 or higher alongside low HIV incidence of less than 0.5 cases per 1000 population, including one country in the WHO African Region (Benin).

Links between HIV and income inequality at the national level have been previously established, although explanations for the reasons behind this association are inconclusive *(20–22)*. One hypothesis suggests income inequality may lead to HIV through economic conditions that perpetuate risky sexual behaviours. Others have suggested this relationship may persist due to reduced social capital, poor public sector performance in

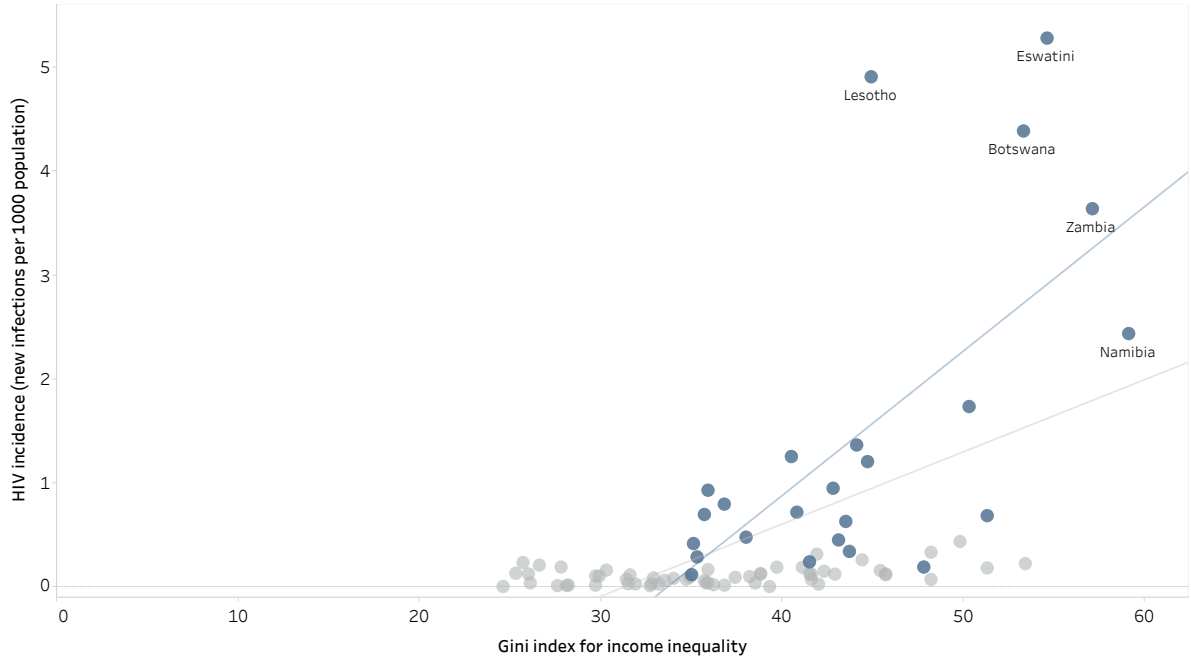
[1] The analysis here does not consider other aspects of economic development such as GDP, for which higher levels of economic development can be related to high income inequality in some countries, such as Botswana, Eswatini and Namibia.

TABLE 6.2. Associations between HIV incidence and AIDS-related mortality (2020) and selected social determinants of health indicators (2015–2020)

		HIV incidence		AIDS-related mortality	
Category	Social determinant of health indicator	Number of countries	Correlation coefficient	Number of countries	Correlation coefficient
Demography	Average annual rate of population change (%)	130	0.17*	131	0.24*
Livelihoods and skills	GDP per capita, PPP (current international $)	125	−0.21*	126	−0.24*
	Poverty headcount ratio at international $1.90 a day (2011 PPP) (% of population)	80	0.38**	80	0.41**
	Primary school completion rate (%)	106	−0.12	107	−0.28*
Health system coverage and inputs	Government health expenditure per capita, PPP (international $)	127	−0.18*	128	−0.22*
	Universal health coverage service coverage index[a]	130	−0.22*	131	−0.33**
Social and economic inclusion	Gender inequality index	120	0.28*	120	0.34**
	Gini index for income inequality	80	0.54**	80	0.50**
	Inequality-adjusted human development index	112	−0.32**	112	−0.40**

GDP: gross domestic product; PPP: purchasing power parity.
* *P* value < 0.05.
** *P* value < 0.001.
[a] The universal health coverage service coverage index is made up of 14 tracer indicators related to reproductive, maternal, newborn and child health; infectious diseases; noncommunicable diseases; and service capacity and access. The HIV indicator "percentage of people living with HIV currently receiving antiretroviral therapy" comprises 1 of the 14 tracer indicators.

FIG. 6.1. Association between HIV incidence (2020) and Gini index (2015–2020) in 80 countries, with 24 World Health Organization (WHO) African Region countries highlighted



Each country on the graph is represented by one circle. Countries in the WHO African Region appear in blue and all other countries in grey. The solid lines show the line of best fit across data points (overall association between the two variables) for the global set of countries (grey line) and the WHO African Region countries (blue line).

Source: UNAIDS/UNICEF/WHO 2021 and World Bank DataBank.

delivering social services, or colonial histories (especially in countries in southern Africa) that have resulted in circumstances simultaneously affecting both income inequality and HIV outcomes *(20)*. In a previous study of 29 African countries, the impacts of income inequality on HIV prevalence were found to be more detrimental for poorer subgroups, with marriage providing some protection for poor households and rural residence providing less protection for poor households *(22)*.

The correlation analysis in this report suggested positive associations between poverty and HIV incidence and poverty and AIDS-related mortality. However, previous studies have explored the patterns and complexities of the relationship between economic status and HIV indicators, demonstrating substantial variation in the strength and nature of these associations across countries and their explanatory factors *(22, 23)*. For instance, in an analysis of countries in Africa, greater wealth was associated with increased HIV prevalence in the majority of countries *(23)*.

The cycle of poverty and HIV, however, has been established *(24, 25)*. Poverty is a distal structural factor linked to increased vulnerability to HIV through multiple pathways. For example, situations of poverty may lead people to migrant labour practices, which in turn erode social cohesion and result in disrupted family structures, food insecurity, concurrent and multiple partner relationships and transactional sex *(26)*. HIV may in turn contribute to poverty, as families affected by HIV may rely on financial coping strategies that reduce the economic capacity of the household, such as selling productive assets, depleting household savings, obtaining loans, or removing children from school *(27)*. Conditional cash transfer programmes have

been explored as an intervention to address poverty and HIV, with mixed success depending on the priority population, programme design and context. For example, in Malawi, monetary transfers resulted in HIV protective behaviours among women but not men *(28)*.

6.2.2.2 TB

Across countries, TB incidence and mortality rates demonstrate significant associations with a range of health determinants (Table 6.3). A comprehensive table of results is available in Annex 6.

Figure 6.2 illustrates the relationship between TB mortality and the universal health coverage service coverage index. Across 193 countries, TB mortality tended to decrease as the coverage of essential health services increased. The relationship between these two indicators at the national level varied across countries, however. Countries such as the Central African Republic and Chad had similarly low universal health coverage service coverage index values of around 30%, with a substantially lower TB burden in Chad (22 deaths per 100 000 population) than the Central African Republic (91 deaths per 100 000 population).

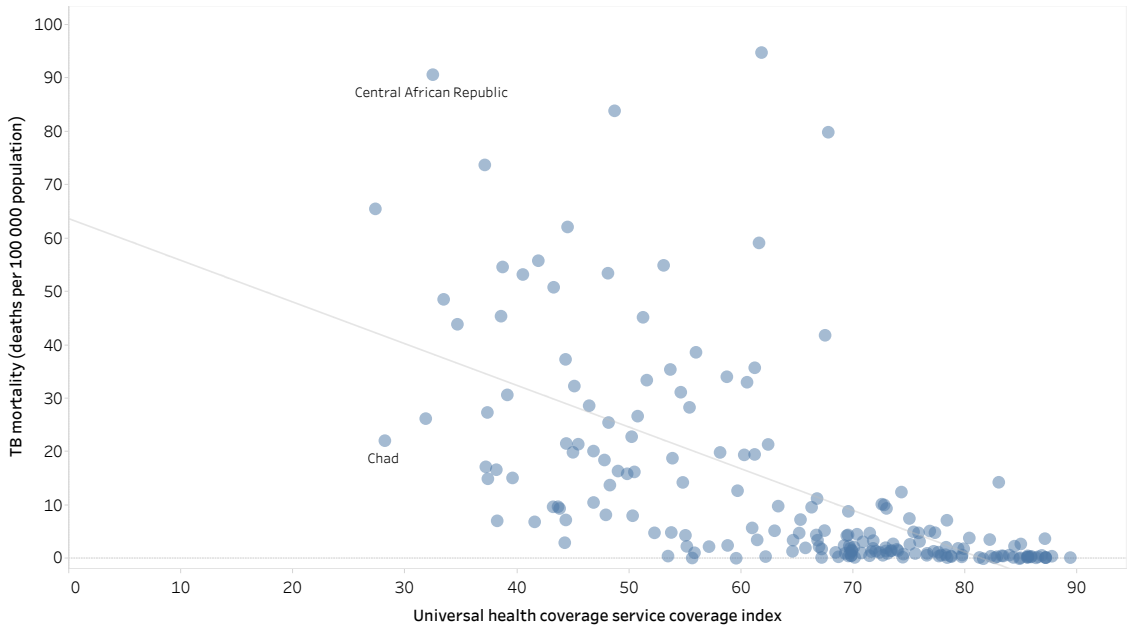
TB incidence and mortality indicators are consistent and reliable predictors of universal health coverage service coverage, especially in low-income countries,

TABLE 6.3. Associations between tuberculosis (TB) burden (2020) and selected determinants of health indicators (2015–2020)

		TB incidence		TB mortality	
Category	Determinant of health indicator	Number of countries	Correlation coefficient	Number of countries	Correlation coefficient
Demography	Average annual rate of population change (%)	193	0.35**	193	0.37**
Environmental quality	Population with primary reliance on clean fuels and technology (%)	189	−0.56**	189	−0.57**
Livelihoods and skills	GDP per capita, PPP (current international $)	184	−0.45**	184	−0.43**
	Poverty headcount ratio at international $1.90 a day (2011 PPP) (% of population)	113	0.45**	113	0.55**
	Primary school completion rate (%)	154	−0.28**	154	−0.35**
Health system coverage and inputs	Government health expenditure per capita, PPP (international $)	189	−0.42**	189	−0.39**
	Universal health coverage service coverage index[a]	193	−0.56**	193	−0.59**
Health risk factors	HIV incidence (new infections per 1000 population)	132	0.56**	132	0.35**
	Mortality rate attributed to cardiovascular disease, cancer, diabetes or chronic respiratory disease (%)	183	0.51**	183	0.41**
	Prevalence of undernourishment (%)	150	0.59**	150	0.59**
	Total alcohol per capita consumption in adults aged ≥ 15 years (litres of pure alcohol)	187	−0.24*	187	−0.26**
Social and economic inclusion	Gender inequality index	162	0.55**	162	0.58**
	Gini index for income inequality	113	0.35**	113	0.32**
	Inequality-adjusted human development index	150	−0.57**	150	−0.59**

GDP: gross domestic product; PPP: purchasing power parity.
* *P* value < 0.05.
** *P* value < 0.001.
[a] The universal health coverage service coverage index is made up of 14 tracer indicators related to reproductive, maternal, newborn and child health; infectious diseases; noncommunicable diseases; and service capacity and access. The TB indicator "percentage of incident TB cases detected and successfully treated" comprises 1 of the 14 tracer indicators.

FIG. 6.2. Association between tuberculosis (TB) mortality (2020) and universal health coverage service coverage index in 193 countries (2019)



Each country on the graph is represented by one circle. The solid line shows the line of best fit across data points (overall association between the two variables).
Source: World Health Organization Global TB Programme and World Health Organization Global Health Observatory.

highlighting the important relationship between these two variables *(29)*. Accelerating progress towards universal health coverage and embedding national TB programmes within the pathway to universal health coverage are part of creating an enabling environment to end TB *(16)*. Strengthening the overall capacity of the health system increases its ability to scale up key strategies to reach high-risk populations and provide universal access to TB testing and treatment. Possible ways that income inequality may impact TB outcomes stem from large numbers of people engaging in high-risk health behaviours and having limited access to health care *(30)*. Long-term strategies to reduce TB could be strengthened by integrating complementary actions to address these broader factors that put populations at risk for TB *(31)*.

6.2.2.3 Malaria

Malaria incidence and mortality were significantly associated with determinants of health related to demography, environmental quality, livelihoods and skills, health system coverage and inputs, health outcomes and risk factors, and social and economic inclusion (Table 6.4). A comprehensive table of results is available in Annex 6.

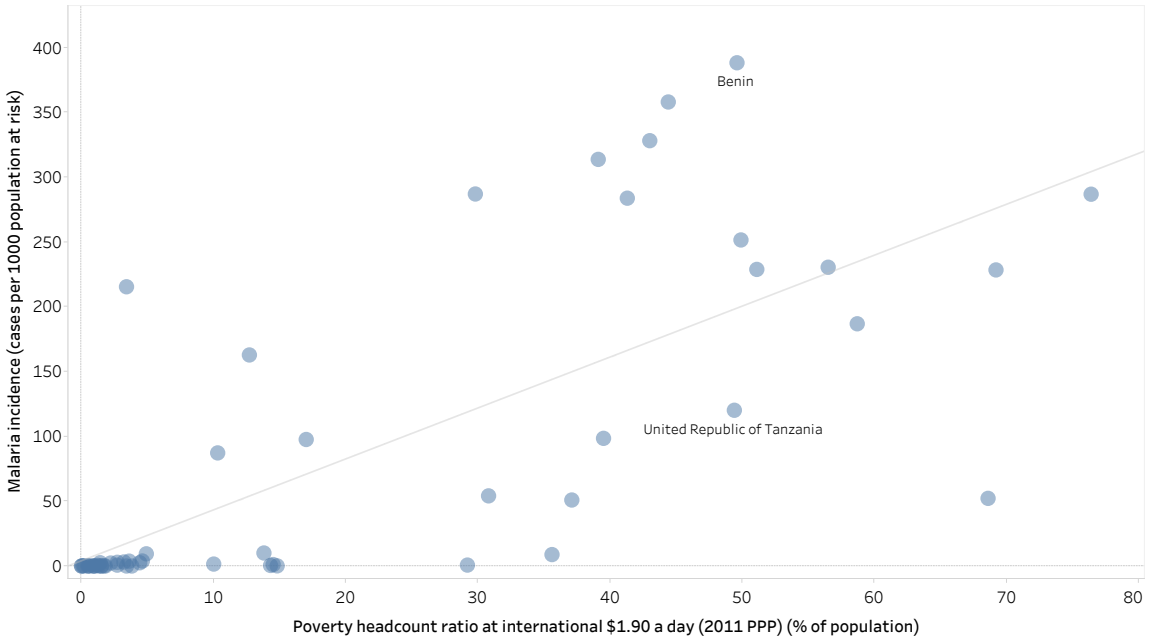
The relationship between malaria burden and poverty was positive, such that countries with higher levels of malaria tended to also have more poverty (Fig. 6.3). In Benin and the United Republic of Tanzania, where half of the population lived in poverty, malaria incidence was more than three times higher in Benin than the United Republic of Tanzania (388 and 120 cases per 1000 population, respectively). Among countries with lower malaria incidence (10 or fewer cases per 1000 population), the poverty rate ranged from 0% to 36%.

TABLE 6.4. Associations between malaria burden (2020) and selected determinants of health indicators (2015–2020)

		Malaria incidence		Malaria mortality	
Category	Determinant of health indicator	Number of countries	Correlation coefficient	Number of countries	Correlation coefficient
Demography	Average annual rate of population change (%)	98	0.60**	93	0.57**
Environmental quality	Population with primary reliance on clean fuels and technology (%)	98	−0.61**	93	−0.60**
Livelihoods and skills	GDP per capita, PPP (current international $)	98	−0.41**	89	−0.41**
	Population living in slums (%)	84	0.52**	79	0.55**
	Poverty headcount ratio at international $1.90 a day (2011 PPP) (% of population)	55	0.74**	53	0.71**
	Primary school completion rate (%)	77	−0.69**	75	−0.71**
Health system coverage and inputs	Government health expenditure per capita, PPP (international $)	95	−0.42**	91	−0.41**
	Universal health coverage service coverage index[a]	98	−0.66**	93	−0.68**
Health outcomes and risk factors	Mortality rate attributed to cardiovascular disease, cancer, diabetes or chronic respiratory disease (%)	98	0.23*	93	0.20
	Prevalence of undernourishment (%)	78	0.32*	74	0.31*
Social and economic inclusion	Gender inequality index	84	0.56**	79	0.61**
	Inequality-adjusted human development index	82	−0.68**	79	−0.72**

GDP: gross domestic product; PPP: purchasing power parity.
* *P* value < 0.05.
** *P* value < 0.001.
[a] The universal health coverage service coverage index is made up of 14 tracer indicators related to reproductive, maternal, newborn and child health; infectious diseases; noncommunicable diseases; and service capacity and access. The malaria indicator "percentage of population in malaria-endemic areas in countries with high malaria burden who slept under an insecticide-treated net the previous night" comprises 1 of the 14 tracer indicators.

FIG. 6.3. Association between malaria incidence (2020) and poverty headcount ratio in 55 countries (2015–2020)



PPP: purchasing power parity.
Each country on the graph is represented by one circle. The solid line shows the line of best fit across data points (overall association between the two variables).
Source: World Health Organization and World Bank DataBank.

There are multiple complex pathways that establish malaria as both a consequence and a cause of poverty *(32, 33)*. Poverty may put populations at risk for malaria when there are insufficient resources for preventive measures (insecticide-treated nets, indoor residual spraying), when malaria control programmes are underfunded, or when there are low levels of general development or environmental management (e.g. precarious housing, undrained swamplands, rural settlements). At the household level, the association between poverty and malaria may be influenced by housing quality, food security, treatment-seeking behaviour, access to health care, occupational exposures and other factors *(34)*. Malaria in turn may have an impact on economic growth and household wealth. For example, in 2018, malaria incidence was 68 times higher in low-income countries than in upper-middle-income countries *(35)*. Households may have additional expenses for malaria treatment, and people with malaria may incur financial losses due to missed work, especially in contexts with no or inadequate health insurance or social protection.

6.3 Discussion

These findings on inequities in the HIV, TB and malaria epidemics confirm the need to scale up efforts to strengthen health systems to deliver essential treatment and preventive services and to address relevant social determinants. Ending the epidemics means ensuring services are available to all, but especially disadvantaged populations. This requires following through on commitments to primary health care and the progressive realization of universal health coverage, and supportive action to address broader determinants of health. Actions to improve the underlying conditions that make groups vulnerable to HIV, TB and malaria are an important part of long-term strategies to end these epidemics.

An equity orientation to health system strengthening includes ensuring essential medicines, health products and well-maintained medical equipment are distributed in a timely manner and are available in the most disadvantaged areas of a country. Adequate numbers of appropriately trained human resources for health should be equitably deployed across countries to meet the needs of the most disadvantaged subgroups. Service delivery approaches may need to be tailored to overcome geographical, cultural and other barriers. Community health workers, adequately supported, supervised and remunerated, have shown their ability to play a vital role in delivering essential services to disadvantaged communities (e.g. through the integrated community case management programme), and their role can be scaled up in many contexts.

Supportive health policy and arrangements should aim to reduce the financial burden of health services and eliminate catastrophic expenditures. Governance mechanisms for health equity may include national platforms for social participation to reinforce the linkages between health and other social protection sectors, thereby providing integrated assistance for households experiencing multidimensional poverty. With poverty and income inequality on the rise, governments require coherent policy approaches and financing arrangements to avoid fragmentation of health services. A first step is to understand the extent to which financial barriers related to HIV, TB and malaria affect different subgroups.

Primary health care and universal health coverage, and indeed the role of the health sector, are only a partial solution to reducing inequities in outcomes for HIV, TB and malaria and to ending the epidemics. A social determinants approach is integral to support and sustain elimination efforts and should be adequately funded and implemented. Such an approach includes investments in development to transform the living conditions of populations who are disadvantaged through poverty reduction and social protection mechanisms; improvements in housing and energy supply; better education and nutrition; and reductions in socioeconomic inequality.

Underpinning this approach must also be a commitment to combat systematic discrimination, such as racism, sexism and casteism, which drive and exacerbate inequities in social determinants and health outcomes. Progressive realization of essential health services and renewed efforts to tackle bias, with an explicit equity

focus to prioritize those groups worst off, are fundamental to reducing inequities and to achieving the interrelated SDG targets. Addressing social determinants of health complements successful health sector interventions to reduce inequities in the three epidemics. Improvements in social determinants and reductions in systematic discrimination directly reduce risk of infections and also increase use of essential health service interventions.

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7

Conclusion

7. Conclusion

This report represents the first comprehensive and systematic assessment of inequalities in these diseases globally. Covering 32 health indicators and 6 dimensions of inequality, the report presents the analysis of the latest situations of inequality for up to 186 countries and quantifies how the latest level of inequality compares with that a decade earlier. An additional analysis explores the associations between disease incidence and mortality indicators and social determinants of health.

Unsurprisingly, there are inequalities between population subgroups within countries for most HIV, TB and malaria indicators. The poorest, least educated and rural subgroups are at a disadvantage across most HIV, TB and malaria indicators, although sex- and age-related inequalities were also evident in some indicators. In most cases, despite improving national averages, the overall latest situation of inequality has not narrowed over the past decade. Evidence from previous studies of key and underserved populations (not included in this analysis due to data unavailability) underscores the challenges and barriers experienced by groups such as men who have sex with men, transgender people, people who inject drugs, sex workers, people in prison and other closed settings, people living with HIV, migrants, refugees, internally displaced people, and indigenous populations.

Other findings, however, point to situations of low inequality or where interventions achieved higher coverage in historically disadvantaged populations. Examples of initiatives to tackle inequities, and the potential impact possible by eliminating unfair and remediable inequality, shed light on a possible way forward, harnessing evidence about inequalities to develop and implement differentiated policy and programme responses.

Although this global analysis does not explain why inequalities exist (further explorations using different analysis approaches and data are needed for this), the findings serve as an evidence base to help inform equity-oriented action to end the epidemics of AIDS, TB and malaria, and to strengthen health inequality monitoring. Opportunities for strengthened inequality monitoring in HIV, TB and malaria, and relevant social determinants of health, are highlighted throughout the report, yielding four overarching recommendations.

First, inequality monitoring should be integrated into global and national goals, indicators and targets, and thereby included in health performance assessments of HIV, TB and malaria. This entails tracking inequalities in key indicators of HIV, TB and malaria, and their national (or overall) averages. Including inequality indicators in global and national strategies establishes a strong impetus for regular health inequality monitoring and the development of accountability mechanisms for reducing inequalities and tackling inequities. For example, in the area of childhood immunization, the WHO Global Vaccine Action Plan includes equity indicators (related to the percentage of districts with less than 80% immunization coverage, and gaps in coverage between the lowest and highest wealth quintiles), which are tracked over time to meet specified targets.

Second, more and better data are required to address gaps in inequality monitoring. The analyses in this report demonstrate the wide variability in the potential of inequality monitoring across topics. The ability to assess inequalities in disease incidence and mortality is limited by a lack of information about multiple dimensions of inequality. Depending on the relevance of the dimensions of inequality across settings, these types of exploration may be appropriately undertaken at the regional, national or subnational level. For TB indicators in particular, the number of countries with available disaggregated data was low because data were not collected, data were collected but not publicly available, or data were of poor quality. For key and underserved populations, who may be largely underrepresented in routine data collection activities, issues related to the

poor quality and lack of comparability across contexts precluded any multi-country inequality analysis. Expanding the availability of disaggregated data across health indicators is an opportunity to facilitate a better understanding of how these diseases affect population subgroups. This may be done by routinely collecting data about multiple dimensions of inequality or by improving the ability of the health information system to link health data with dimensions of inequality data from different data sources. Sources such as household surveys, where many of the data for this report were sourced, remain important to collect information about populations who do not have access to health services.

Third, inequality analysis and reporting should be done regularly and across global, national and subnational levels. The findings of this first comprehensive global report on inequalities in HIV, TB and malaria highlight concerning situations of inequality, some of which have remained unchanged or worsened over the past decade. Routine analysis and reporting of inequalities can help to show how inequalities change over time and serve as an input for designing and implementing equity-oriented policies, programmes and practices. Therefore, comprehensive assessments of inequalities in HIV, TB and malaria at multiple levels should be integrated into regular monitoring and evaluation activities.

Fourth, inequality monitoring should be complemented by quantitative and qualitative studies. The analysis of inequalities according to a broad range of dimensions of inequality, also taking into account intersecting and compounding forms of vulnerability, is needed to illustrate the diverse ways that inequities in these diseases manifest in populations. The quantitative findings that emerge from health inequality monitoring should be considered alongside qualitative and quantitative studies and other sources of knowledge about the context. This provides a nuanced understanding of the state of inequality in a given setting and can help to inform impactful solutions to tackle inequities. In this report, an extensive literature review accompanies the results of health inequality monitoring to give background and context to the findings of the inequality analyses. Inequality monitoring and subsequent quantitative and qualitative in-depth inequality studies can lend insight into whether interventions are successfully narrowing gaps between subgroups, and where further efforts are needed.

Overall, tackling inequities is key to accelerating progress towards the SDGs for HIV, TB and malaria. Impressive achievements in lowering the burden of these diseases over the past two decades demonstrate the power of collective global efforts. Monitoring inequalities in HIV, TB and malaria as part of forthcoming efforts is essential to identify where action is most needed, and to determine how policies, programmes and practices can be targeted to accelerate the end of these epidemics.

ANNEX 1
Glossary

Absolute inequality
Magnitude of difference in health between subgroups. Absolute measures of inequality, such as absolute difference, retain the same unit of measure as the health indicator.

Antimalarial medicine
Pharmaceutical product used in humans for the prevention, treatment or reduction of transmission of malaria.

Antiretroviral therapy
Treatment for HIV that is highly active in suppressing viral replication, reducing the amount of virus in the blood to undetectable levels and slowing the progress of the disease.

Case detection
Activity of surveillance operations, involving searching for cases of disease in a community.

Case notification
Compulsory reporting of all disease cases to an authority such as a health department or national surveillance system, as required by national laws or regulations. For example, case notification of tuberculosis (TB) includes reporting of new and recurrent episodes of TB within the national surveillance system, which is then reported by the national TB programme to the World Health Organization.

Change over time
In the context of health inequality monitoring, a comparison of the situation of inequality at multiple points in time, demonstrating the extent to which inequalities have increased, stayed the same or decreased.

Dimension of inequality
Categorization upon which subgroups are formed for health inequality monitoring, such as sex, economic status, education, place of residence or age. The selection of dimensions of inequality for health inequality monitoring should include categories that are reasonably likely to reflect unfair differences between groups that could be corrected by changes to policies, programmes and practices.

Disadvantaged
Term used in this report to describe populations that have low economic status, low education and precarious employment, among other factors, that typically result in poor health outcomes or compromised access to health services or interventions. Depending on the context, populations may be considered disadvantaged based on factors such as gender, ethnicity, place of residence and sex.

Disaggregated data
Estimates broken down by population subgroups.

Double disaggregation
Filtering data according to two dimensions of inequality simultaneously, such as sex and economic status.

Epidemic
Occurrence of a number of disease cases in excess of that expected in a given place or among a specific group of people during a particular period.

Gender
Social and cultural construct distinguishing the attributes of men and women (or boys and girls) according to normative expectations surrounding their roles and responsibilities, characteristics, aptitudes and likely behaviours (femininity and masculinity).

Health indicators
Indicators that reflect aspects of health that have a standardized definition and can be measured in a comparable manner across settings and over time. Health indicators for a particular topic may include diverse types of health outcomes, interventions, inputs, processes and outputs.

Health inequalities
Observable health differences between subgroups within a population. Health inequalities can be measured and monitored.

Health inequity
Normative concept that describes systematic differences in health between population subgroups deemed to be unjust, unfair and avoidable or remediable. Health inequity is rooted in the unfair distribution of and access to power, wealth and other social resources, and linked to forms of disadvantage that are socially produced, such as poverty, discrimination, and lack of access to services or goods.

Household surveys
Surveys used for health inequality monitoring that collect data from a representative sample of a study population about a variety of health indicators and a range of dimensions of inequality.

Incidence
Number of new cases of a disease occurring in a given year.

Indoor residual spraying
Operational procedure and strategy for malaria vector control involving spraying interior surfaces of dwellings with a residual insecticide to kill or repel endophilic mosquitoes.

Inequality thresholds
Used to report the state of inequality to convey standard interpretations of what is considered to be high, moderate and low inequality. Inequality thresholds may also describe the extent of change in inequality over time (e.g. large, moderate or small changes). To ensure transparent reporting, details should be provided about the bounds of inequality thresholds and how they were determined and applied.

Insecticide-treated mosquito nets
Malaria vector control measure recommended by the World Health Organization that repel, disable or kill mosquitoes that come into contact with the insecticide on the netting material. (Untreated mosquito nets can provide substantial protection against mosquito bites but have less effect against vectorial capacity and transmission rates.)

Intermittent preventive treatment in pregnancy (IPTp)
Full therapeutic course of antimalarial medicine given to pregnant women at routine antenatal visits, regardless of whether the woman has malaria.

Key and underserved populations
In the context of HIV, TB and malaria, populations that are identified based on their increased risk, vulnerability or burden of disease; significantly lower access to relevant services compared with the general population; and frequent human rights violations, systematic disenfranchisement, social or economic marginalization, or criminalization. Key populations in the HIV response include men who have sex with men, transgender people (especially transgender women), people who inject drugs, sex workers and people in prison and detention. Key populations in the TB response may include people in prison and other closed settings, people living with HIV, migrants, refugees and indigenous populations. Underserved populations in the malaria response may include refugees, migrants, internally displaced people, and indigenous populations.

Latest situation of inequality
Assessment of inequality using the latest available data. In this report, latest situation was assessed for the period 2011–2020.

Median
Middle point of a set of ordered numbers; half of the values are higher than the median, and half of the values are lower.

Men who have sex with men
Males who have sex with males (including young males), regardless of whether or not they also have sex with women or have a personal or social gay or bisexual identity. The term includes men who self-identify as heterosexual but who have sex with other men.

Modelled estimates for disease burden
Estimates that draw from different sources of data, information and expertise and use established, standardized methods to produce estimates related to mortality and morbidity that are comparable across settings.

Monitoring
Process of repeatedly observing a situation to watch for changes over time. Monitoring can help to determine the impact of policies, programmes and practices, although monitoring alone cannot typically explain the cause of troublesome trends. It can be thought of as a warning system. Monitoring activities can help to inform and direct research in a given area.

Mortality
Number of deaths caused by a disease in a given year.

Multidrug-resistant tuberculosis
Tuberculosis (TB) disease caused by bacteria resistant to two of the most important medicines – isoniazid (used to prevent TB disease in people with latent TB infection) and rifampicin (often used to treat TB disease and considered a first-line medicine).

Population subgroups
Ways of grouping a population based on a dimension of inequality; for example, population subgroups based on household economic status are commonly grouped as quintiles, ranging from the poorest 20% to the richest 20%.

Prevalence
Proportion of people in a population with a particular disease or attribute at a specified point in time or over a specified period of time.

Relative inequality
Proportional differences in health among subgroups. Relative measures of inequality, such as ratio, are unitless.

Sex
Biological and physiological reality of being female or male. In this report, most of the underlying data sources reported data by biological sex, and therefore sex-related inequalities were described using "female" and "male".

Social determinants of health
Set of conditions, including economic, political, environmental, cultural and commercial factors, in which people are born and where they grow, live, work and age.

Summary measure of inequality
Single number that reflects the level of inequality between two or more subgroups. Summary measures of inequality may indicate absolute or relative inequality and may involve two subgroups (simple measures) or more than two subgroups (complex measures).

Surveillance
Continuous, systematic collection, analysis and interpretation of disease-specific data for use in planning, implementing and evaluating public health practice.

Transgender
Term for people whose gender identity and expression do not conform to the norms and expectations traditionally associated with the sex assigned at birth. This includes people who are transsexual, transgender or otherwise gender nonconforming.

Treatment cascade for HIV
Chain of events involved in a person living with HIV receiving treatment until their viral load is suppressed to undetectable levels. The stages of the HIV treatment cascade are assessed as the number of people living with HIV; the number of people linked to medical care; the number of people who start HIV treatment; the number of people who adhere to their treatment regime; and the number of people who suppress HIV to undetectable levels in the blood.

Underserved populations
see Key and underserved populations.

Vector control
In the context of malaria, measures of any kind against malaria-transmitting mosquitoes, intended to limit their ability to transmit the disease. Ideally, malaria vector control results in reduction of malaria transmission rates, by reducing the vectorial capacity to a point at which transmission is interrupted.

Young people
In this report, people aged 15–24 years.

ANNEX 2
Technical details: HIV

A2.1 Data

A2.1.1 Data sources

Data for the analysis of inequalities in HIV come from two types of sources. For incidence and mortality indicators and the cascade testing and treatment indicators related to the 95–95–95 targets (people living with HIV who know their HIV-positive status, people living with HIV who are on antiretroviral therapy, and people living with HIV who have suppressed viral load), data were obtained from UNAIDS/UNICEF/WHO modelled annual estimates *(1)*.

For all other indicators covering knowledge, attitudes and practices and testing and treatment, data were obtained from AIS and DHS, sourced through the DHS programme STATcompiler tool *(2)*.

A2.1.2 Health indicators

Thirteen HIV indicators were included in the analysis to assess inequalities in three priority populations: the general population, young people aged 15–24 years, and pregnant women. These indicators cover a range of topics, including indicators related to new infections and deaths, knowledge, attitudes and practices, and testing and treatment, and were selected based on data availability and relevance in consultation with programme experts.

New infections and deaths related to HIV were assessed through HIV incidence and AIDS-related mortality. Knowledge, attitudes and practices indicators encompass measures of comprehensive correct knowledge about AIDS; accepting attitudes towards people living with HIV; and use of condom during last high-risk sex in the past 12 months.

The knowledge indicator is a composite indicator reflecting the percentage of the population aged 15–49 years who correctly identify the two major ways of preventing the sexual transmission of HIV (using condoms and limiting sex to one faithful, uninfected partner), who reject the two most common local misconceptions about HIV transmission, and who know that a healthy-looking person can be living with HIV. The attitudes indicator was defined by whether people would buy fresh vegetables from a shopkeeper living with HIV. The practice indicator is condom use at last high-risk sex among people aged 15–49 years; it refers to the last time the person had sex with a non-marital, non-cohabiting partner in the past 12 months. Although indicators related to consistent condom use are subject to recall bias and other biases, these are minimized when referring to the most recent act of non-cohabiting sex.[1]

Testing and treatment cascade indicators included people living with HIV who know their HIV-positive status, people living with HIV on antiretroviral therapy, and people who have suppressed viral load, among all those living with HIV. Three additional testing indicators based on survey data were included: ever being tested for HIV and receiving results (for the general population[2]), tested for HIV and receiving results in the past 12 months (for young people), and tested for HIV during antenatal care (for pregnant women). Whenever possible, indicators were presented for females and males separately.

Detailed descriptions of indicator definitions, data sources and methods of calculation are in Annex 7.

[1] The notion of undetectable = untransmittable (U = U) underscores the possibility for people living with HIV who have an undetectable viral load to have sex without a condom with no risk of transmitting HIV. The promotion of condom use and other combination prevention strategies remains a key part of the HIV response and sexual and reproductive health programming more generally *(3)*.

[2] Indicators for HIV testing and receiving results capture testing during pregnancy, which is likely to contribute to higher testing among females.

A2.1.3 Dimensions of inequality

Disaggregated data were available for up to five inequality dimensions: sex, economic status, education, place of residence and age (Table A2.1). For indicators based on modelled annual estimates, the analysis focused on sex-related inequalities only. Sex refers to the biological sex (female or male), as this is how data were collected and reported in the sources. (The lack of data availability reflecting diverse gender identities is a limitation.) For indicators based on surveys, additional inequality dimensions were explored, including economic status, education, place of residence and age. Whenever possible, inequalities were shown separately for females and males.

Economic status was determined at the household level using a wealth index. This is a composite measure of a household's cumulative living standard based on ownership of household assets and access to utility services. It is constructed using principal component analysis and used to divide household populations into five groups (wealth quintiles) within each country.

Education reflects the highest level of education attained by the person and is categorized in two subgroups: no or primary education, and secondary or higher education.

Place of residence specifies the location of the household (rural or urban). Criteria to categorize rural and urban areas were country-specific and subject to variation across countries and over time.

A2.1.4 Study countries

Data analysis was conducted in WHO Member States with available data for the selected HIV indicators (see Table A2.9). The analysis of inequalities included 141 countries with health indicator data available for all subgroups of at least one inequality dimension. In each country, the year of available data varied depending on the indicator and data source. For indicators based on UNAIDS/UNICEF/WHO estimates, sex-disaggregated data for the analysis of latest situation and change over time were available in most (137 of 141) countries. For indicators sourced from survey data, information for the latest situation was available in 57 countries, and for change over time in 44 countries. In addition, results for a subset of 17 Global Fund high-burden or high-funding priority countries were highlighted (where possible, according to data availability and relevance).

For modelled annual estimates, the latest situation looks at 2020 in most countries. In 28 countries, modelled estimates for some indicators (mainly testing and treatment indicators) were not available for 2020, and data from an earlier year were included (mostly 2019). For data from AIS and DHS, the latest situation was assessed based on the most recent data from 2011–2020.

For modelled annual estimates, change over time analysis looks mainly at the change between 2010 and 2020. Based on data availability, change over time for a few modelled estimates was assessed using alternative years for the latest situation, including 2019, 2018, 2017, 2016 and 2015. For survey indicators, change over time

TABLE A2.1. Inequality dimensions and subgroups for HIV analysis

Inequality dimension	Subgroups
Sex	Two subgroups: females and males
Economic status	Five subgroups: from quintile 1 (poorest 20% of population) to quintile 5 (richest 20% of population)
Education	Two subgroups: no or primary education, and secondary or higher education
Place of residence	Two subgroups: rural and urban
Age	Four subgroups (for the general population and pregnant women): age 15–19 years, 20–29 years, 30–39 years and 40–49 years Two subgroups (for young people): age 15–19 years and 20–24 years

TABLE A2.2. Overview of disaggregated data used for HIV analysis

				Inequality dimension					Countries with available data	
Population	Category	Indicator	Source	Sex	Economic status	Education	Place of residence	Age	Latest situation[a]	Change over time[b]
General population	Incidence and mortality[c]	HIV incidence (new infections per 1000 population)	UNAIDS/ UNICEF/WHO	✔					130	130
		AIDS-related mortality (deaths per 1000 population)	UNAIDS/ UNICEF/WHO	✔					131	130
	Knowledge, attitudes and practices	Comprehensive correct knowledge about AIDS (%)	AIS, DHS	✔					50	32
		• Females	AIS, DHS		✔	✔	✔	✔	53	41
		• Males	AIS, DHS		✔	✔	✔	✔	49–50[d]	30–32[d]
		Accepting attitudes (would buy fresh vegetables from shopkeeper living with HIV) (%)	AIS, DHS	✔					50	36
		• Females	AIS, DHS		✔	✔	✔	✔	54–55[d]	41
		• Males	AIS, DHS		✔	✔	✔	✔	48–50[d]	34–36[d]
		Condom use at last high-risk sex (%)	AIS, DHS	✔					44	31
		• Females	AIS, DHS		✔	✔	✔	✔	36–43[d]	25–33[d]
		• Males	AIS, DHS		✔	✔	✔	✔	41–44[d]	28–34[d]
	Testing and treatment	People living with HIV who know their HIV-positive status (%)	UNAIDS/ UNICEF/WHO	✔					121	
		People living with HIV on antiretroviral therapy (%)	UNAIDS/ UNICEF/WHO	✔					128	
		People living with HIV with suppressed viral load (%)	UNAIDS/ UNICEF/WHO	✔					93	
		Testing for HIV and receiving results (ever) (%)	AIS, DHS	✔					48	29
		• Females	AIS, DHS		✔	✔	✔	✔	52	34
		• Males	AIS, DHS		✔	✔	✔	✔	47–48[d]	30
Young population	Knowledge, attitudes and practices	Comprehensive correct knowledge about AIDS among young people (%)	AIS, DHS	✔					43	27
		• Females	AIS, DHS			✔	✔	✔	46–47[d]	35–36[d]
		• Males	AIS, DHS			✔	✔	✔	42–43[d]	26–27[d]
		Condom use at last sexual intercourse among young people (%)	AIS, DHS	✔					35	22
		• Females	AIS, DHS			✔	✔	✔	25–29[d]	14–18[d]
		• Males	AIS, DHS			✔	✔	✔	29–35[d]	21–23[d]
	Testing and treatment	Testing for HIV and receiving results in the past 12 months among sexually active young people (%)	AIS, DHS	✔					48	31
		• Females	AIS, DHS			✔	✔	✔	50–51[d]	34
		• Males	AIS, DHS			✔	✔	✔	46–48[d]	31
Pregnant women	Testing and treatment	Pregnant women tested for HIV during antenatal care visit or labour and received results (%)	AIS, DHS		✔	✔	✔	✔	45–46[d]	22

AIS: AIDS Indicator Survey; DHS: Demographic and Health Surveys; UNAIDS: Joint United Nations Programme on HIV/AIDS; UNICEF: United Nations Children's Fund; WHO: World Health Organization.

[a] Data for the latest situation are the most recent available data. Estimates from UNAIDS/UNICEF/WHO are from 2020; survey estimates are from the most recent survey conducted between 2011 and 2020. Although data are available for a larger number of countries, analysis was restricted to countries with complete disaggregated data.

[b] Data for change over time are from two periods: for HIV incidence and AIDS-related mortality, estimates are from 2020 and 2010; survey estimates are from the most recent survey conducted between 2011 and 2020, and a previous survey conducted between 2001 and 2010, with a 5- to 15-year gap between the two surveys.

[c] Although age-disaggregated data were available for HIV incidence and AIDS-related mortality indicators, inequalities by age for these indicators are affected by expected age-related progression of the disease and, therefore, patterns of disease by age are presented as part of the disease context.

[d] Number of countries with available data may vary within indicator depending on the availability of information for the inequality dimension.

analysis includes countries with data points in two time periods, 2001–2010 and 2011–2020, where the data points are 5–15 years apart. Table A2.2 provides an overview of the disaggregated data used for the HIV analysis by indicator, including the numbers of countries with available data.

A2.2 Analysis

Health inequalities were analysed using disaggregated data and summary measures of inequality. Absolute and relative summary measures of inequality were calculated based on the disaggregated data. Inequality thresholds were developed and applied to the summary measures of inequality to evaluate the state of inequality. The thresholds label situations considered to be high, moderate or low inequality, and to describe changes in inequality over time that are large, moderate or small. The inequality thresholds were used to report the global state of inequality.

A2.2.1 Summary measures of inequality

A2.2.1.1 Latest situation

To assess the latest situation of inequality, difference (a measure of absolute inequality) and ratio (a relative measure of inequality) were calculated. Difference and ratio are simple measures of inequality that make pairwise comparisons between two population subgroups. Table A2.3 provides an overview of the calculation by indicator type and inequality dimension.

TABLE A2.3. Calculation of latest situation summary measures for HIV analysis, by priority population, indicator type and inequality dimension

Population	Indicator category	Type of indicator	Inequality dimension	Difference calculation	Ratio calculation
General population	HIV incidence and AIDS-related mortality	Adverse	Sex	Females – males	Females / males
	Knowledge, attitudes and practices and testing and treatment indicators	Favourable	Sex	Males – females	Males / females
			Economic status	Quintile 5 (richest) – quintile 1 (poorest)	Quintile 5 (richest)/ quintile 1 (poorest)
			Education	Secondary or higher – no or primary	Secondary or higher / no or primary
			Place of residence	Urban – rural	Urban / rural
			Age	40–49 years age group – 15–19 years age group	40–49 years age group / 15–19 years age group
Young population	Knowledge, attitudes and practices and testing and treatment indicators	Favourable	Sex	Males – females	Males / females
			Education	Secondary or higher – no or primary	Secondary or higher / no or primary
			Place of residence	Urban – rural	Urban / rural
			Age	20–24 years age group – 15–19 years age group	20–24 years age group / 15–19 years age group
Pregnant women	Testing and treatment	Favourable	Economic status	Quintile 5 (richest) – quintile 1 (poorest)	Quintile 5 (richest)/ quintile 1 (poorest)
			Education	Secondary or higher – no or primary	Secondary or higher / no or primary
			Place of residence	Urban – rural	Urban / rural
			Age	40–49 years age group – 15–19 years age group	40–49 years age group / 15–19 years age group

Reference subgroups were selected based on convenience of data interpretation (providing positive values for difference calculations). In the case of sex, this selection does not represent an assumed advantage of one sex over the other.

For reporting purposes, for each indicator, either absolute or relative summary measures were used to assess the latest situation of inequality. Ratios were used for indicators that were not percentages (on a 0–100 scale) due to the complexity of having consistent absolute inequality thresholds across different scales. These indicators include HIV incidence and AIDS-related mortality. For all other indicators (measured as percentages), differences were used. Inequalities in the latest situation were assessed using the thresholds presented in Table A2.4. Table A2.5 provides examples of how measures of inequality were calculated and how thresholds were applied.

TABLE A2.4. Summary measures and inequality thresholds to assess latest situation of inequality for HIV analysis

		Threshold				
Indicator category	**Summary measure of inequality**	High inequality (favouring poorest, least educated, rural, youngest, female)	Moderate inequality (favouring poorest, least educated, rural, youngest, female)	Low inequality	Moderate inequality (favouring richest, most educated, urban, oldest, male)	High inequality (favouring richest, most educated, urban, oldest, male)
HIV incidence and AIDS-related mortality	Ratio of females to males	≤ 0.5	> 0.5 and ≤ 0.9	> 0.9 and < 1.1	≥ 1.1 and < 2	≥ 2
Knowledge, attitudes and practices and testing and treatment indicators	Difference between two population subgroups	≤ −20 percentage points	> −20 and ≤ −5 percentage points	> −5 and < 5 percentage points	≥ 5 and < 20 percentage points	≥ 20 percentage points

TABLE A2.5. Example of calculation of summary measures and assessment of latest situation of inequality for HIV analysis

Indicator	Inequality dimension	Country example	Calculation	Inequality assessment
Adverse indicator: HIV incidence (new infections per 1000 population)	Sex	South Africa (UNAIDS/UNICEF/WHO 2020): Females: 5.96 Males: 3.26	Ratio: Females / males = 5.96 / 3.26 = 1.83	Ratio ≥ 1.1 and < 2: moderate inequality favouring males (higher HIV incidence among females than males)
Favourable indicator: comprehensive correct knowledge about AIDS (%) (men)	Economic status	Senegal (DHS 2017): Quintile 5 (richest): 70.4% Quintile 1 (poorest): 12.5%	Difference: Quintile 5 (richest) – quintile 1 (poorest) = 70.4% – 12.5% = 57.9 percentage points	Difference ≥ 20 percentage points: high inequality favouring richest quintile (higher coverage among richest quintile)

DHS: Demographic and Health Surveys; UNAIDS: Joint United Nations Programme on HIV/AIDS; UNICEF: United Nations Children's Fund; WHO: World Health Organization.

A2.2.1.2 Change over time

To assess change in inequality over time, difference and ratio measures were calculated (yielding values above or equal to 0 and 1, respectively) and compared between the two time points (Table A2.6). For difference, the change in inequality over time was calculated as the difference between the absolute value of the differences in the two time points, expressed as percentage points. In the case of ratios, relative change in the ratio was analysed.

For reporting purposes, for each indicator, either absolute or relative summary measures were used to assess the change in inequality over time. Ratios were used for indicators that were not percentages (on a 0–100 scale) due to the complexity of having consistent absolute inequality thresholds across different scales. These indicators include HIV incidence and AIDS-related mortality. For all other indicators (measured as percentages), differences were used. Changes in inequality over a 10-year period were assessed using the thresholds presented in Table A2.7. These thresholds

TABLE A2.6. Calculation of change over time summary measures for HIV analysis

Time period	Difference calculation	Ratio calculation
Time 1 (2001–2010)	Difference between two population subgroups in time 1[a] *|Difference time 1|*	Ratio between two population subgroups in time 1[b] *Ratio time 1*
Time 2 (2011–2020)	Difference between two population subgroups in time 2[a] *|Difference time 2|*	Ratio between two population subgroups in time 2[b] *Ratio time 2*
Change over time	Difference between difference in time 2 and time 1 *(|Difference time 2| − |Difference time 1|) / number of years between two time points × 10*	Ratio between ratio in time 2 and ratio in time 1 *(Ratio time 2 / Ratio time 1) / number of years between two time points × 10*

[a] Calculated as absolute value yielding values above 0.
[b] Calculated as converted ratio yielding values above 1 (values were converted to be greater than 1 by dividing the maximum value by the minimum value).

TABLE A2.7. Summary measures and inequality thresholds to assess change in inequality over time for HIV analysis[a]

		Threshold				
Indicator category	Summary measure of inequality	Large decrease in inequality	Moderate decrease in inequality	Small change	Moderate increase in inequality	Large increase in inequality
HIV incidence and AIDS-related mortality	Ratio between range ratio of females to males in time 2 and time 1	≤ 0.5	> 0.5 and ≤ 0.9	> 0.9 and < 1.1	≥ 1.1 and < 2	≥ 2
Knowledge, attitudes and practices and testing and treatment indicators	Change in absolute difference between two population groups	≤ −20 percentage points	> −20 and ≤ −5 percentage points	> −5 and < 5 percentage points	≥ 5 and < 20 percentage points	≥ 20 percentage points

[a] These thresholds were used to describe change in inequality over time for countries that had high inequality according to the latest situation.

TABLE A2.8. Example of calculation of summary measures and assessment of change in inequality over time for HIV analysis

Indicator	Inequality dimension	Country example	Calculation	Inequality assessment
Adverse indicator: HIV incidence (new infections per 1000 population)	Sex	South Africa (UNAIDS/ UNICEF/WHO 2010 and 2020): Time 1 (2010): females: 11.26 males: 7.83 Time 2 (2020): females: 5.96 males: 3.26	Ratio: Time 1 (2010): females / males = 11.26 / 7.83 = 1.44 Time 2 (2020): females / males = 5.96 / 3.26 = 1.83 Change over time: (ratio time 2 / ratio time 1) / number of years between two time points × 10 = (1.83 / 1.44) / 10 years × 10 = 1.27	Ratio between ratio in time 2 and time 1 ≥ 1.1 and < 2: moderate increase in inequality
Favourable indicator: comprehensive correct knowledge about AIDS (%) (males)	Economic status	Senegal (DHS 2005 and 2017): Time 1 (2005): Quintile 5 (richest): 39.0% Quintile 1 (poorest): 9.3% Time 2 (2017): Quintile 5 (richest): 70.4% Quintile 1 (poorest): 12.5%	Difference: Time 1 (2005): |quintile 5 (richest) – quintile 1 (poorest)| = |39.0% – 9.3%| = 29.7 percentage points Time 2 (2017): |quintile 5 (richest) – quintile 1 (poorest)| = |70.4% – 12.5%| = 57.9 percentage points Change over time: (|difference time 2| – |difference time 1|) / number of years between two time points × 10 = (57.9 percentage points – 29.7 percentage points) / 12 years × 10 = 23.5 percentage points	Difference between difference in time 2 and time 1 ≥ 20 percentage points: high increase in inequality

DHS: Demographic and Health Surveys; UNAIDS: Joint United Nations Programme on HIV/AIDS; UNICEF: United Nations Children's Fund; WHO: World Health Organization.

were applied to identify large, moderate or small changes in inequalities over time. Table A2.8 shows examples of how measures of change over time were calculated and how inequality thresholds were applied.

A2.2.2 Addressing inequality

A2.2.2.1 Definition

PAR is a summary measure used to assess the impact of addressing inequality in HIV indicators. PAR is an absolute measure of inequality that takes into account all population subgroups (the whole population). It estimates the possible improvement in national averages if the entire population had the same level of coverage as the most advantaged subgroup. The larger the value of PAR, the higher the level of inequality.

A2.2.2.2 Analysis

PAR was calculated for indicators with data disaggregated by economic status, with the most advantaged

subgroup being the richest 20% of the population (quintile 5). For each country and health indicator, PAR was calculated as the difference between the estimate for quintile 5 and the national average (Box A2.1). In the majority of cases, the richest subgroup reported better performance compared with the national average, and PAR yielded a positive value. In the few cases where PAR was negative due to the richest quintile having a worse situation compared with the national average, PAR was reassigned to 0, indicating the national average would not be improved.

BOX A2.1. Example of country-level calculation of PAR

Comprehensive correct knowledge about AIDS (%) (females) in Angola (DHS 2015):
Quintile 5 (richest): 60.8%
National average: 31.7%
PAR = quintile 5 − national average
= 29.1 percentage points

To assess PAR globally across countries for a given HIV indicator, both the current national average and PAR were weighted using the applicable population for the indicator (e.g. total population, females and males aged 15–49 years, and young people aged 15–24 years) for each country[1] and then averaged across all countries. This global average is based on the number of countries with data available for each indicator during the period of 2011 to 2020.

[1] Population estimates are from the 2019 revision of the United Nations World Population Prospects database, matched to the same year as the disaggregated data for each country and indicator *(4)*.

TABLE A2.9. List of countries and year of data for HIV analysis, by source[a]

	UNAIDS/UNICEF/WHO estimates		AIS or DHS	
Country	Latest situation	Change over time	Latest situation	Change over time
Afghanistan	2020	2010	2015	
Albania	2020	2010	2017	2008
Algeria	2019, 2020	2010		
Angola	2020	2010	2015	
Argentina	2020	2010		
Armenia	2020	2010	2015	2005, 2010
Australia	2019, 2020	2010		
Azerbaijan	2020	2010		
Bahamas	2020	2010		
Bangladesh			2011, 2014	2007
Belarus	2020	2010		
Belize	2020	2010		
Benin	2020	2010	2011, 2017	2001, 2006
Bhutan	2019, 2020	2010		
Bolivia (Plurinational State of)	2019, 2020	2010		
Botswana[b]	2020	2010		
Brazil	2020	2010		

TABLE A2.9. *continued*

	UNAIDS/UNICEF/WHO estimates		AIS or DHS	
Country	Latest situation	Change over time	Latest situation	Change over time
Burkina Faso	2020	2010		
Burundi	2020	2010	2016	2010
Cabo Verde	2019, 2020	2010		
Cambodia	2020	2010	2014	2005
Cameroon	2020	2010	2011, 2018	2004
Central African Republic	2020	2010		
Chad	2020	2010	2014	2004
Chile	2020	2010		
Colombia	2020	2010	2015	2005, 2010
Comoros	2020	2010	2012	
Congo	2020	2010	2011	2005
Costa Rica	2020	2010		
Côte d'Ivoire	2020	2010	2011	2005
Croatia	2020	2010		
Cuba	2019, 2020	2010		
Democratic Republic of the Congo[b]	2020	2010	2013	2007
Denmark	2018, 2020	2010		
Djibouti	2020	2010		
Dominican Republic	2020	2010	2013	2002, 2007
Ecuador	2019, 2020	2010		
Egypt	2020	2010	2014	2005
El Salvador	2020	2010		
Equatorial Guinea	2020	2010		
Eritrea	2020	2010		
Estonia	2018, 2019, 2020	2010		
Eswatini[b]	2020	2010		
Ethiopia[b]	2020	2010	2011, 2016	2005
Fiji	2020	2010		
Gabon	2020	2010	2012	
Gambia	2020	2010	2013	
Georgia	2020	2010		
Germany	2019, 2020	2010		
Ghana	2019, 2020	2010	2014	2003, 2008
Greece	2020	2010		
Guatemala	2020	2010	2014	
Guinea	2015, 2020	2010	2012, 2018	2005

TABLE A2.9. *continued*

	UNAIDS/UNICEF/WHO estimates		AIS or DHS	
Country	Latest situation	Change over time	Latest situation	Change over time
Guinea-Bissau	2020	2010		
Guyana	2020	2010		
Haiti	2020	2010	2016	2005
Honduras	2020	2010	2011	2005
Iceland	2018, 2020	2010		
India[b]	2020	2010	2015	2005
Indonesia	2020	2010	2012, 2017	2002, 2007
Iran (Islamic Republic of)	2018, 2020	2010		
Ireland	2018, 2020	2010		
Italy	2016, 2019, 2020	2010		
Jamaica	2020	2010		
Japan	2020	2010		
Jordan	2019, 2020	2010	2017	2007
Kazakhstan	2020	2010		
Kenya[b]	2020	2010	2014	2003, 2008
Kyrgyzstan	2020	2010	2012	
Lao People's Democratic Republic	2020	2010		
Lebanon	2020	2010		
Lesotho[b]	2020	2010	2014	2004, 2009
Liberia	2020	2010	2013, 2019	2007
Libya	2020	2010		
Madagascar	2020	2010		
Malawi[b]	2020	2010	2015	2004, 2010
Malaysia	2020	2010		
Maldives			2016	2009
Mali	2020	2010	2012, 2018	2001, 2006
Mauritania	2020	2010		
Mauritius	2020	2010		
Mexico	2020	2010		
Mongolia	2020	2010		
Montenegro	2020	2010		
Morocco	2020	2010		
Mozambique[b]	2020	2010	2015	2003
Myanmar			2015	
Namibia[b]	2020	2010	2013	2006
Nepal	2020	2010	2011, 2016	2006

TABLE A2.9. *continued*

	UNAIDS/UNICEF/WHO estimates		AIS or DHS	
Country	Latest situation	Change over time	Latest situation	Change over time
Netherlands	2019, 2020	2010		
New Zealand	2019, 2020	2010		
Nicaragua	2019, 2020	2010		
Niger	2020	2010	2012	2006
Nigeria[b]	2020	2010	2013, 2018	2003, 2008
Norway	2019, 2020	2010		
Pakistan	2020	2010	2012, 2017	2006
Panama	2020	2010		
Papua New Guinea	2020	2010	2016	
Paraguay	2020	2010		
Peru	2020	2010	2012	2004, 2007
Philippines	2020	2010	2013, 2017	2003, 2008
Portugal	2018, 2020	2010		
Qatar	2020	2010		
Republic of Moldova	2020	2010		
Romania	2020	2010		
Rwanda[b]	2020	2010	2014	2005
Sao Tome and Principe	2020	2010		
Saudi Arabia	2020	2010		
Senegal	2020	2010	2017, 2018, 2019	2005, 2010
Serbia	2020	2010		
Sierra Leone	2020	2010	2013, 2019	2008
Singapore	2020	2010		
Slovenia	2020	2010		
Somalia	2020	2010		
South Africa[b]	2020	2010	2016	
South Sudan	2019, 2020	2010		
Spain	2017, 2020	2010		
Sri Lanka	2020	2010		
Sudan	2020	2010		
Suriname	2020	2010		
Switzerland	2018, 2020	2008, 2010		
Syrian Arab Republic	2020	2010		
Tajikistan	2020	2010	2012, 2017	
Thailand	2020	2010		
Timor-Leste	2020	2010	2016	2009

TABLE A2.9. *continued*

	UNAIDS/UNICEF/WHO estimates		AIS or DHS	
Country	Latest situation	Change over time	Latest situation	Change over time
Togo	2020	2010	2013	
Trinidad and Tobago	2020	2010		
Tunisia	2020	2010		
Turkmenistan	2020			
Uganda[b]	2020	2010	2011, 2016	2004, 2006
Ukraine	2020	2010		
United Arab Emirates	2020	2010		
United Republic of Tanzania[b]	2019, 2020	2010	2011	2003
United States of America	2019	2010		
Uruguay	2020	2010		
Uzbekistan	2020	2010		
Venezuela (Bolivarian Republic of)	2020	2010		
Viet Nam	2019, 2020	2010		
Yemen	2020	2010	2013	
Zambia[b]	2020	2010	2013, 2018	2001, 2007
Zimbabwe[b]	2020	2010	2015	2005

AIS: AIDS Indicator Surveys; DHS: Demographic and Health Surveys; UNAIDS: Joint United Nations Programme on HIV/AIDS; UNICEF: United Nations Children's Fund; WHO: World Health Organization.
[a] Indicator-specific information about the data source and year are available in the accompanying interactive visuals and data (see https://www.who.int/data/health-equity/report_2021_hiv_tb_malaria). Depending on the indicator, the year of data source for latest situation and change over time may vary within a country.
[b] Global Fund to Fight AIDS, Tuberculosis and Malaria high-burden or high-funding countries.

A2.3 References

1. Joint United Nations Programme on HIV/AIDS, United Nations Children's Fund, World Health Organization. AIDSinfo. Geneva: Joint United Nations Programme on HIV/AIDS; 2021 (https://aidsinfo.unaids.org/, accessed 3 August 2021).
2. STATcompiler. Washington, DC: United States Agency for International Development; 2021 (https://www.statcompiler.com/en/, accessed 29 July 2021).
3. Undetectable = untransmittable: public health and HIV viral load suppression. Geneva: Joint United Nations Programme on HIV/AIDS; 2018 (https://www.unaids.org/sites/default/files/media_asset/undetectable-untransmittable_en.pdf, accessed 23 July 2021).
4. World population prospects 2019. New York: United Nations Department of Economic and Social Affairs; 2019 (https://population.un.org/wpp/, accessed 15 February 2021).

ANNEX 3
Technical details: TB

A3.1 Data

A3.1.1 Data sources

Data about TB incidence and mortality come from official modelled estimates produced annually by the WHO Global TB programme *(1)*. A detailed description of the methods used to generate these estimates has been published as a technical appendix *(2)*. Data on TB prevalence came from TB prevalence surveys *(3)*. Country-reported case notification data are reported annually to WHO by national TB programmes *(1)*. Data for the proportion of people with MDR/RR-TB come from routine surveillance data or national surveys *(1)*. Data for BCG immunization coverage among children aged 1 year were sourced from the WHO Health Equity Monitor database *(4)*. This database contains BCG data gathered through nationally representative population-based surveys, including DHS, MICS and RHS. TB knowledge and attitudes indicators were sourced from DHS surveys. Information about families affected by TB facing catastrophic costs due to TB were sourced from TB patient cost surveys (obtained from country reports).

A3.1.2 Health indicators

To assess the state of inequality in TB burden, detection, prevention, knowledge, attitudes and social protection, the report included 10 indicators. Burden is monitored through TB incidence, prevalence and mortality rates (per 100 000 population), with a fourth burden indicator specifying the percentage of people with TB who have MDR/RR-TB.

The prevalence to notification ratio and case detection rate are indicators of TB case detection. The prevalence to notification ratio gives the average time, expressed in years, to notify a TB case and is calculated based on prevalence estimates from TB prevalence surveys and the number of TB case notifications to the national TB programme. The higher the ratio, the longer the time for a prevalent case to be notified to the national TB programme. The case detection rate is the proportion of estimated new and relapse TB cases that are detected and reported within a given year, calculated as the number of TB case notifications divided by the estimated incident cases.

The prevalence to notification ratio and case detection rate indicators are subject to uncertainty. TB case notifications are subject to both underreporting (especially in countries that lack policies on mandatory notifications and other measures to ensure reporting of detected cases by all care providers) and overreporting (particularly among children). The prevalence to notification ratio is less biased because it is based on prevalence survey estimates, but it is available for fewer countries. The case detection rate is available for more countries but uses incidence estimates (which are modelled and therefore subject to uncertainty).

BCG immunization coverage among children aged 1 year is an indicator of prevention of severe forms of TB in children. Correct knowledge about TB was reflected by the percentage of people aged 15–49 years who had heard of TB and who correctly reported TB can spread through the air when coughing. Negative attitudes and stigma regarding TB were measured by the percentage of people who said they would want it to remain a secret if a member of their family received a TB diagnosis.

Given that costs associated with TB may be considerable and result in delayed diagnoses, the percentage of families affected by TB facing catastrophic costs due to TB (costs accounting for 20% or more of the household income) is included as an indicator of social protection (Box A3.1).

BOX A3.1. Differentiating families affected by TB facing catastrophic costs due to TB from the SDG indicator of catastrophic expenditures on health care

The catastrophic cost indicator analysed in this report (families affected by TB facing catastrophic costs due to TB), which is part of the WHO End TB Strategy, is distinct from the catastrophic costs indicator used in the SDG monitoring framework (SDG indicator 3.8.2 refers to the proportion of the population with large household expenditures on health as a share of total household expenditure or income).

The SDG indicator is for the general population, and health expenditures are defined as direct expenditures on medical care. This indicator attempts to capture the impact of direct health spending on the household ability to spend on other basic needs. The denominator includes many people who had no contact with the health system and thus had zero expenditures on health. Although these people did not experience financial hardship as a consequence of direct expenditures on health care, they may nonetheless have faced financial barriers to accessing health services that they needed.

Due to the nature of the illness, TB patients and their households can face severe direct and indirect financial and economic costs. These pose barriers that can greatly affect their ability to access diagnosis and treatment, and to complete treatment successfully. Costs included in the TB-specific indicator include not only direct medical payments for diagnosis and treatment, but also direct non-medical payments (e.g. transportation and lodging) and indirect costs (e.g. lost income). In contrast to SDG indicator 3.8.2, the TB-specific indicator is restricted to a particular population: diagnosed TB patients who are users of health services that are part of National TB Programme networks.

Given these conceptual differences, the percentage of TB patients facing catastrophic total costs – that is, costs that account for 20% or more of their household income – is expected to be much higher than the percentage of the general population facing catastrophic expenditures on health care. Hence, the two indicators cannot and should not be compared directly.

Detailed descriptions of indicator definitions, data sources and methods of calculation are in Annex 7.

A3.1.3 Dimensions of inequality

Disaggregated data were available for up to six inequality dimensions: sex, economic status, education, place of residence, age and TB drug resistance status (Table A3.1). Sex refers to the biological sex (female or male), as this is how data were collected and reported in the sources. (The lack of data availability reflecting diverse gender identities is a limitation.)

Economic status was determined at the household level using a wealth index. This is a composite measure of a household's cumulative living standard based on ownership of household assets and access to utility services. It is constructed using principal component analysis and used to divide household populations into five groups (wealth quintiles) within each country.

Education reflects the highest level of education attained by the child's mother (in the case of BCG immunization coverage) or the person surveyed (in the case of TB knowledge and attitudes indicators).

TABLE A3.1. Inequality dimensions and subgroups for tuberculosis (TB) analysis

Inequality dimension	Subgroups
Sex	Two subgroups: females and males
Economic status	Five subgroups: from quintile 1 (poorest 20% of population) to quintile 5 (richest 20% of population)
Education	Three subgroups: no education, primary education, and secondary or higher education
Place of residence	Two subgroups: rural and urban
Age	Two subgroups (for case detection rate): age 0–14 years and ≥ 15 years Three subgroups (for knowledge and attitudes indicators): age 15–19 years, 20–34 years and 35–49 years
TB drug resistance status	Two subgroups: drug-resistant TB and drug-susceptible TB

TABLE A3.2. Overview of disaggregated data used for tuberculosis (TB) analysis

			Inequality dimension						Countries with available data	
Category	Indicator	Source	Sex	Economic status	Education	Place of residence	Age	TB drug resistance status	Latest situation[a]	Change over time[b]
Burden	TB incidence (new infections per 100 000 population)[c, d]	WHO	✔						186[e]	
	TB mortality (deaths per 100 000 population)[c, d]	WHO	✔						180[e]	
	TB prevalence (cases per 100 000 population)	TB prevalence surveys				✔			20	
	People with MDR/RR-TB (%)[f]	Country reported to WHO	✔						85[e]	
Detection	Prevalence to notification ratio (years)	TB prevalence surveys and country-reported case notifications	✔						28	
	Case detection rate (%)	WHO and country-reported case notifications	✔				✔		109–116[g]	
Prevention	BCG immunization coverage among children aged 1 year (%)	DHS, MICS, RHS	✔	✔	✔	✔			67–90[g]	56–74[g]
Knowledge and attitudes	People who report TB is spread through coughing (%)	DHS	✔						16	9
	• Females	DHS		✔	✔	✔	✔		18–19[g]	13
	• Males	DHS		✔	✔	✔	✔		15–17[g]	9–10[g]
	People who would want a family member's TB kept secret (%)	DHS	✔						12	8
	• Females	DHS		✔	✔	✔	✔		13–14[g]	10
	• Males	DHS		✔	✔	✔	✔		11–13[g]	8–9[g]
Social protection	Families affected by TB facing catastrophic costs due to TB (%)[h]	TB patient cost surveys		✔				✔	6–21[g]	

BCG: bacille Calmette-Guérin; DHS: Demographic and Health Surveys; MDR/RR-TB: multidrug- or rifampicin-resistant TB; MICS: Multiple Indicator Cluster Surveys; RHS: Reproductive Health Surveys; WHO: World Health Organization.

[a] Data for the latest situation are the most recent available data. Modelled estimates from WHO are from 2020; country-reported data about the proportion of people with TB with MDR/RR-TB are from 2011–2019; survey estimates for detection, prevention, knowledge and attitudes and social protection indicators reflect the most recent survey conducted between 2011 and 2020.

[b] Data for change over time from DHS, RHS and MICS reflect the most recent survey conducted between 2011 and 2020, and a previous survey conducted between 2001 and 2010, with a 5- to 15-year gap between the two surveys.

[c] Although age-disaggregated data were available for TB incidence and mortality indicators, inequalities by age for these indicators are affected by expected age-related progression of the disease and, therefore, patterns of disease by age are presented as part the disease context.

[d] TB incidence and mortality estimates refer to HIV-negative incidence and mortality.

[e] Does not include countries where male/female ratios could not be calculated due to zero values.

[f] Proportion of MDR/RR-TB is the percentage of MDR/RR-TB out of new and previously treated cases.

[g] Number of countries with available data may vary within indicator depending on the availability of information for the inequality dimension.

[h] Catastrophic costs refer to costs of 20% or more of pre-TB household income.

Place of residence specifies the location of the household (rural or urban). Criteria to categorize rural and urban areas were country-specific and subject to variation across countries and over time.

Age reflects children (aged 0–14 years) and adults (aged ≥ 15 years) for the case detection rate indicator, and three subgroups (ages 15–19 years, 20–34 years and 35–49 years) for the knowledge and attitudes indicators.

For the assessment of inequality in catastrophic costs due to TB experienced by families affected by TB, disaggregation by people with drug-resistant and drug-susceptible TB was also explored.

A3.1.4 Study countries

Data analysis for TB included all 194 WHO Member States where estimates of TB incidence and TB mortality were available. For the analysis of inequalities, study countries were limited to up to 186 countries with data available for all subgroups of at least one inequality dimension (see Table A3.9). Countries included in the analysis varied by indicator based on data availability. The analysis of inequalities for burden indicators covered most countries (186 for incidence, 180 for mortality), but detection, prevention, knowledge and attitudes and social protection indicators had varying numbers of countries. Where possible and relevant, results for a subset of 26 Global Fund high-burden or high-funding priority countries were highlighted. Table A3.2 provides an overview of the disaggregated data used for the TB analysis by indicator, including the numbers of countries with available data.

A3.2 Analysis

Health inequalities were analysed using disaggregated data and summary measures of inequality. Absolute and relative summary measures of inequality were calculated based on the disaggregated data. Inequality thresholds were developed and applied to the summary measures of inequality to evaluate the state of inequality. The thresholds label situations considered to be high, moderate or low inequality, and to describe changes in inequality over time that are large, moderate or small. The inequality thresholds were used to report the global state of inequality.

A3.2.1 Summary measures of inequality

A3.2.1.1 Latest situation

To assess the latest situation of inequality, difference (a measure of absolute inequality) and ratio (a relative measure of inequality) were calculated. Difference and ratio are simple measures of inequality that make pairwise comparisons between two population subgroups. Table A3.3 provides an overview of the calculation by indicator type and inequality dimension.

For reporting purposes, for each indicator, either absolute or relative summary measures were used to assess the latest situation of inequality. Ratios were used for indicators that were not percentages (on a 0–100 scale) due to the complexity of having consistent absolute inequality thresholds across different scales. These indicators include TB burden and prevalence to notification ratio. For all other indicators (measured as percentages), differences were used. Inequalities in the latest situation were assessed using the thresholds presented in Table A3.4. Table A3.5 provides examples of how measures of inequality were calculated and how thresholds were applied.

A3.2.1.2 Change over time

To assess change in inequality over time, difference and ratio measures were calculated (yielding values above or equal to 0 and 1, respectively) and compared between the two time points (Table A3.6). For difference, the change in inequality over time was calculated as the difference between the absolute value of the differences in the two time points, expressed as percentage points. In the case of ratios, relative change in the ratio was analysed.

For reporting purposes, for each indicator, either absolute or relative summary measures were used to assess the change in inequality over time. Ratios were used for indicators that were not percentages (on a 0–100 scale) due to the complexity of having consistent

TABLE A3.3. Calculation of latest situation summary measures for tuberculosis (TB) analysis, by indicator type and inequality dimension

Category	Indicator	Type of indicator	Inequality dimension	Difference calculation	Ratio calculation
Burden	TB incidence (new infections per 100 000 population)	Adverse	Sex	Males – females	Males / females
	TB mortality (deaths per 100 000 population)				
	People with MDR/RR-TB (%)				
	TB prevalence (cases per 100 000 population)	Adverse	Place of residence	Urban – rural	Urban / rural
Detection	Prevalence to notification ratio (years)	Adverse	Sex	Males – females	Males / females
	Case detection rate (%)	Favourable	Sex	Females – males	Females / males
			Age	Age ≥ 15 years – age 0–14 years	Age ≥ 15 years / age 0–14 years
Prevention, knowledge and attitudes	BCG immunization coverage among children aged 1 year (%)	Favourable	Sex	Males – females	Males / females
	People who report TB is spread through coughing (%)		Economic status	Quintile 5 (richest) – quintile 1 (poorest)	Quintile 5 (richest) / quintile 1 (poorest)
			Education	Secondary or higher education – no education	Secondary or higher education / no education
			Place of residence	Urban – rural	Urban / rural
			Age	Age 35–49 years – age 15–19 years	Age 35–49 years / age 15–19 years
Prevention, knowledge and attitudes	People who would want a family member's TB kept secret (%)	Adverse	Sex	Females – males	Females / males
			Economic status	Quintile 1 (poorest) – quintile 5 (richest)	Quintile 1 (poorest) / quintile 5 (richest)
			Education	No education –secondary or higher education	No education / secondary or higher education
			Place of residence	Rural – urban	Rural / urban
			Age	Age 15–19 years – age 35–49 years	Age 15–19 years / age 35–49 years
Social protection	Families affected by TB facing catastrophic costs due to TB (%)	Adverse	Economic status	Quintile 1 (poorest) – quintile 5 (richest)	Quintile 1 (poorest) / quintile 5 (richest)
			TB drug resistance	Drug-resistant TB – drug-susceptible TB	Drug-resistant TB / drug-susceptible TB

BCG: bacille Calmette-Guérin; MDR/RR-TB: multidrug- or rifampicin-resistant TB.
Reference subgroups were selected based on convenience of data interpretation (providing positive values for difference calculations).

TABLE A3.4. Threshold values used for global analysis of inequalities for latest situation for tuberculosis (TB) analysis

		Threshold				
Indicator	Summary measure of inequality	High inequality (favouring poorest, least educated, rural, male)	Moderate inequality (favouring poorest, least educated, rural, male)	Low inequality	Moderate inequality (favouring richest, most educated, urban, female)	High inequality (favouring richest, most educated, urban, female)
TB burden and prevalence to notification ratio	Ratio of two population subgroups (i.e. males to females, or urban to rural)	≤ 0.5	> 0.5 and ≤ 0.9	> 0.9 and < 1.1	≥ 1.1 and < 2	≥ 2
Case detection rate, prevention, knowledge and attitudes, and social protection indicators	Difference between two population subgroups	≤ –20 percentage points	> –20 and ≤ –5 percentage points	> –5 and < 5 percentage points	≥ 5 and < 20 percentage points	≥ 20 percentage points

TABLE A3.5. Example of calculation of summary measures and assessment of latest situation of inequality for tuberculosis (TB) analysis

Indicator	Inequality dimension	Country example	Calculation	Inequality assessment
Adverse indicator: TB incidence (per 100 000 population)	Sex	Nepal (WHO 2020): Male: 337 Female: 146	Ratio: Males / females: = 337 / 146 = 2.31	Ratio ≥ 2: high inequality favouring females (lower TB incidence among females than males)
Favourable indicator: People who report TB is spread through coughing (%) (females)	Economic status	Ethiopia (DHS 2011): Quintile 5 (richest): 43.1% Quintile 1 (poorest): 89.6%	Difference: Quintile 5 (richest) – quintile 1 (poorest) = 89.6% – 43.1% = 46.5 percentage points	Difference ≥ 20 percentage points: high inequality favouring richest quintile (lower TB knowledge among poorest quintile)

DHS: Demographic and Health Surveys; WHO: World Health Organization.

TABLE A3.6. Change over time measures of inequality calculations for tuberculosis (TB) analysis

Time period	Difference calculation	Ratio calculation
Time 1 (2001–2010)	Difference between two population subgroups in time 1[a] *|Difference time 1|*	Ratio between two population subgroups in time 1[b] *Ratio time 1*
Time 2 (2011–2020)	Difference between two population subgroups in time 2[a] *|Difference time 2|*	Ratio between two population subgroups in time 2[b] *Ratio time 2*
Change over time	Difference between difference in time 2 and time 1 *(|Difference time 2| − |Difference time 1|) / number of years between two time points × 10*	Ratio between ratio in time 2 and ratio in time 1 *(Ratio time 2 / Ratio time 1) / number of years between two time points × 10*

[a] Calculated as absolute value yielding values above 0.
[b] Calculated as converted ratio yielding values above 1 (values were converted to be greater than 1 by dividing the maximum value by the minimum value).

TABLE A3.7. Summary measures and inequality thresholds to assess change in inequality over time for tuberculosis (TB) analysis[a]

		Threshold				
Indicator	Summary measure of inequality	Large decrease in inequality	Moderate decrease in inequality	Small change	Moderate increase in inequality	Large increase in inequality
TB burden and prevalence to notification ratio	Ratio between ratio of two population groups in time 2 and time 1	≤ 0.5	> 0.5 and ≤ 0.9	> 0.9 and < 1.1	≥ 1.1 and < 2	≥ 2
Case detection rate, prevention, knowledge and attitudes, and social protection indicators	Change in absolute difference between two population groups	≤ −20 percentage points	> −20 and ≤ −5 percentage points	> −5 and < 5 percentage points	≥ 5 and < 20 percentage points	≥ 20 percentage points

[a] These thresholds were used to describe change in inequality over time for countries that had high inequality according to the latest situation.

absolute inequality thresholds across different scales. These indicators include TB burden and prevalence to notification ratio. For all other indicators (measured as percentages), differences were used. Changes in inequality over a 10-year period were assessed using the thresholds presented in Table A3.7. These thresholds allowed identification of large, moderate or small changes in inequalities over time. Table A3.8 shows examples of how measures of change over time were calculated and how inequality thresholds were applied.

TABLE A3.8. Example of calculation of summary measures and assessment of change in inequality over time for tuberculosis (TB) analysis

Indicator	Inequality dimension	Country example	Calculation	Inequality assessment
Adverse indicator: People who would want a family member's TB kept secret (%) (males)	Age	Malawi (DHS 2010 and 2015) Time 1 (2010): 15–19 years: 38.2% 35–49 years: 28.9% Time 2 (2015): 15–19 years: 41.0% 35–49 years: 18.5%	Difference: Time 1 (2010): |age 15–19 years – age 35–49 years| = |38.2% – 28.9%| = 9.3 percentage points Time 2 (2015): |age 15–19 years – age 35–49 years| = |41.0% – 18.5%| = 22.5 percentage points Change over time: (|difference time 2| – |difference time 1|) / number of years between time points × 10 = (22.5 percentage points – 9.3 percentage points) / 5 years × 10 = 26.4 percentage points	Difference between difference in time 2 and time 1 ≥ 20 percentage points: large increase in inequality
Favourable indicator: BCG immunization coverage among children aged 1 year (%)	Economic status	Chad (DHS 2004 and 2014) Time 1 (2004): Quintile 5 (richest): 67.8% Quintile 1 (poorest): 13.8% Time 2 (2014): Quintile 5 (richest): 80.0% Quintile 1 (poorest): 52.9%	Difference: Time 1 (2004): |quintile 5 (richest) – quintile 1 (poorest)| = |67.8% – 13.8%| = 54.0 percentage points Time 2 (2014): |quintile 5 (richest) – quintile 1 (poorest)| = |80.0% – 52.9%| = 27.1 percentage points Change over time: (|difference time 2| – |difference time 1|) / number of years between time points × 10 = (27.1 percentage points – 54.0 percentage points) / 10 years × 10 = –26.9 percentage points	Difference between difference in time 2 and time 1 ≤ –20 percentage points: large decrease in inequality

BCG: bacille Calmette-Guérin; DHS: Demographic and Health Surveys.

A3.2.2 Addressing inequality

A3.2.2.1 Definition

PAR is a summary measure used to assess the impact of addressing inequality in TB indicators. PAR is an absolute measure of inequality that takes into account all population subgroups (the whole population). It estimates the possible improvement in national averages if the entire population had the same level of coverage as the most advantaged subgroup. The larger the value of PAR, the higher the level of inequality.

A3.2.2.2 Analysis

PAR was calculated for indicators with data disaggregated by economic status, with the most advantaged subgroup being the richest 20% of the population (quintile 5). For each country and health indicator, PAR was calculated as the difference between the estimate for quintile 5

BOX A3.2. Example of country-level calculation of PAR

Families affected by TB facing catastrophic costs due to TB (%) in the Lao People's Democratic Republic (TB patient cost survey 2019):
Quintile 5 (richest): 27.5%
National average: 62.5%
PAR = quintile 5 − national average
= −35.0 percentage points

and the national average (Box A3.2). In the majority of cases, the richest subgroup reported better performance compared with the national average, and PAR yielded a positive value (in the case of favourable indicators) or a negative value (in the case of adverse indicators). In the few cases where the richest quintile had a worse situation compared with the national average, PAR was reassigned to 0, indicating the national average would not be improved.

To assess PAR globally across countries for a given health indicator, the current national average and PAR were weighted using the applicable population for the indicator (e.g. total population or population aged 15–49 years) for each country,[1] and then averaged across all countries. This global average is based on the number of countries with data available for each indicator during the period of 2011 to 2020.

[1] Population estimates are from the 2019 revision of the United Nations World Population Prospects database, matched to the same year as the disaggregated data for each country and indicator *(5)*.

TABLE A3.9. List of countries and year of data for tuberculosis (TB) analysis, by indicator and source[a]

Country	TB incidence and mortality (WHO estimates) Latest situation	TB prevalence rate (TB prevalence surveys) Latest situation	MDR/RR-TB[b] (country-reported) Latest situation	Prevalence to notification ratio (TB prevalence surveys and country-reported case notifications) Latest situation	Case detection rate (WHO estimates and country-reported notifications) Latest situation
Afghanistan	2020				2020
Albania	2020		2011–2019		
Algeria	2020				2020
Andorra	2020				
Angola	2020				2020
Argentina	2020				2020
Armenia	2020				
Australia	2020		2011–2019		2020
Austria	2020		2011–2019		
Azerbaijan	2020		2011–2019		2020
Bahamas	2020				
Bahrain	2020		2011–2019		
Bangladesh[c]	2020	2015	2011–2019	2015	2020
Belarus	2020		2011–2019		2020
Belgium	2020		2011–2019		
Belize	2020				
Benin	2020		2011–2019		2020

A3.3 References

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2. Glaziou P, Arinaminpathy N, Dodd P, Floyd K. Technical appendix: methods used by WHO to estimate the global burden of TB disease. Geneva: World Health Organization; 2021 (https://cdn.who.int/media/docs/default-source/hq-tuberculosis/tb-report-2021/technical_annex_methods_2021.pdf?sfvrsn=b32dc5d8_14&download=true, accessed 19 October 2021).
3. National tuberculosis prevalence surveys 2007–2016. Geneva: World Health Organization; 2021 (https://apps.who.int/iris/handle/10665/341072, accessed 7 October 2021).
4. National health inequality monitoring: a step-by-step manual. Geneva: World Health Organization; 2017 (https://www.who.int/data/gho/health-equity, accessed 5 May 2021).
5. World population prospects 2019. New York: United Nations Department of Economic and Social Affairs; 2019 (https://population.un.org/wpp/, accessed 15 February 2021).

BCG immunization coverage (DHS, MICS or RHS)		TB knowledge and attitudes (DHS)		Catastrophic costs due to TB (TB patient cost surveys)	
Latest situation	Change over time	Latest situation	Change over time	Latest situation	Country
DHS 2015	MICS 2010	2015			Afghanistan
					Albania
MICS 2018					Algeria
					Andorra
DHS 2015					Angola
					Argentina
DHS 2015	DHS 2005	2015	2005		Armenia
					Australia
					Austria
					Azerbaijan
					Bahamas
					Bahrain
DHS 2014	DHS 2004				Bangladesh[c]
					Belarus
					Belgium
MICS 2015	MICS 2006				Belize
DHS 2017	DHS 2006			2018	Benin

TABLE A3.9. *continued*

Country	TB incidence and mortality (WHO estimates) Latest situation	TB prevalence rate (TB prevalence surveys) Latest situation	MDR/RR-TB[b] (country-reported) Latest situation	Prevalence to notification ratio (TB prevalence surveys and country-reported case notifications) Latest situation	Case detection rate (WHO estimates and country-reported notifications) Latest situation
Bhutan	2020				2020
Bolivia (Plurinational State of)	2020				2020
Bosnia and Herzegovina	2020		2011–2019		
Botswana[c]	2020				2020
Brazil	2020				2020
Brunei Darussalam	2020				
Bulgaria	2020		2011–2019		
Burkina Faso	2020				2020
Burundi	2020				2020
Cabo Verde	2020				
Cambodia[c]	2020	2011	2011–2019	2011	2020
Cameroon[c]	2020				2020
Canada	2020		2011–2019		
Central African Republic	2020				2020
Chad	2020				2020
Chile	2020		2011–2019		2020
China	2020		2011–2019		2020
Colombia	2020				2020
Comoros	2020				
Congo	2020				2020
Costa Rica	2020				
Côte d'Ivoire	2020		2011–2019		2020
Croatia	2020				
Cuba	2020		2011–2019		
Cyprus	2020		2011–2019		
Czechia	2020		2011–2019		
Democratic People's Republic of Korea	2020	2016		2016	2020
Democratic Republic of the Congo[c]	2020				2020

BCG immunization coverage (DHS, MICS or RHS)		TB knowledge and attitudes (DHS)		Catastrophic costs due to TB (TB patient cost surveys)	
Latest situation	Change over time	Latest situation	Change over time	Latest situation	Country
					Bhutan
					Bolivia (Plurinational State of)
MICS 2011	MICS 2006				Bosnia and Herzegovina
					Botswana[c]
				2019	Brazil
					Brunei Darussalam
					Bulgaria
				2020	Burkina Faso
DHS 2016	DHS 2010, MICS 2005[d]				Burundi
					Cabo Verde
DHS 2014	DHS 2005				Cambodia[c]
DHS 2018	DHS 2004, MICS 2006[d]				Cameroon[c]
					Canada
MICS 2018	MICS 2010				Central African Republic
DHS 2014	DHS 2004				Chad
					Chile
					China
					Colombia
DHS 2012					Comoros
MICS 2014	DHS 2005				Congo
MICS 2018					Costa Rica
MICS 2016	MICS 2006				Côte d'Ivoire
					Croatia
MICS 2019	MICS 2010				Cuba
					Cyprus
					Czechia
					Democratic People's Republic of Korea
MICS 2017	DHS 2007			2019	Democratic Republic of the Congo[c]

TABLE A3.9. *continued*

Country	TB incidence and mortality (WHO estimates) Latest situation	TB prevalence rate (TB prevalence surveys) Latest situation	MDR/RR-TB[b] (country-reported) Latest situation	Prevalence to notification ratio (TB prevalence surveys and country-reported case notifications) Latest situation	Case detection rate (WHO estimates and country-reported notifications) Latest situation
Denmark	2020		2011–2019		
Djibouti[c]	2020		2011–2019		
Dominica	2020				
Dominican Republic	2020				2020
Ecuador	2020				2020
Egypt	2020		2011–2019		2020
El Salvador	2020				2020
Equatorial Guinea	2020				2020
Eritrea	2020		2011–2019		2020
Estonia	2020		2011–2019		
Eswatini[c]	2020		2011–2019	2017	2020
Ethiopia[c]	2020	2011		2011	2020
Fiji	2020				
Finland	2020		2011–2019		
France	2020				2020
Gabon[c]	2020				2020
Gambia	2020	2013		2012	2020
Georgia	2020		2011–2019		2020
Germany	2020		2011–2019		2020
Ghana[c]	2020	2013		2013	2020
Greece	2020				
Grenada	2020				
Guatemala	2020				2020
Guinea	2020				2020
Guinea-Bissau	2020				2020
Guyana	2020				
Haiti	2020				2020
Honduras	2020				2020
Hungary	2020		2011–2019		
Iceland	2020				

BCG immunization coverage (DHS, MICS or RHS)		TB knowledge and attitudes (DHS)		Catastrophic costs due to TB (TB patient cost surveys)	
Latest situation	Change over time	Latest situation	Change over time	Latest situation	Country
					Denmark
					Djibouti[c]
					Dominica
MICS 2014	DHS 2002	2013	2007		Dominican Republic
					Ecuador
DHS 2014	DHS 2005				Egypt
MICS 2014	RHS 2002				El Salvador
					Equatorial Guinea
					Eritrea
					Estonia
MICS 2014	DHS 2006				Eswatini[c]
DHS 2016	DHS 2005	2011	2005		Ethiopia[c]
				2017	Fiji
					Finland
					France
DHS 2012					Gabon[c]
MICS 2018	MICS 2010				Gambia
					Georgia
					Germany
MICS 2017	DHS 2008	2014	2008	2016	Ghana[c]
					Greece
					Grenada
DHS 2014	RHS 2002, RHS 2008[d]				Guatemala
DHS 2018	DHS 2005				Guinea
MICS 2018	MICS 2006				Guinea-Bissau
MICS 2014	MICS 2006				Guyana
DHS 2016	DHS 2005				Haiti
DHS 2011	DHS 2005, RHS 2001[d]	2012	2005		Honduras
					Hungary
					Iceland

TABLE A3.9. *continued*

Country	TB incidence and mortality (WHO estimates) Latest situation	TB prevalence rate (TB prevalence surveys) Latest situation	MDR/RR-TB[b] (country-reported) Latest situation	Prevalence to notification ratio (TB prevalence surveys and country-reported case notifications) Latest situation	Case detection rate (WHO estimates and country-reported notifications) Latest situation
India[c]	2020				2020
Indonesia[c]	2020	2014		2013	2020
Iran (Islamic Republic of)	2020		2011–2019		2020
Iraq	2020		2011–2019		2020
Ireland	2020		2011–2019		
Israel	2020		2011–2019		
Italy	2020		2011–2019		
Jamaica	2020				
Japan	2020				2020
Jordan	2020				
Kazakhstan	2020		2011–2019		2020
Kenya[c]	2020	2015	2011–2019	2015	2020
Kiribati	2020				
Kuwait	2020		2011–2019		
Kyrgyzstan	2020				2020
Lao People's Democratic Republic	2020	2011	2011–2019	2011	2020
Latvia	2020		2011–2019		
Lebanon	2020		2011–2019		
Lesotho[c]	2020		2011–2019	2019	2020
Liberia	2020				2020
Libya	2020				2020
Lithuania	2020		2011–2019		
Luxembourg	2020				
Madagascar	2020				2020
Malawi	2020	2013	2011–2019	2013	2020
Malaysia	2020		2011–2019		2020
Maldives	2020				
Mali	2020				2020

BCG immunization coverage (DHS, MICS or RHS)		TB knowledge and attitudes (DHS)		Catastrophic costs due to TB (TB patient cost surveys)	
Latest situation	Change over time	Latest situation	Change over time	Latest situation	Country
DHS 2015	DHS 2005	2015	2005		India[c]
DHS 2017	DHS 2007			2020	Indonesia[c]
					Iran (Islamic Republic of)
MICS 2018	MICS 2006				Iraq
					Ireland
					Israel
					Italy
MICS 2011	MICS 2005				Jamaica
					Japan
DHS 2017	DHS 2007, DHS 2002[d]	2012	2007		Jordan
MICS 2015	MICS 2006				Kazakhstan
DHS 2014	DHS 2003	2014	2008	2017	Kenya[c]
MICS 2018					Kiribati
					Kuwait
MICS 2018	MICS 2005	2012			Kyrgyzstan
MICS 2017	MICS 2006			2019	Lao People's Democratic Republic
					Latvia
					Lebanon
MICS 2018	DHS 2009	2014	2004	2019	Lesotho[c]
DHS 2013	DHS 2007	2019	2007		Liberia
					Libya
					Lithuania
					Luxembourg
MICS 2018	DHS 2008				Madagascar
DHS 2015	DHS 2004, MICS 2006[d]	2015	2010		Malawi
					Malaysia
DHS 2016	DHS 2009				Maldives
DHS 2018	DHS 2006, MICS 2009[d]				Mali

TABLE A3.9. *continued*

Country	TB incidence and mortality (WHO estimates) Latest situation	TB prevalence rate (TB prevalence surveys) Latest situation	MDR/RR-TB[b] (country-reported) Latest situation	Prevalence to notification ratio (TB prevalence surveys and country-reported case notifications) Latest situation	Case detection rate (WHO estimates and country-reported notifications) Latest situation
Malta	2020				
Marshall Islands	2020		2011–2019		
Mauritania	2020				2020
Mauritius	2020		2011–2019		
Mexico	2020				2020
Micronesia (Federated States of)	2020				
Mongolia	2020	2015	2011–2019	2014	2020
Montenegro	2020		2011–2019		
Morocco	2020		2011–2019		2020
Mozambique[c]	2020			2018	2020
Myanmar[c]	2020			2018	2020
Namibia[c]	2020		2011–2019	2018	2020
Nauru	2020				
Nepal	2020		2011–2019	2018	2020
Netherlands	2020		2011–2019		
New Zealand	2020		2011–2019		
Nicaragua	2020				2020
Niger	2020				2020
Nigeria[c]	2020	2012	2011–2019		2020
North Macedonia	2020		2011–2019		
Norway	2020		2011–2019		
Oman	2020		2011–2019		
Pakistan[c]	2020	2011	2011–2019	2011	2020
Palau	2020				
Panama	2020				2020
Papua New Guinea	2020				2020
Paraguay	2020				2020
Peru	2020		2011–2019		2020
Philippines[c]	2020		2011–2019	2016	2020
Poland	2020		2011–2019		2020

BCG immunization coverage (DHS, MICS or RHS)		TB knowledge and attitudes (DHS)		Catastrophic costs due to TB (TB patient cost surveys)	
Latest situation	Change over time	Latest situation	Change over time	Latest situation	Country
					Malta
					Marshall Islands
MICS 2015	MICS 2007				Mauritania
					Mauritius
MICS 2015					Mexico
					Micronesia (Federated States of)
MICS 2018	MICS 2010			2017	Mongolia
MICS 2013	MICS 2005				Montenegro
					Morocco
DHS 2015	DHS 2003				Mozambique[c]
DHS 2015		2015		2015	Myanmar[c]
DHS 2013	DHS 2006	2013	2006		Namibia[c]
					Nauru
MICS 2019	MICS 2010				Nepal
					Netherlands
					New Zealand
					Nicaragua
DHS 2012	DHS 2006				Niger
DHS 2018	DHS 2008			2017	Nigeria[c]
MICS 2018	MICS 2005				North Macedonia
					Norway
					Oman
DHS 2017	DHS 2006	2012	2006		Pakistan[c]
					Palau
MICS 2013					Panama
DHS 2016				2019	Papua New Guinea
MICS 2016	RHS 2004, RHS 2008[d]				Paraguay
DHS 2018	DHS 2008	2012	2004		Peru
DHS 2017	DHS 2008			2017	Philippines[c]
					Poland

TABLE A3.9. *continued*

Country	TB incidence and mortality (WHO estimates) Latest situation	TB prevalence rate (TB prevalence surveys) Latest situation	MDR/RR-TB[b] (country-reported) Latest situation	Prevalence to notification ratio (TB prevalence surveys and country-reported case notifications) Latest situation	Case detection rate (WHO estimates and country-reported notifications) Latest situation
Portugal	2020		2011–2019		2020
Qatar	2020				
Republic of Korea	2020				2020
Republic of Moldova	2020		2011–2019		2020
Romania	2020		2011–2019		2020
Russian Federation	2020				2020
Rwanda	2020		2011–2019	2012	2020
Saint Lucia	2020				
Saint Vincent and the Grenadines	2020				
Samoa	2020				
Sao Tome and Principe	2020				
Saudi Arabia	2020		2011–2019		2020
Senegal	2020		2011–2019		2020
Serbia	2020		2011–2019		2020
Sierra Leone	2020				2020
Singapore	2020		2011–2019		2020
Slovakia	2020				
Slovenia	2020				
Solomon Islands	2020				
Somalia	2020		2011–2019		2020
South Africa[c]	2020			2018	2020
South Sudan	2020				2020
Spain	2020				2020
Sri Lanka	2020				2020
Sudan	2020	2013	2011–2019	2014	2020
Suriname	2020				
Sweden	2020		2011–2019		
Switzerland	2020		2011–2019		
Syrian Arab Republic	2020				2020
Tajikistan	2020		2011–2019		2020

BCG immunization coverage (DHS, MICS or RHS)		TB knowledge and attitudes (DHS)		Catastrophic costs due to TB (TB patient cost surveys)	
Latest situation	Change over time	Latest situation	Change over time	Latest situation	Country
					Portugal
MICS 2012					Qatar
					Republic of Korea
MICS 2012	DHS 2005				Republic of Moldova
					Romania
					Russian Federation
DHS 2014	DHS 2005	2014			Rwanda
					Saint Lucia
					Saint Vincent and the Grenadines
					Samoa
MICS 2019	DHS 2008				Sao Tome and Principe
					Saudi Arabia
DHS 2017	DHS 2005				Senegal
MICS 2019	MICS 2005				Serbia
MICS 2017	DHS 2008				Sierra Leone
					Singapore
					Slovakia
					Slovenia
					Solomon Islands
					Somalia
DHS 2016					South Africa[c]
					South Sudan
					Spain
					Sri Lanka
MICS 2014					Sudan
					Suriname
					Sweden
					Switzerland
					Syrian Arab Republic
DHS 2017	MICS 2005	2012			Tajikistan

TABLE A3.9. *continued*

Country	TB incidence and mortality (WHO estimates) Latest situation	TB prevalence rate (TB prevalence surveys) Latest situation	MDR/RR-TB[b] (country-reported) Latest situation	Prevalence to notification ratio (TB prevalence surveys and country-reported case notifications) Latest situation	Case detection rate (WHO estimates and country-reported notifications) Latest situation
Thailand	2020	2012		2012	2020
Timor-Leste	2020				2020
Togo	2020		2011–2019		2020
Tonga	2020				
Trinidad and Tobago	2020				
Tunisia	2020				2020
Turkey	2020		2011–2019		2020
Turkmenistan	2020		2011–2019		2020
Tuvalu	2020				
Uganda[c]	2020	2015	2011–2019	2015	2020
Ukraine[c]	2020		2011–2019		2020
United Arab Emirates	2020				
United Kingdom	2020		2011–2019		2020
United Republic of Tanzania[c]	2020	2012	2011–2019	2012	2020
United States of America	2020		2011–2019		2020
Uruguay	2020				2020
Uzbekistan	2020		2011–2019		2020
Vanuatu	2020				
Venezuela (Bolivarian Republic of)	2020				2020
Viet Nam[c]	2020	2018	2011–2019	2018	2020
Yemen	2020		2011–2019		2020
Zambia[c]	2020	2014		2014	2020
Zimbabwe	2020	2014		2014	2020

BCG: bacille Calmette-Guérin; DHS: Demographic and Health Surveys; MDR/RR-TB: multidrug- or rifampicin-resistant TB; MICS: Multiple Indicator Cluster Surveys ; RHS: Reproductive Health Surveys; WHO: World Health Organization.

[a] Indicator-specific information about the data source and year are available in the accompanying interactive visuals and data (see https://www.who.int/data/health-equity/report_2021_hiv_tb_malaria). Depending on the indicator, the year of data source for latest situation and change over time may vary within a country.

[b] Proportion of MDR/RR-TB: data disaggregated by sex correspond to the sum of cases for the period 2011–2019.

[c] Global Fund high-burden or high-funding countries.

[d] Where there were low sample sizes for dimensions of inequality subgroups a previous survey was used.

BCG immunization coverage (DHS, MICS or RHS)		TB knowledge and attitudes (DHS)		Catastrophic costs due to TB (TB patient cost surveys)	
Latest situation	Change over time	Latest situation	Change over time	Latest situation	Country
MICS 2019	MICS 2005			2020	Thailand
DHS 2016	DHS 2009	2016	2009	2017	Timor-Leste
MICS 2017	MICS 2006				Togo
MICS 2019					Tonga
					Trinidad and Tobago
MICS 2018					Tunisia
DHS 2013	DHS 2003				Turkey
MICS 2015	MICS 2006				Turkmenistan
DHS 2016	DHS 2006			2017	Uganda[c]
MICS 2012					Ukraine[c]
					United Arab Emirates
					United Kingdom
DHS 2015	DHS 2004			2019	United Republic of Tanzania[c]
					United States of America
					Uruguay
					Uzbekistan
					Vanuatu
					Venezuela (Bolivarian Republic of)
MICS 2013	DHS 2002			2016	Viet Nam[c]
DHS 2013	MICS 2006				Yemen
DHS 2018	DHS 2007	2013	2007		Zambia[c]
DHS 2019	DHS 2009			2018	Zimbabwe

ANNEX 4
Technical details: malaria

A4.1 Data

A4.1.1 Data sources

Data about malaria were sourced from DHS and MIS available through the DHS Program STATcompiler tool *(1)*. These are nationally representative household health surveys routinely conducted in low- and middle-income countries. Standardized questionnaires are used to collect information through face-to-face interviews. Information is collected on a range of health topics, including malaria. Many surveys also include biomarker tests for malaria *(2, 3)*.

A4.1.2 Health indicators

Nine malaria indicators were included in the analysis to assess inequalities in malaria burden, prevention, and testing and treatment. These indicators represent a range of indicators within the topic and were selected on the basis of data availability and relevancy, in consultation with topic experts from WHO and the Global Fund.

Burden is assessed through malaria prevalence in children aged under 5 years according to rapid diagnostic testing. Prevention indicators encompass vector control measures (percentage of households with at least one insecticide-treated net; percentage of households with one insecticide-treated net for every two people; percentage of children sleeping under an insecticide-treated net; percentage of pregnant women sleeping under an insecticide-treated net) and an indicator of chemoprevention (percentage of women using three or more doses of IPTp).

Testing and treatment indicators pertain to children aged under 5 years with fever in the 2 weeks preceding the survey and are expressed as percentages: prompt care-seeking for fever (same or next day); malaria diagnostic use with fever; and prompt treatment of fever with antimalarial medicines (children with fever who took an antimalarial medicine the same or next day).

Detailed descriptions of indicator definitions, data sources and methods of calculation are in Annex 7.

A4.1.3 Dimensions of inequality

Malaria indicators were disaggregated by up to five dimensions of inequality: sex, economic status, education, place of residence and age (Table A4.1). Sex refers to the biological sex of the child (female or male), as this is how data were collected and reported in the sources.

Economic status was determined at the household level using a wealth index. This is a composite measure of a household's cumulative living standard based on ownership of household assets and access to utility services. It is constructed using principal component analysis and used to divide household populations into five groups (wealth quintiles) within each country.

Education reflects the highest level of education attained by the woman or the child's mother and is categorized in two subgroups: no or primary education, and secondary or higher education.

Place of residence specifies the location of the household (rural or urban). Criteria to categorize rural and urban areas were country-specific and subject to variation across countries and over time.

Age refers to the age of the child (in months).

TABLE A4.1. Inequality dimensions and subgroups for malaria analysis

Inequality dimension	Subgroups
Sex	Two subgroups: females and males
Economic status	Five subgroups: from quintile 1 (poorest 20% of population) to quintile 5 (richest 20% of population)
Education	Two subgroups: no or primary education, and secondary or higher education
Place of residence	Two subgroups: rural and urban
Age	Five subgroups: age < 12 months, 12–23 months, 24–35 months, 36–47 months and 48–59 months

A4.1.4 Study countries

Data analysis was conducted in WHO Member States with available data for the selected malaria indicators (see Table A4.9). For indicators included in the inequality analysis, only countries with data available for all subgroups of a dimension were included. For insecticide-treated net indicators, the analysis was further limited to countries from the WHO African Region, where insecticide-treated nets are the main vector control measure and distributed to a large number of people. For the IPTp indicator, analysis was limited to countries from the WHO African Region that have adopted IPTp to reduce the burden of malaria during pregnancy (see Table A4.9).

The latest situation was assessed based on the most recently available data from 2011–2020. Change over time was analysed when data were available from two time points – a recent data point from 2011–2020 and an older data point from 2001–2010, with data points being 5–15 years apart. The years vary across countries and indicators.

Depending on the malaria indicator and inequality dimension, data were available for 23–38 countries to assess the latest situation and for 8–24 countries to assess the change over time. For each of the indicators, the countries included in the analysis represent at least 72% (up to 94%) of the global malaria cases and global malaria deaths in 2020. Table A4.2 provides an overview of the disaggregated data used for the malaria analysis by indicator, including the numbers of countries with available data.

TABLE A4.2. Overview of disaggregated data used for malaria analysis

			Inequality dimension					Countries with available data	
Category	Indicator	Source	Sex	Economic status	Education	Place of residence	Age	Latest situation[a]	Change over time[b]
Burden	Malaria prevalence in children aged < 5 years (according to rapid diagnostic testing) (%)	DHS, MIS	✔	✔	✔	✔		23	8
Prevention	Households with at least one insecticide-treated net (%)	DHS, MIS		✔		✔		30	24
	Households with at least one insecticide-treated net for every two people (%)	DHS, MIS		✔		✔		30	24
	Children aged < 5 years sleeping under insecticide-treated net (%)	DHS, MIS	✔	✔		✔	✔	30	24
	Pregnant women sleeping under insecticide-treated net (%)	DHS, MIS		✔	✔	✔		30	23–24[c]
	Use of ≥3 doses of intermittent preventive treatment in pregnancy (%)	DHS, MIS		✔	✔	✔		28	19
Testing and treatment	Prompt care-seeking for children aged < 5 years with fever (%)	DHS, MIS	✔	✔	✔	✔	✔	28	15
	Malaria diagnostic use in children aged < 5 years with fever (%)	DHS, MIS	✔	✔	✔	✔	✔	38	9
	Prompt treatment of children aged < 5 years with fever with antimalarial medicines (%)	DHS, MIS	✔	✔	✔	✔	✔	36	24

DHS: Demographic and Health Surveys; MIS: Malaria Indicator Surveys.

[a] Data for the latest situation reflect the most recent survey conducted between 2011 and 2020.

[b] Data for change over time reflect the most recent survey conducted between 2011 and 2020, and a previous survey conducted between 2001 and 2010, with a 5- to 15-year gap between the two surveys.

[c] Number of countries with available data may vary within indicator depending on the availability of information for the inequality dimension.

A4.2 Analysis

Health inequalities were analysed using disaggregated data and summary measures of inequality. Absolute and relative summary measures of inequality were calculated based on the disaggregated data. Inequality thresholds were developed and applied to the summary measures of inequality to evaluate the state of inequality. The thresholds label situations considered to be high, moderate or low inequality, and to describe large, moderate or small changes in inequality over time. The inequality thresholds were used to report the global state of inequality.

A4.2.1 Summary measures of inequality

A4.2.1.1 Latest situation

To assess the latest situation of inequality, difference (a measure of absolute inequality) and ratio (a relative measure of inequality) were calculated. Difference and ratio are simple measures of inequality that make pairwise comparisons between two population subgroups. Table A4.3 provides an overview of the calculation by indicator type and inequality dimension.

TABLE A4.3. Calculation of latest situation summary measures for malaria analysis, by indicator type and inequality dimension

Indicator type	Inequality dimension	Difference calculation	Ratio calculation
Adverse health indicators, where lower estimates are desirable (burden indicators)	Sex	Females – males	Females / males
	Economic status	Quintile 1 (poorest) – quintile 5 (richest)	Quintile 1 (poorest) / quintile 5 (richest)
	Education	No or primary education – secondary or higher education	No or primary education / secondary or higher education
	Place of residence	Rural – urban	Rural / urban
Favourable health indicators, where higher estimates are desirable (prevention and testing and treatment indicators)	Sex	Males – females	Males / females
	Economic status	Quintile 5 (richest) – quintile 1 (poorest)	Quintile 5 (richest) / quintile 1 (poorest)
	Education	Secondary or higher education – no or primary education	Secondary or higher education / no or primary education
	Place of residence	Urban – rural	Urban / rural
	Age	Age 48–59 months – age < 12 months	Age 48–59 months / age < 12 months

Reference subgroups were selected based on convenience of data interpretation (providing positive values for difference calculations). For example, the poorest, least educated and rural subgroups tended to have higher malaria prevalence than the richest, most educated and urban subgroups. In the case of sex, this selection does not represent an assumed advantage of one sex over the other.

For reporting purposes, for malaria indicators (all measured as percentages), the latest situation of inequality was evaluated using the difference between two population subgroups (a measure of absolute inequality). The values used to define the inequality thresholds for the latest situation are described in Table A4.4. Table A4.5 provides examples of how measures of inequality were calculated and how thresholds were applied.

TABLE A4.4. Summary measures and inequality thresholds to assess latest situation of inequality for malaria analysis

		Threshold				
Indicator type	Summary measure of inequality	High inequality (favouring poorest, least educated, rural, youngest, female)	Moderate inequality (favouring poorest, least educated, rural, youngest, female)	Low inequality	Moderate inequality (favouring richest, most educated, urban, oldest, male)	High inequality (favouring richest, most educated, urban, oldest, male)
All indicators	Difference between two population subgroups	≤ –20 percentage points	> –20 and ≤ –5 percentage points	> –5 and < 5 percentage points	≥ 5 and < 20 percentage points	≥ 20 percentage points

TABLE A4.5. Example of calculation of summary measures and assessment of latest situation of inequality for malaria analysis

Indicator type	Inequality dimension	Country example	Difference calculation	Inequality assessment
Adverse indicator: malaria prevalence in children aged < 5 years (according to rapid diagnostic testing) (%)	Economic status	Nigeria (DHS 2018): Quintile 1 (poorest): 57.1% Quintile 5 (richest): 10.7%	Quintile 1 (poorest) − quintile 5 (richest) = 57.1% − 10.7% = 46.4 percentage points	Difference ≥ 20 percentage points: high inequality favouring richest quintile (lower prevalence among richest quintile)
Favourable indicator: households with at least one insecticide-treated net (%)	Economic status	Senegal (DHS 2019): Quintile 5 (richest): 68.0% Quintile 1 (poorest): 88.5%	Quintile 5 (richest) − quintile 1 (poorest) = 68.0% − 88.5% = −20.5 percentage points	Difference ≤ −20 percentage points: high inequality favouring poorest quintile (higher coverage among poorest quintile)

DHS: Demographic and Health Surveys.

A4.2.1.2 Change over time

To assess change in inequality over time, difference and ratio were calculated and compared between the two time points (Table A4.6). For the difference, the change in inequality over time was calculated as the difference between the absolute values of the two differences in the two time points. In the case of ratios, relative change in the ratio was analysed.

For reporting purposes, for malaria indicators (all measured as percentages), the change in inequality was evaluated using the change in difference between two population subgroups (a measure of absolute inequality). The values used to define the inequality thresholds for the change over time are described in Table A4.7. Table A4.8 shows examples of how measures of change over time were calculated and how inequality thresholds were applied.

TABLE A4.6. Calculation of change over time summary measures for malaria analysis

Time period	Difference calculation	Ratio calculation
Time 1 (2001–2010)	Difference between two population subgroups in time 1[a] *|Difference time 1|*	Ratio between two population subgroups in time 1[b] *Ratio time 1*
Time 2 (2011–2020)	Difference between two population subgroups in time 2[a] *|Difference time 2|*	Ratio between two population subgroups in time 2[b] *Ratio time 2*
Change over time	Difference between difference in time 2 and time 1 *(|Difference time 2| − |Difference time 1|) / number of years between two time points × 10*	Ratio between ratio in time 2 and ratio in time 1 *(Ratio time 2 / Ratio time 1) / number of years between two time points × 10*

[a] Calculated as absolute value yielding values above 0.
[b] Calculated as converted ratio yielding values above 1 (values were converted to be greater than 1 by dividing the maximum value by the minimum value).

TABLE A4.7. Summary measures and inequality thresholds to assess change in inequality over time for malaria analysis[a]

Indicator type	Summary measure of inequality	Threshold				
		Large decrease	Moderate decrease	Small change	Moderate increase	Large increase
All indicators	Difference between difference in time 2 and time 1	≤ −20 percentage points	> −20 and ≤ −5 percentage points	> −5 and < 5 percentage points	≥ 5 and < 20 percentage points	≥ 20 percentage points

[a] These thresholds were used to describe change in inequality over time for countries with high inequality according to the latest situation.

TABLE A4.8. Example of calculation of summary measures and assessment of change in inequality over time for malaria analysis

Indicator type	Inequality dimension	Country example	Difference calculation	Inequality assessment
Adverse indicator: malaria prevalence in children aged < 5 years (according to rapid diagnostic testing) (%)	Economic status	Nigeria (MIS 2010 and DHS 2018) Time 1 (2010): Quintile 1 (poorest): 57.0% Quintile 5 (richest): 30.1% Time 2 (2018): Quintile 1 (poorest): 57.1% Quintile 5 (richest): 10.7%	Time 1 (2010): |quintile 1 (poorest) – quintile 5 (richest)| = |57.0% – 30.1%| = 26.9 percentage points Time 2 (2018): |quintile 1 (poorest) – quintile 5 (richest)| = |57.1% – 10.7%| = 46.4 percentage points Change over time: (|difference time 2| – |difference time 1|) / number of years between two time points × 10 = (46.4 percentage points – 26.9 percentage points) / 8 years × 10 = 24.4 percentage points	Difference between difference in time 2 and time 1 ≥ 20 percentage points: large increase in inequality
Favourable indicator: households with at least one insecticide-treated net (%)	Economic status	Senegal (DHS 2010 and DHS 2019) Time 1 (2010): Quintile 5 (richest): 42.4% Quintile 1 (poorest): 75.0% Time 2 (2019): Quintile 5 (richest): 68.0% Quintile 1 (poorest): 88.5%	Time 1 (2010): |quintile 5 (richest) – quintile 1 (poorest)| = |42.4% – 75.0%| = 32.6 percentage points Time 2 (2019): |quintile 5 (richest) – quintile 1 (poorest)| = |68.0% – 88.5%| = 20.5 percentage points Change over time: (|difference time 2| – |difference time 1|) / number of years between two time points × 10 = (20.5 percentage points – 32.6 percentage points) / 9 years × 10 = −13.4 percentage points	Difference between difference in time 2 and time 1 > −20 and ≤ −5 percentage points: moderate decrease in inequality

DHS: Demographic and Health Surveys; MIS: Malaria Indicator Surveys.

A4.2.2 Addressing inequality

A4.2.2.1 Definition

PAR is a summary measure used to assess the impact of addressing inequality in malaria indicators. PAR is an absolute measure of inequality that takes into account all population subgroups (the whole population). It estimates the possible improvement in national averages if the entire population had the same level of coverage as the most advantaged subgroup. The larger the value of PAR, the higher the level of inequality.

A4.2.2.2 Analysis

PAR was calculated for indicators with data disaggregated by economic status, with the most advantaged subgroup being the richest 20% of the population (quintile 5). For each country and health indicator, PAR was calculated as the difference between the estimate for quintile 5 and the national average (Box A4.1). In the majority of cases, the richest subgroup reported better performance compared with the national average, and thus PAR yielded a positive value. In the few cases where PAR was negative due to the richest quintile having a worse situation compared with the national average, PAR was reassigned to 0, indicating the national average would not be improved.

To assess PAR globally across countries for a given health indicator, both the current national average and PAR were weighted using the applicable population for the indicator (e.g. total population, children aged under 5 years) for each country[1] and then averaged across all countries. This global average is based on the number of countries with data available for each indicator during the period of 2011 to 2020.

BOX A4.1. Example of country-level calculation of PAR

Prompt care-seeking for children aged under 5 years with fever (%) in Cameroon (DHS 2018):
Quintile 5 (richest): 45.0%
National average: 33.5%
PAR = quintile 5 (richest) – national average
= 11.5 percentage points

[1] Population estimates are from the 2019 revision of the United Nations World Population Prospects database, matched to the same year as the disaggregated data for each country and indicator *(4)*.

TABLE A4.9. Study countries, data sources and years for malaria analysis

	WHO estimates		DHS or MIS	
Country	Latest situation	Change over time	Latest situation	Change over time
Afghanistan	2020	2010	DHS 2015	
Algeria	2020	2010		
Angola[a]	2020	2010	DHS 2015	MIS 2006
Argentina	2020	2010		
Armenia	2020	2010		
Azerbaijan	2020	2010		
Bangladesh	2020	2010		
Belize	2020	2010		
Benin[a,b]	2020	2010	DHS 2017	DHS 2006
Bhutan	2020	2010		
Bolivia (Plurinational State of)	2020	2010		
Botswana	2020	2010		
Brazil	2020	2010		
Burkina Faso[a,b]	2020	2010	MIS 2017	DHS 2003
Burundi[a]	2020	2010	DHS 2016	DHS 2010
Cabo Verde	2020	2010		
Cambodia	2020	2010		
Cameroon[a]	2020	2010	DHS 2018	DHS 2004
Central African Republic[b]	2020	2010		
Chad[a]	2020	2010	DHS 2014	
China	2020	2010		
Colombia	2020	2010		
Comoros[a]	2020	2010	DHS 2012	
Congo[a]	2020	2010	DHS 2011	DHS 2005
Costa Rica	2020	2010		
Côte d'Ivoire[a,b]	2020	2010	DHS 2011	AIS 2005[c]
Democratic People's Republic of Korea	2020	2010		
Democratic Republic of the Congo[a,b]	2020	2010	DHS 2013	DHS 2007
Djibouti	2020	2010		
Dominican Republic	2020	2010		
Ecuador	2020	2010		
Egypt	2020	2010		
El Salvador	2020	2010		
Equatorial Guinea	2020	2010		
Eritrea	2020	2010		

TABLE A4.9. *continued*

	WHO estimates		DHS or MIS	
Country	Latest situation	Change over time	Latest situation	Change over time
Eswatini	2020	2010		
Ethiopia[b]	2020	2010		
Gabon[a,b]	2020	2010	DHS 2012	
Gambia[a]	2020	2010	DHS 2013	
Georgia	2020	2010		
Ghana[a,b]	2020	2010	MIS 2020	DHS 2008
Guatemala	2020	2010		
Guinea[a,b]	2020	2010	DHS 2018, DHS 2012[d]	DHS 2005
Guinea-Bissau	2020	2010		
Guyana	2020	2010		
Haiti	2020	2010	DHS 2016	
Honduras	2020	2010		
India[b]	2020	2010	DHS 2015	
Indonesia	2020	2010		
Iran (Islamic Republic of)	2020	2010		
Iraq	2020	2010		
Kazakhstan	2020	2010		
Kenya[a,b]	2020	2010	MIS 2015, DHS 2014[e]	DHS 2003, DHS 2008[e]
Kyrgyzstan	2020	2010		
Lao People's Democratic Republic	2020	2010		
Liberia[a]	2020	2010	DHS 2020, MIS 2016[f]	MIS 2010
Madagascar[a]	2020	2010	MIS 2016	DHS 2008
Malawi[a]	2020	2010	MIS 2017	DHS 2010
Malaysia	2020	2010		
Mali[a,b]	2020	2010	DHS 2018	DHS 2006
Mauritania	2020	2010		
Mexico	2020	2010		
Morocco	2020	2010		
Mozambique[a,b]	2020	2010	MIS 2018	
Myanmar	2020	2010	DHS 2015	
Namibia	2020	2010	DHS 2013	
Nepal	2020	2010		
Nicaragua	2020	2010		
Niger[a,b]	2020	2010	DHS 2012	DHS 2006

TABLE A4.9. *continued*

	WHO estimates		DHS or MIS	
Country	Latest situation	Change over time	Latest situation	Change over time
Nigeria[a,b]	2020	2010	DHS 2018	DHS 2008, MIS 2010[g]
Oman	2020	2010		
Pakistan	2020	2010	DHS 2017	DHS 2006
Panama	2020	2010		
Papua New Guinea	2020	2010	DHS 2016	
Paraguay	2020	2010		
Peru	2020	2010		
Philippines	2020	2010	DHS 2017	
Republic of Korea	2020	2010		
Rwanda[a]	2020	2010	MIS 2017	DHS 2007, DHS 2010[h]
Sao Tome and Principe	2020	2010		
Saudi Arabia	2020	2010		
Senegal[a]	2020	2010	DHS 2020, DHS 2017[i]	DHS 2010, MIS 2008[i]
Sierra Leone[a,b]	2020	2010	DHS 2020, MIS 2016[j]	DHS 2008
Solomon Islands	2020	2010		
Somalia	2020	2010		
South Africa	2020	2010		
South Sudan[b]	2020	2010		
Sri Lanka	2020	2010		
Sudan	2020	2010		
Suriname	2020	2010		
Syrian Arab Republic	2020	2010		
Tajikistan	2020	2010	DHS 2017	
Thailand	2020	2010		
Timor-Leste[b]	2020	2010	DHS 2016	DHS 2010
Togo[a]	2020	2010	MIS 2017	
Turkey	2020	2010		
Turkmenistan	2020	2010		
Uganda[a,b]	2020	2010	MIS 2018	MIS 2010
United Arab Emirates	2020	2010		
United Republic of Tanzania[a,b]	2020	2010	MIS 2017	MIS 2007
Uzbekistan	2020	2010		
Vanuatu	2020	2010		
Venezuela (Bolivarian Republic of)	2020	2010		
Viet Nam	2020	2010		

TABLE A4.9. *continued*

	WHO estimates		DHS or MIS	
Country	Latest situation	Change over time	Latest situation	Change over time
Yemen	2020	2010		
Zambia[a]	2020	2010	DHS 2018	DHS 2007
Zimbabwe[a]	2020	2010	DHS 2015, DHS 2010[k]	DHS 2005

AIS: AIDS Indicator Surveys; DHS: Demographic and Health Surveys; MIS Malaria Indicator Surveys; WHO: World Health Organization.

[a] Global Fund to Fight AIDS, Tuberculosis and Malaria high-burden or high-funding countries.

[b] Countries included in analyses of household ownership of insecticide-treated bed nets and intermittent preventive treatment in pregnancy (IPTp). Note that Rwanda was not included in the analysis for IPTp.

[c] For Côte d'Ivoire, data for change over time in insecticide-treated net ownership and use were drawn from the 2005 AIDS Indicator Surveys.

[d] For Guinea, the latest data on malaria prevalence in children aged under 5 years were available from DHS 2012. For all other indicators, the latest data were available from DHS 2018.

[e] For Kenya, data on care-seeking for febrile children aged under 5 years were drawn from DHS 2014 and DHS 2008. Data for all other indicators were drawn from MIS 2015 and DHS 2003.

[f] For Liberia, the latest data on malaria prevalence in children aged under 5 years were available from MIS 2016. For all other indicators, the latest data were available from DHS 2020.

[g] For Nigeria, data on malaria testing and malaria prevalence in children aged under 5 years were drawn from DHS 2018 and MIS 2010. Data for all other indicators were drawn from DHS 2018 and DHS 2008.

[h] For Rwanda, data on malaria testing and malaria prevalence in children aged under 5 years were drawn from MIS 2017 and DHS 2010. Data for all other indicators were drawn from MIS 2017 and DHS 2007.

[i] For Senegal, data on malaria prevalence in children aged under 5 years were drawn from DHS 2017 and DHS 2010. For care-seeking for febrile children aged under 5 years, data were drawn from DHS 2020 and MIS 2008. For all other indicators, data were drawn from DHS 2020 and DHS 2010.

[j] For Sierra Leone, the latest data on malaria prevalence in children aged under 5 years were available from MIS 2016. For all other indicators, data were available from DHS 2020 and DHS 2008.

[k] For Zimbabwe, the latest data on the use of IPTp were available from DHS 2010. For all other indicators, the latest data were available from DHS 2015.

A4.3 References

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2. DHS overview. Washington, DC: United States Agency for International Development; 2021 (https://dhsprogram.com/Methodology/Survey-Types/DHS.cfm, accessed 18 March 2021).
3. MIS overview. Washington, DC: United States Agency for International Development; 2021 (https://dhsprogram.com/Methodology/Survey-Types/MIS.cfm, accessed 18 March 2021).
4. World population prospects 2019. New York: United Nations Department of Economic and Social Affairs; 2019 (https://population.un.org/wpp/, accessed 15 February 2021).

ANNEX 5
Technical details: social determinants of health

A5.1 Data

A5.1.1 Health indicators and social determinants of health

This exploration drew from data about HIV, TB and malaria disease incidence and mortality and social determinants of health. In terms of health indicators, the analysis included estimates of disease incidence and mortality for HIV, TB and malaria. The selection of relevant social determinants of health indicators was informed by a literature review, existing monitoring frameworks (such as the TB SDG monitoring framework, developed based on linkages between TB incidence and relevant SDG monitoring framework indicators), and consultation with experts.

Sixteen relevant indicators were selected to address a range of social determinants of health, encompassing demographic characteristics, environmental factors, livelihoods and skills, health system coverage and inputs, health risk factors, and social and economic inclusion.

Other indicators considered but not included in the final analysis included universal health coverage financial hardship (SDG 2.8.2), literacy rate, air pollution (SDG 11.6.2), safe water and sanitation, workforce informality, the gender development index, the human development index, and stigma. These were not included due to a lack of comparable data across a sufficient number of countries, or due to their similarity with other indicators selected for inclusion.

A5.1.2 Data sources

The disease incidence and mortality data (UNAIDS/UNICEF/WHO or WHO estimates) were the same data used in Chapters 3–5. Data about social determinants of health were sourced from a number of databases including UNAIDS/UNICEF/WHO AIDSinfo *(1)*, UNDP Human Development Data Center *(2)*, the United Nations Global SDG Indicator Database *(3)*, the United Nations World Population Prospects *(4)*, the WHO Global Health Observatory *(5)* and the World Bank DataBank *(6)*.

Although the disease incidence and mortality indicator data are from 2020 across all countries, the social determinants of health indicator data reflect the most recent data within the past five years for each country (2015–2020). A complete list of indicators and data sources is given in Table A5.1.

TABLE A5.1. Social determinants of health indicators included in correlation analysis

Category	Social determinant of health indicator	Data source
Demography	Average annual rate of population change (%)	United Nations World Population Prospects
	Net migration rate	United Nations World Population Prospects
Environmental quality	Population with primary reliance on clean fuels and technology (%)	United Nations Global SDG Indicators Database
Livelihoods and skills	GDP per capita, PPP (current international $)	World Bank DataBank
	Population living in slums (%)	United Nations Global SDG Indicators Database
	Poverty headcount ratio at international $1.90 a day (2011 PPP) (% of population)	World Bank DataBank
	Primary school completion rate (%)	World Bank DataBank
Health system coverage and inputs	Government health expenditure per capita, PPP (international $)	WHO Global Health Observatory
	Universal health coverage service coverage index[a]	WHO Global Health Observatory
Health risk factors	HIV incidence (new infections per 1000 population)[b]	UNAIDS/UNICEF/WHO AIDSinfo
	Mortality rate attributed to cardiovascular disease, cancer, diabetes or chronic respiratory disease (%)	WHO Global Health Observatory
	Prevalence of undernourishment (%)	United Nations Global SDG Indicators Database
	Total alcohol per capita consumption in adults aged ≥ 15 years (litres of pure alcohol)	WHO Global Health Observatory
Social and economic inclusion	Gender inequality index[c]	UNDP Human Development Data Center
	Gini index for income inequality	World Bank DataBank
	Inequality-adjusted human development index	UNDP Human Development Data Center

GDP: gross domestic product; PPP: purchasing power parity; SDG: Sustainable Development Goal; UNAIDS: Joint United Nations Programme on HIV/AIDS; UNDP: United Nations Development Programme; UNICEF: United Nations Children's Fund; WHO: World Health Organization.

[a] The universal health coverage service coverage index is made up of 14 tracer indicators related to reproductive, maternal, newborn and child health; infectious diseases; noncommunicable diseases; and service capacity and access *(7)*. HIV, TB and malaria indicators (1 per disease, relating to prevention or treatment) comprise 3 of the 14 tracer indicators.

[b] HIV incidence was considered a risk factor only in the analysis of TB burden.

[c] The gender inequality index covers five indicators related to reproductive health, empowerment and economic status *(8)*.

A5.2 Analysis

The analysis investigated relationships between HIV, TB and malaria incidence and mortality and single social determinant indicators using bivariate correlation analysis. For each country, incidence and mortality estimates were matched to the most recent social determinants data within the previous 5 years.

Correlation analysis does not look at the presence or effect of other variables outside the two being analysed, and it does not imply causal relationships. The sign of the correlation coefficient indicates the direction of the association. A positive coefficient indicates higher levels of one variable are associated with higher levels of the other. A negative coefficient indicates higher levels of one variable are associated with lower levels of the other. The absolute value of the correlation coefficient indicates the strength of the association, ranging from 0 (weakest) to ± 1 (strongest).

P values were used to determine the statistical significance level of the correlation, with significance levels of < 0.05 and < 0.001 noted in the results. A *P* value of less than 0.05 indicates there is less than 5% chance that there is no correlation.

A5.3 References

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ANNEX 6
Full results: social determinants of health

Table A6.1 provides comprehensive results from the correlation analysis. The associations between country-level determinants and health indicators are available in the interactive visuals and data that accompany the report (see https://www.who.int/data/health-equity/report_2021_hiv_tb_malaria).

TABLE A6.1. Associations between HIV, tuberculosis (TB) and malaria incidence and mortality and social determinants of health indicators

Category	Social determinant of health indicator	HIV incidence[a]	AIDS-related mortality[a]	TB incidence[a]	TB mortality[a]	Malaria incidence[a]	Malaria mortality[a]
Demography	Average annual rate of population change (%)	0.17* (130)	0.24* (131)	0.35** (193)	0.37** (193)	0.60** (98)	0.57** (93)
	Net migration rate	−0.10 (130)	−0.06 (131)	−0.16* (183)	−0.14 (183)	0.03 (98)	−0.03 (93)
Environmental quality	Population with primary reliance on clean fuels and technology (%)	−0.22* (127)	−0.30** (128)	−0.56** (189)	−0.57** (189)	−0.61** (98)	−0.60** (93)
Livelihoods and skills	GDP per capita, PPP (current international $)	−0.21* (125)	−0.24* (126)	−0.45** (184)	−0.43** (184)	−0.41** (93)	−0.41** (89)
	Population living in slums (%)	0.18 (104)	0.26* (105)	0.48** (122)	0.51** (122)	0.52** (84)	0.55** (79)
	Poverty headcount ratio at international $1.90 a day (2011 PPP) (% of population)	0.38** (80)	0.41** (80)	0.45** (113)	0.55** (113)	0.74** (55)	0.71** (53)
	Primary school completion rate (%)	−0.12 (106)	−0.28* (107)	−0.28** (154)	−0.35** (154)	−0.69** (77)	−0.71** (75)
Health system coverage and inputs	Government health expenditure per capita, PPP (international $)	−0.18* (127)	−0.22* (128)	−0.42** (189)	−0.39** (189)	−0.42** (95)	−0.41** (91)
	Universal health coverage service coverage index[b]	−0.22* (130)	−0.33** (131)	−0.56** (193)	−0.59** (193)	−0.66** (98)	−0.68** (93)

TABLE A6.1. *continued*

Category	Social determinant of health indicator	HIV incidence[a]	AIDS-related mortality[a]	TB incidence[a]	TB mortality[a]	Malaria incidence[a]	Malaria mortality[a]
Health risk factors	HIV incidence (new infections per 1000 population)	—	—	0.56** (132)	0.35** (132)	—	—
	Mortality rate attributed to cardiovascular disease, cancer, diabetes or chronic respiratory disease (%)	0.40** (130)	0.42** (131)	0.51** (183)	0.41** (183)	0.23* (98)	0.20 (93)
	Prevalence of undernourishment (%)	0.32** (106)	0.38** (106)	0.59** (150)	0.59** (150)	0.32* (78)	0.31* (74)
	Total alcohol per capita consumption in people aged ≥ 15 years (litres of pure alcohol)	0.08 (128)	0.07 (129)	−0.24* (187)	−0.26** (187)	0.09 (96)	0.02 (91)
Social and economic inclusion	Gender inequality index	0.28* (120)	0.34** (120)	0.55** (162)	0.58** (162)	0.56** (84)	0.61** (79)
	Gini index for income inequality	0.54** (80)	0.50** (80)	0.35** (113)	0.32** (113)	0.03 (55)	−0.01 (53)
	Inequality-adjusted human development index	−0.32** (112)	−0.39** (112)	−0.57** (150)	−0.59** (150)	−0.68** (82)	−0.72** (79)

GDP: gross domestic product; PPP: purchasing power parity.
* *P* value < 0.05.
** *P* value < 0.001.
[a] The numbers in brackets indicate the number of countries with data.
[b] The universal health coverage service coverage index is made up of 14 tracer indicators related to reproductive, maternal, newborn and child health; infectious diseases; noncommunicable diseases; and service capacity and access. HIV, TB and malaria indicators (1 per disease, relating to prevention or treatment) comprise 3 of the 14 tracer indicators.

ANNEX 7
Indicator metadata

A7.1 HIV

	HIV
Indicator name	**HIV incidence (new infections per 1000 population)**
Data unit	Rate
Data source	UNAIDS/UNICEF/WHO
Definition	Number of new HIV infections per 1000 uninfected population Incidence rate is number of new cases per population at risk in a given time period
Numerator	Number of new HIV infections
Denominator	Uninfected population (total population minus people living with HIV)
Method of estimation	Modelling is often used to obtain an estimate of new infections using prevalence data as the main input data. Most countries rely on modelled estimates using Spectrum, a UNAIDS-supported software tool. To calculate the uninfected population per 1000, the estimate of the number of people living with HIV is subtracted from the previous year's population estimates produced by UNDP https://www.unaids.org/en/resources/documents/2016/methods-for-deriving-UNAIDS-estimates
Disaggregation	Sex
Comments	Estimates obtained through AIDSinfo (UNAIDS/UNICEF/WHO) https://aidsinfo.unaids.org/

	HIV
Indicator name	**AIDS-related mortality (deaths per 1000 population)**
Data unit	Rate
Data source	UNAIDS/UNICEF/WHO
Definition	Total number of people who have died from AIDS-related causes per 1000 population
Numerator	Number of people dying from AIDS-related causes during calendar year
Denominator	Total population regardless of HIV status
Method of estimation	The number of people dying from AIDS-related causes is estimated using mathematical modelling. To estimate the number of people dying from AIDS-related causes, the Spectrum tool, used to develop the estimates used in this report, is based on demographic data, HIV prevalence from surveys and surveillance, the number of people receiving antiretroviral therapy, HIV incidence, and assumptions around survival patterns. In some countries, data from vital reporting systems and estimates of underreporting and misclassification may also be incorporated to derive estimates of the number of AIDS-related deaths https://www.unaids.org/en/dataanalysis/datatools/spectrum-epp
Disaggregation	Sex
Comments	Estimates obtained through AIDSinfo (UNAIDS/UNICEF/WHO) https://aidsinfo.unaids.org/

HIV	
Indicator name	**Comprehensive correct knowledge about AIDS [overall, females, males]** (%)
Data unit	Percentage
Data source	AIS and DHS
Definition	Percentage of [people, females, males] who correctly identify the two major ways of preventing sexual transmission of HIV (using condoms and limiting sex to one faithful, uninfected partner), who reject the two most common local misconceptions about HIV transmission, and who know that a healthy-looking person can be living with HIV
Numerator	Interviewed [population, females, males] aged 15–49 years who correctly identify the two major ways of preventing sexual transmission of HIV, who reject the two most common local misconceptions about HIV transmission, and who know a healthy-looking person can be living with HIV
Denominator	All interviewed [population, females, males] aged 15–49 years
Method of estimation	Numerator divided by denominator, multiplied by 100 Weighted average constructed using sample weights
Disaggregation	For overall indicator: sex For sex-specific indicator: economic status, education, place of residence, age
Comments	Estimates obtained through DHS StatCompiler https://www.statcompiler.com/en/

HIV	
Indicator name	**Comprehensive correct knowledge about AIDS among young people [overall, females, males]** (%)
Data unit	Percentage
Data source	AIS and DHS
Definition	Percentage of young [people, females, males] who correctly identify the two major ways of preventing sexual transmission of HIV (using condoms and limiting sex to one faithful, uninfected partner), who reject the two most common local misconceptions about HIV transmission, and who know a healthy-looking person can be living with HIV
Numerator	Interviewed [people, females, males] aged 15–24 years who correctly identify the two major ways of preventing sexual transmission of HIV, who reject the two most common local misconceptions about HIV transmission, and who know a healthy-looking person can be living with HIV
Denominator	All interviewed [people, females, males] aged 15–24 years
Method of estimation	Numerator divided by denominator, multiplied by 100 Weighted average constructed using sample weights
Disaggregation	For overall indicator: sex For sex-specific indicator: education, place of residence, age
Comments	Estimates obtained through DHS StatCompiler https://www.statcompiler.com/en/

	HIV
Indicator name	**Accepting attitudes (would buy fresh vegetables from shopkeeper living with HIV) [overall, females, males] (%)**
Data unit	Percentage
Data source	AIS and DHS
Definition	Percentage of [people, females, males] who say they would buy fresh vegetables from a shopkeeper who they knew was living with HIV
Numerator	Interviewed [people, females, males] aged 15–49 years who say they would buy fresh vegetables from a shopkeeper who they knew was living with HIV
Denominator	All interviewed [people, females, males] aged 15–49 years who have heard of AIDS
Method of estimation	Numerator divided by denominator, multiplied by 100 Weighted average constructed using sample weights
Disaggregation	For overall indicator: sex For sex-specific indicator: economic status, education, place of residence, age
Comments	Estimates obtained through DHS StatCompiler https://www.statcompiler.com/en/

	HIV
Indicator name	**Condom use at last high-risk sex [overall, females, males] (%)**
Data unit	Percentage
Data source	AIS and DHS
Definition	Percentage of [people, females, males] who say they used a condom the last time they had sex with a non-marital, non-cohabiting partner, of those who have had sex with such a partner in the past 12 months Condom use refers to both female and male condoms in countries with an active female condom programme
Numerator	Interviewed [people, females, males] aged 15–49 years who say they used a condom the last time they had sex with a non-marital, non-cohabiting partner
Denominator	All interviewed [people, females, males] aged 15–49 years who had sex with a non-marital, non-cohabiting partner in the past 12 months
Method of estimation	Numerator divided by denominator, multiplied by 100 Weighted average constructed using sample weights
Disaggregation	For overall indicator: sex For sex-specific indicator: economic status, education, place of residence, age
Comments	Estimates obtained through DHS StatCompiler https://www.statcompiler.com/en/

HIV	
Indicator name	**Condom use at last sexual intercourse among young people [overall, females, males] (%)**
Data unit	Percentage
Data source	AIS and DHS
Definition	Percentage of young [people, females, males] aged 15–24 years who reported using a condom at last sexual intercourse, of all young [people, females, males] who had sex with more than 1 partner in the 12 months preceding the survey
Numerator	Interviewed [people, females, males] aged 15–24 years who reported using a condom at last sexual intercourse
Denominator	All interviewed [people, females, males] aged 15–24 years who had sex with more than 1 partner in the 12 months preceding the survey
Method of estimation	Numerator divided by denominator, multiplied by 100 Weighted average constructed using sample weights
Disaggregation	For overall indicator: sex For sex-specific indicator: education, place of residence, age
Comments	Estimates obtained through DHS StatCompiler https://www.statcompiler.com/en/

HIV	
Indicator name	**People living with HIV who know their HIV-positive status (%)**
Data unit	Percentage
Data source	UNAIDS/UNICEF/WHO
Definition	Percentage of people aged 15 years and older living with HIV who know their HIV-positive status at the end of the reporting period
Numerator	Number of people aged 15 years and older living with HIV who know their HIV-positive status
Denominator	Number of people aged 15 years and older living with HIV
Method of estimation	Numerator divided by denominator, multiplied by 100 Estimates of number of people living with HIV who know their HIV-positive status were derived using the most recent HIV surveillance, programme data and nationally representative population-based survey data https://indicatorregistry.unaids.org/indicator/people-living-hiv-who-know-their-status
Disaggregation	Sex
Comments	Estimates obtained through AIDSinfo (UNAIDS/UNICEF/WHO) https://aidsinfo.unaids.org/

	HIV
Indicator name	**People living with HIV on antiretroviral therapy (%)**
Data unit	Percentage
Data source	UNAIDS/UNICEF/WHO
Definition	Percentage of people aged 15 years and older on antiretroviral therapy among all people aged 15 years and older living with HIV at the end of the reporting period
Numerator	Number of people aged 15 years and older on antiretroviral therapy at the end of the reporting period
Denominator	Estimated number of people aged 15 years and older living with HIV (to determine treatment coverage)
Method of estimation	Numerator divided by denominator, multiplied by 100 Estimates of antiretroviral therapy numbers are abstracted from country reported programme data through the UNAIDS-supported Spectrum software, the Global AIDS Monitoring reporting tool and the Dublin Declaration reporting process https://indicatorregistry.unaids.org/indicator/people-living-hiv-antiretroviral-therapy
Disaggregation	Sex
Comments	Estimates obtained through AIDSinfo (UNAIDS/UNICEF/WHO) https://aidsinfo.unaids.org/

	HIV
Indicator name	**People living with HIV with suppressed viral load (%)**
Data unit	Percentage
Data source	UNAIDS/UNICEF/WHO
Definition	Percentage of people aged 15 years and older living with HIV who are on treatment and have suppressed viral loads at end of reporting period
Numerator	Number of people aged 15 years and older living with HIV in reporting period who are on treatment and have suppressed viral loads (< 1000 copies/mL)
Denominator	Estimated number of people aged 15 years and older living with HIV who are on treatment
Method of estimation	Numerator divided by denominator, multiplied by 100 Estimates were derived from data reported in Spectrum and through the online Global AIDS Monitoring reporting tool and the Dublin Declaration reporting process https://indicatorregistry.unaids.org/indicator/people-living-hiv-who-have-suppressed-viral-loads
Disaggregation	Sex
Comments	Estimates obtained through AIDSinfo (UNAIDS/UNICEF/WHO) https://aidsinfo.unaids.org/

HIV	
Indicator name	**Testing for HIV and receiving results (ever) [overall, females, males] (%)**
Data unit	Percentage
Data source	AIS and DHS
Definition	Percentage of [people, females, males] who have ever had an HIV test and received their results
Numerator	Interviewed [people, females, males] aged 15–49 years who have ever had an HIV test and received their results
Denominator	All interviewed [people, females, males] aged 15–49 years
Method of estimation	Numerator divided by denominator, multiplied by 100 Weighted average constructed using sample weights
Disaggregation	For overall indicator: sex For sex-specific indicator: economic status, education, place of residence, age
Comments	Estimates obtained through DHS StatCompiler https://www.statcompiler.com/en/

HIV	
Indicator name	**Testing for HIV and receiving results in past 12 months among sexually active young people [overall, females, males] (%)**
Data unit	Percentage
Data source	AIS and DHS
Definition	Percentage of sexually active young [people, females, males] aged 15–24 years who had sexual intercourse in the 12 months preceding the survey who had an HIV test in the 12 months preceding the survey and know the results
Numerator	Interviewed young [people, females, males] aged 15–24 years who had sexual intercourse in the 12 months preceding the survey and had an HIV test in the 12 months preceding the survey and know the results
Denominator	All interviewed young [people, females, males] aged 15–24 years who had sexual intercourse in the 12 months preceding the survey
Method of estimation	Numerator divided by denominator, multiplied by 100 Weighted average constructed using sample weights
Disaggregation	For overall indicator: sex For sex-specific indicator: education, place of residence, age
Comments	Estimates obtained through DHS StatCompiler https://www.statcompiler.com/en/

	HIV
Indicator name	**Pregnant women tested for HIV during antenatal care visit or labour and received results (%)**
Data unit	Percentage
Data source	AIS and DHS
Definition	Percentage of women tested for HIV during antenatal care visit or labour for most recent birth and receiving results, of all women who gave birth in the 2 years preceding the survey
Numerator	Interviewed women aged 15–49 years who tested for HIV during antenatal care visit or labour for most recent birth and received results
Denominator	All interviewed women aged 15–49 years who gave birth in past 2 years
Method of estimation	Numerator divided by denominator, multiplied by 100 Weighted average constructed using sample weights
Disaggregation	Economic status, education, place of residence, age
Comments	Estimates obtained through DHS StatCompiler https://www.statcompiler.com/en/

A7.2 TB

Tuberculosis	
Indicator name	**TB incidence (new infections per 100 000 population)**
Data unit	Rate
Data source	WHO estimate
Definition	New and relapsed cases of TB per 100 000 population per year
Numerator	Estimated number of new and relapsed cases of (HIV-negative) TB
Denominator	UNDP estimated population
Method of estimation	https://cdn.who.int/media/docs/default-source/hq-tuberculosis/tb-report-2021/technical_annex_methods_2021.pdf?sfvrsn=b32dc5d8_14&download=true
Disaggregation	Sex, age
Comments	Estimates obtained through WHO https://www.who.int/teams/global-tuberculosis-programme/data

Tuberculosis	
Indicator name	**TB mortality (deaths per 100 000 population)**
Data unit	Rate
Data source	WHO estimate
Definition	Annual number of TB deaths per 100 000 population
Numerator	Estimated number of (HIV-negative) TB deaths
Denominator	UNDP estimated population
Method of estimation	https://cdn.who.int/media/docs/default-source/hq-tuberculosis/tb-report-2021/technical_annex_methods_2021.pdf?sfvrsn=b32dc5d8_14&download=true
Disaggregation	Sex, age
Comments	Estimates obtained through WHO https://www.who.int/teams/global-tuberculosis-programme/data

Tuberculosis	
Indicator name	**TB prevalence (cases per 100 000 population)**
Data unit	Rate
Data source	TB prevalence surveys
Definition	National prevalence of bacteriologically positive pulmonary TB among general population aged 15 years and older
Numerator	Number of cases of bacteriologically confirmed TB (smear-positive TB and smear-negative culture-positive TB)
Denominator	Population aged 15 years and older
Method of estimation	https://www.who.int/publications/i/item/9789240022430
Disaggregation	Place of residence
Comments	TB prevalence for United Republic of Tanzania was for smear-positive TB Philippines used 10-year-old eligibility threshold for its 2007 survey

Tuberculosis	
Indicator name	**People with MDR/RR-TB (%)**
Data unit	Percentage
Data source	Country-reported to WHO
Definition	Proportion of MDR/RR-TB among people with TB
Numerator	Total number of previously untreated cases of MDR/RR-TB between 2011 and 2019
Denominator	Total number of previously untreated cases of MDR/RR-TB and non-MDR/RR-TB between 2011 and 2019
Method of estimation	Country-level sex-disaggregated data on new and previously treated cases collected by national TB programmes and reported to WHO were used to calculate estimates. Data recorded number of people with TB who underwent drug susceptibility testing before starting current course of treatment and had results for MDR/RR-TB. Data were collected either through periodic, nationally representative drug-resistance surveys of a sample of patients, or through continuous surveillance by the routine collection of drug susceptibility testing results for the majority of patients. To control for variation due to small numbers, cases of MDR/RR-TB were pooled for 2011–2019. Data were excluded where drug resistance was not reported separately for females and males. Data were restricted to data screened as having a good coverage of testing for rifampicin resistance among new TB patients, and to national-level data, to ensure representability
Disaggregation	Sex
Comments	National average estimates based on WHO estimates https://www.who.int/teams/global-tuberculosis-programme/data

Tuberculosis	
Indicator name	**Prevalence to notification ratio (years)**
Data unit	Number of years
Data source	TB prevalence surveys and country-reported case notifications
Definition	Ratio of prevalence rate to annual notification rate (expressed in years)
Numerator	Prevalence rate (at time of survey)
Denominator	Annual case notification rate
Method of estimation	Prevalence rate estimated based on TB prevalence survey; this is divided by annual notification rate
Disaggregation	Sex
Comments	The indicator indicates average time to notify a TB case; the higher the ratio, the longer the time taken for a prevalent case to be notified to the national TB programme. This accounts for some people exiting the pool of prevalent cases without being notified, for example because they self-cure or die or because they are detected and treated by providers not linked to official reporting systems https://www.who.int/teams/global-tuberculosis-programme/tb-reports

Tuberculosis	
Indicator name	**Case detection rate (%)**
Data unit	Percentage
Data source	WHO-estimated TB incidence and country-reported case notifications
Definition	Proportion of estimated new and relapse TB cases detected in a given year
Numerator	Number of new and relapse TB cases diagnosed and treated in national TB control programmes and notified to WHO
Denominator	WHO estimate of number of incident TB cases for same year
Method of estimation	Number of country-reported case notifications divided by estimated TB incidence, multiplied by 100
Disaggregation	Sex, age
Comments	The term "case detection" used here means TB is diagnosed in a patient and reported within the national surveillance system and then to WHO The term "rate" is used for historical reasons; the indicator is actually a ratio (expressed as percentage) https://www.who.int/teams/global-tuberculosis-programme/data

Tuberculosis	
Indicator name	**BCG immunization coverage among children aged 1 year (%)**
Data unit	Percentage
Data source	DHS, MICS and RHS
Definition	The percentage of children aged 1 year who have received one dose of BCG vaccine in given year
Numerator	Number of children aged 12–23 months receiving one dose of BCG vaccine
Denominator	Total number of children aged 12–23 months surveyed
Method of estimation	Data derived from reanalysis of DHS, MICS and RHS micro-data publicly available using standard indicator definitions published in DHS, MICS or RHS documentation. In some countries the time period of 12–23 months was adjusted to align with alternative national immunization periods (18–29 months or 15–26 months)
Disaggregation	Sex, economic status, mother's education, place of residence
Comments	Estimates obtained from WHO Health Equity Monitor database https://www.who.int/data/gho/health-equity

	Tuberculosis
Indicator name	**People who report TB is spread through coughing (%)**
Data unit	Percentage
Data source	DHS
Definition	Percentage of [people, females, males] who have heard of TB and correctly report TB is spread through air when coughing
Numerator	Interviewed [people, females, males] aged 15–49 years who have heard of TB and correctly report TB is spread through air when coughing
Denominator	All interviewed [people, females, males] aged 15–49 years
Method of estimation	Numerator divided by denominator, multiplied by 100 Weighted average constructed using sample weights
Disaggregation	Sex, economic status, education, place of residence, age
Comments	Estimates obtained through analysis of DHS data https://dhsprogram.com/

	Tuberculosis
Indicator name	**People who would want a family member's TB kept secret (%)**
Data unit	Percentage
Data source	DHS
Definition	Percentage of [people, females, males] who have heard of TB and who would want a family member's TB kept secret
Numerator	Interviewed [people, females, males] aged 15–49 years who have heard of TB and who would want a family member's TB kept secret
Denominator	All interviewed [people, females, males] aged 15–49 years
Method of estimation	Numerator divided by denominator, multiplied by 100 Weighted average constructed using sample weights
Disaggregation	Sex, economic status, education, place of residence, age
Comments	Estimates obtained through analysis of DHS data https://dhsprogram.com/

Tuberculosis	
Indicator name	**Families affected by TB facing catastrophic costs due to TB (%)**
Data unit	Percentage
Data source	TB patient cost surveys
Definition	Percentage of families affected by TB with total costs due to TB equivalent to over 20% of annual household income
Numerator	Number of families affected by TB incurring total costs due to TB exceeding 20% of annual household income
Denominator	Total number of families affected by TB, identified among people diagnosed with TB who are users of health services that are part of National TB Programme networks
Method of estimation	Household income is estimated in several ways within a cost survey of people with TB, depending on context, including from monthly household consumption, monthly household expenditure, monthly self-reported household income, and prediction of household annual income based on asset ownership and dwelling characteristics Total costs calculated as sum of direct medical expenditures, non-medical expenditures and income losses https://apps.who.int/iris/bitstream/handle/10665/259701/9789241513524-eng.pdf?sequence=1
Disaggregation	Economic status, TB drug resistance status
Comments	The focus of this indicator is on direct and indirect financial and economic costs which pose barriers that can greatly affect the ability of TB patients to access diagnosis and treatment, and to complete treatment successfully

A7.3 Malaria

	Malaria
Indicator name	**Malaria incidence (cases per 1000 population at risk)**
Data unit	Rate
Data source	WHO estimate
Definition	Number of malaria cases per 1000 population at risk
Numerator	Number of estimated malaria cases
Denominator	Population at risk
Method of estimation	See the methods section of the 2021 World Malaria Report for a detailed description of the estimation methods: https://www.who.int/teams/global-malaria-programme/reports/world-malaria-report-2021
Disaggregation	Not available

	Malaria
Indicator name	**Malaria mortality (deaths per 1000 population at risk)**
Data unit	Rate
Data source	WHO estimate
Definition	Number of malaria deaths per 1000 population at risk
Numerator	Number of estimated malaria deaths
Denominator	Population at risk
Method of estimation	See the methods section of the 2021 World Malaria Report for a detailed description of the estimation methods: https://www.who.int/teams/global-malaria-programme/reports/world-malaria-report-2021
Disaggregation	Not available

	Malaria
Indicator name	**Malaria prevalence in children aged < 5 years (according to rapid diagnostic testing)** (%)
Data unit	Percentage
Data source	DHS and MIS
Definition	Percentage of children aged 6–59 months tested with rapid diagnostic testing who are positive for malaria
Numerator	Children aged 6–59 months tested with rapid diagnostic testing who are positive for malaria
Denominator	Children aged 6–59 months tested with rapid diagnostic testing
Method of estimation	Numerator divided by denominator, multiplied by 100 Weighted average constructed using sample weights
Disaggregation	Sex, economic status, education, place of residence, age
Comments	Estimates obtained through DHS StatCompiler https://www.statcompiler.com/en/ Estimates may be biased by the seasonality of survey data collection: survey fieldwork for DHS is most often done during the dry season, while fieldwork for MIS is typically conducted at the end of or just after the rainy season https://dhsprogram.com/data/Guide-to-DHS-Statistics/index.htm#t=Prevalence_of_Malaria_in_Children.htm

Malaria	
Indicator name	**Households with at least one insecticide-treated net (%)**
Data unit	Percentage
Data source	DHS and MIS
Definition	Percentage of households with at least one insecticide-treated mosquito net
Numerator	Number of surveyed households with at least one insecticide-treated mosquito net
Denominator	Number of surveyed households
Method of estimation	Numerator divided by denominator, multiplied by 100 Weighted average constructed using sample weights
Disaggregation	Economic status, place of residence
Comments	Estimates obtained through DHS StatCompiler https://www.statcompiler.com/en/ Estimates may be biased by the seasonality of survey data collection: survey fieldwork for DHS is most often done during the dry season, and fieldwork for MIS is typically conducted at the end of or just after the rainy season https://dhsprogram.com/data/Guide-to-DHS-Statistics/index.htm#t=Household_Possession_of_Mosquito_Nets.htm

Malaria	
Indicator name	**Households with at least one insecticide-treated net for every two people (%)**
Data unit	Percentage
Data source	DHS and MIS
Definition	Percentage of households with at least one insecticide-treated mosquito net for every two people who stayed in the household the previous night
Numerator	Households with at least one insecticide-treated mosquito net for every two people who stayed in the household the night before the survey
Denominator	Households with at least one person who stayed in the household the night before the survey
Method of estimation	Numerator divided by denominator, multiplied by 100 Weighted average constructed using sample weights
Disaggregation	Economic status, place of residence
Comments	Estimates obtained through DHS StatCompiler https://www.statcompiler.com/en/ Estimates may be biased by the seasonality of survey data collection: survey fieldwork for DHS is most often done during the dry season, and fieldwork for MIS is typically conducted at the end of or just after the rainy season https://dhsprogram.com/data/Guide-to-DHS-Statistics/index.htm#t=Household_Possession_of_Mosquito_Nets.htm

	Malaria
Indicator name	**Children aged < 5 years sleeping under insecticide-treated net (%)**
Data unit	Percentage
Data source	DHS and MIS
Definition	Percentage of children aged < 5 years who slept under insecticide-treated net the night before the survey
Numerator	Children aged < 5 years who slept under insecticide-treated net the night before the survey
Denominator	Children aged < 5 years
Method of estimation	Numerator divided by denominator, multiplied by 100 Weighted average constructed using sample weights
Disaggregation	Sex, economic status, place of residence, age
Comments	Estimates obtained through DHS StatCompiler https://www.statcompiler.com/en/ Estimates may be biased by the seasonality of survey data collection: survey fieldwork for DHS is most often done during the dry season, and fieldwork for MIS is typically conducted at the end of or just after the rainy season https://dhsprogram.com/data/Guide-to-DHS-Statistics/index.htm#t=Use_of_Mosquito_Nets_by_Children.htm

	Malaria
Indicator name	**Pregnant women sleeping under insecticide-treated net (%)**
Data unit	Percentage
Data source	DHS and MIS
Definition	Percentage of pregnant women who slept under insecticide-treated net the night before the survey
Numerator	Pregnant women who slept under insecticide-treated net the night before the survey
Denominator	Pregnant women
Method of estimation	Numerator divided by denominator, multiplied by 100 Weighted average constructed using sample weights
Disaggregation	Economic status, education, place of residence
Comments	Estimates obtained through DHS StatCompiler https://www.statcompiler.com/en/ Estimates may be biased by the seasonality of survey data collection: survey fieldwork for DHS is most often done during the dry season, and fieldwork for MIS is typically conducted at the end of or just after the rainy season https://dhsprogram.com/data/Guide-to-DHS-Statistics/index.htm#t=Use_of_Mosquito_Nets_by_Pregnant_Women.htm

Malaria	
Indicator name	**Use of ≥3 doses of intermittent preventive treatment in pregnancy (%)**
Data unit	Percentage
Data source	DHS and MIS
Definition	Percentage of women aged 15–49 years with a live birth in the 2 years preceding the survey who during the pregnancy took three or more doses of sulfadoxine/pyrimethamine
Numerator	Women aged 15–49 years with a live birth in the 2 years preceding the survey who during the pregnancy took three or more doses of sulfadoxine/pyrimethamine
Denominator	Women aged 15–49 years with a live birth in the 2 years preceding the survey
Method of estimation	Numerator divided by denominator, multiplied by 100 Weighted average constructed using sample weights
Disaggregation	Economic status, education, place of residence
Comments	Estimates obtained through DHS StatCompiler https://www.statcompiler.com/en/ Estimates may be biased by the seasonality of survey data collection: survey fieldwork for DHS is most often done during the dry season, and fieldwork for MIS is typically conducted at the end of or just after the rainy season https://dhsprogram.com/data/Guide-to-DHS-Statistics/index.htm#t=Use_of_Intermittent_Preventive_Treatment_IPTp_by_Women_during_Pregnancy.htm

Malaria	
Indicator name	**Prompt care-seeking for children aged < 5 years with fever (%)**
Data unit	Percentage
Data source	DHS and MIS
Definition	Among children aged < 5 years with fever in the 2 weeks preceding the survey, the percentage for whom advice or treatment was sought the same or next day
Numerator	Children aged < 5 years with fever in the 2 weeks preceding the survey, for whom advice or treatment was sought the same or next day
Denominator	Children aged < 5 years with fever in the 2 weeks preceding the survey
Method of estimation	Numerator divided by denominator, multiplied by 100 Weighted average constructed using sample weights
Disaggregation	Sex, economic status, education, place of residence, age
Comments	Estimates obtained through DHS StatCompiler https://www.statcompiler.com/en/ Estimates may be biased by the seasonality of survey data collection: survey fieldwork for DHS is most often done during the dry season, and fieldwork for MIS is typically conducted at the end of or just after the rainy season https://dhsprogram.com/data/Guide-to-DHS-Statistics/index.htm#t=Prevalence_Diagnosis_and_Prompt_Treatment_of_Children_with_Fever.htm

	Malaria
Indicator name	**Malaria diagnostic use in children aged < 5 years with fever (%)**
Data unit	Percentage
Data source	DHS and MIS
Definition	Among children aged < 5 years with fever in the 2 weeks preceding the survey, the percentage who had blood taken from a finger or heel for testing
Numerator	Children aged < 5 years with fever in the 2 weeks preceding the survey who had blood taken from a finger or heel for testing
Denominator	Children aged < 5 years with fever in the 2 weeks preceding the survey
Method of estimation	Numerator divided by denominator, multiplied by 100 Weighted average constructed using sample weights
Disaggregation	Sex, economic status, education, place of residence, age
Comments	Estimates obtained through DHS StatCompiler https://www.statcompiler.com/en/ Estimates may be biased by the seasonality of survey data collection: survey fieldwork for DHS is most often done during the dry season, and fieldwork for MIS is typically conducted at the end of or just after the rainy season https://dhsprogram.com/data/Guide-to-DHS-Statistics/index.htm#t=Prevalence_Diagnosis_and_Prompt_Treatment_of_Children_with_Fever.htm

	Malaria
Indicator name	**Prompt treatment of children aged < 5 years with fever with antimalarial medicines (%)**
Data unit	Percentage
Data source	DHS and MIS
Definition	Among children aged < 5 years with fever in the 2 weeks preceding the survey, the percentage who took antimalarial medicines the same or next day following the onset of fever
Numerator	Children aged < 5 years with fever in the 2 weeks preceding the survey who took antimalarial medicines the same or next day following the onset of fever
Denominator	Children aged < 5 years with fever in the 2 weeks preceding the survey
Method of estimation	Numerator divided by denominator, multiplied by 100 Weighted average constructed using sample weights
Disaggregation	Sex, economic status, education, place of residence, age
Comments	Estimates obtained through DHS StatCompiler https://www.statcompiler.com/en/ Estimates may be biased by the seasonality of survey data collection: survey fieldwork for DHS is most often done during the dry season, and fieldwork for MIS is typically conducted at the end of or just after the rainy season https://dhsprogram.com/data/Guide-to-DHS-Statistics/index.htm#t=Prevalence_Diagnosis_and_Prompt_Treatment_of_Children_with_Fever.htm

A7.4 Social determinants of health

Social determinants of health	
Indicator name	**Average annual rate of population change** (%)
Data unit	Percentage
Data source	United Nations World Population Prospects
Definition	Annual average rate of change of population size for given country during specified year
Numerator	Annual increase in population size
Denominator	Total population (mid-year estimated value)
Method of estimation	Annual increase in population size divided by total population, multiplied by 100
Comments	https://population.un.org/wpp/Publications/Files/WPP2019_Methodology.pdf

Social determinants of health	
Indicator name	**Net migration rate**
Data unit	Number
Data source	United Nations World Population Prospects
Definition	Net number of migrants (number of immigrants minus number of emigrants per 1000 population)
Numerator	Number of immigrants minus number of emigrants over period
Denominator	Person-years lived by population of receiving country over period
Method of estimation	Number of immigrants minus number of emigrants over period, divided by person-years lived by population of receiving country over period Expressed as net number of migrants per 1000 population
Comments	https://population.un.org/wpp/Publications/Files/WPP2019_Methodology.pdf

Social determinants of health	
Indicator name	**Population with primary reliance on clean fuels and technology** (%)
Data unit	Percentage
Data source	United Nations Global SDG Indicator Database
Definition	Percentage of population with primary reliance on clean fuels and technology (SDG 7.1.2)
Numerator	Number of people using clean fuels and technologies for cooking, heating and lighting
Denominator	Total population reporting any cooking, heating or lighting
Method of estimation	Numerator divided by denominator, multiplied by 100
Comments	"Clean" is defined by the emission rate targets and specific fuel recommendations (against unprocessed coal and kerosene) included in the normative guidance WHO guidelines for indoor air quality: household fuel combustion https://unstats.un.org/sdgs/metadata/

Social determinants of health	
Indicator name	**GDP per capita, PPP (current international $)**
Data unit	International dollars
Data source	World Bank DataBank
Definition	GDP divided by mid-year population
Numerator	Sum of gross value added by all resident producers in economy plus any product taxes and minus any subsidies not included in value of the products (GDP)
Denominator	Mid-year population
Method of estimation	Numerator divided by denominator
Comments	https://databank.worldbank.org/metadataglossary/sustainable-development-goals-%28sdgs%29/series/NY.GDP.PCAP.KD

Social determinants of health	
Indicator name	**Population living in slums (%)**
Data unit	Percentage
Data source	United Nations Global SDG Indicator Database
Definition	Percentage of urban population living in slums and informal settlements (SDG 11.1.1)
Numerator	Number of people living in slums and informal settlements
Denominator	Total urban population
Method of estimation	Numerator divided by denominator, multiplied by 100
Comments	Criteria used in defining slums, informal settlements and inadequate housing include access to water and sanitation, sufficient living area (overcrowding), structural quality (durability and location), and security of tenure https://unstats.un.org/sdgs/metadata/

Social determinants of health	
Indicator name	**Poverty headcount ratio at international $1.90 a day (2011 PPP) (% of population)**
Data unit	Percentage
Data source	World Bank DataBank
Definition	Percentage of population living on less than international $1.90 a day at 2011 international prices
Numerator	Population living on less than international $1.90 a day at 2011 international prices
Denominator	Total population
Method of estimation	Numerator divided by denominator, multiplied by 100
Comments	Current extreme poverty line is set at international $1.90 a day in 2011 PPP terms, which represents the mean of the poverty lines found in 15 of the poorest countries ranked by per capita consumption https://databank.worldbank.org/metadataglossary/world-development-indicators/series/SI.POV.GAPS

Social determinants of health	
Indicator name	**Primary school completion rate** (%)
Data unit	Percentage
Data source	World Bank DataBank
Definition	Completion rate of primary education or gross intake ratio to last grade of primary education
Numerator	Number of new entrants (enrolments minus repeaters) in last grade of primary education (all ages)
Denominator	Population at entrance age for last grade of primary education
Method of estimation	Numerator divided by denominator, multiplied by 100
Comments	Data on education are collected by the UNESCO Institute for Statistics from official responses to its annual education survey. All data are mapped to the International Standard Classification of Education to ensure comparability of education programmes at international level. The current version was formally adopted by UNESCO Member States in 2011 Population data drawn from UNPD https://databank.worldbank.org/metadataglossary/gender-statistics/series/SE.PRM.CMPT.FE.ZS

Social determinants of health	
Indicator name	**Government health expenditure per capita, PPP (international $)**
Data unit	International dollars
Data source	WHO Global Health Observatory
Definition	Per capita general government expenditure on health expressed in PPP international dollars
Numerator	General government expenditure on health
Denominator	Total population
Method of estimation	Sum of general government expenditure on health divided by total population
Comments	https://www.who.int/data/gho/indicator-metadata-registry/imr-details/108

Social determinants of health	
Indicator name	**Universal health coverage service coverage index**
Data unit	Index (0–100)
Data source	WHO Global Health Observatory
Definition	Coverage of essential health services (defined as average coverage of essential services based on tracer interventions that include reproductive, maternal, newborn and child health, infectious diseases, noncommunicable diseases and service capacity and access, among the general and the most disadvantaged population) (SDG 3.8.1)
Method of estimation	Computed using geometric means of 14 tracer indicators: *Reproductive, maternal, newborn and child health:* • Family planning: percentage of women of reproductive age (15—49 years) who are married or in union who have their need for family planning satisfied with modern methods • Pregnancy and delivery care: percentage of women aged 15–49 years with a live birth in a given time • Child immunization: percentage of infants receiving three doses of diphtheria-tetanus-pertussis containing vaccine • Child treatment: percentage of children aged under 5 years with suspected pneumonia in the 2 weeks preceding survey taken to an appropriate health facility or provider *Infectious diseases:* • TB: percentage of incident TB cases detected and successfully treated • HIV: percentage of people living with HIV on antiretroviral therapy • Malaria: percentage of population in malaria-endemic areas who slept under insecticide-treated net the previous night (only for countries with high malaria burden) • Water and sanitation: percentage of households using at least basic sanitation facilities *Noncommunicable diseases:* • Hypertension: age-standardized prevalence of non-raised blood pressure among adults aged ≥ 18 years • Diabetes: age-standardized mean fasting plasma glucose (mmol/L) for adults aged ≥ 18 years • Tobacco: age-standardized prevalence of adults aged ≥ 15 years not smoking tobacco in past 30 days *Service capacity and access:* • Hospital access: hospital beds per capita • Health workforce: health professionals (physicians, psychiatrists, surgeons) per capita • Health security: International Health Regulations core capacity index
Comments	https://www.who.int/data/gho/indicator-metadata-registry/imr-details/4834

Social determinants of health	
Indicator name	**Mortality rate attributed to cardiovascular disease, cancer, diabetes or chronic respiratory disease (%)**
Data unit	Percentage
Data source	WHO Global Health Observatory
Definition	Mortality rate attributed to cardiovascular disease, cancer, diabetes or chronic respiratory disease (SDG 3.4.1)
Method of estimation	Percentage of people aged 30 years who would die before their 70th birthday from cardiovascular disease, cancer, diabetes or chronic respiratory disease, assuming they experience current mortality rates at every age and do not die from any other cause of death (e.g. injuries, AIDS). This is calculated using life table methods https://www.who.int/docs/default-source/gho-documents/global-health-estimates/ghe2019_cod_methods.pdf
Comments	Estimates derived from WHO Global Health Estimates

Social determinants of health	
Indicator name	**Prevalence of undernourishment (%)**
Data unit	Percentage
Data source	United Nations Global SDG Indicator Database
Definition	Proportion of population whose habitual food consumption is insufficient to provide dietary energy levels required to maintain normal active and healthy life (SDG 2.1.1)
Method of estimation	Computed at the population level. The population is represented by an "average" individual for whom a probability distribution of the habitual daily dietary energy intake levels is modelled through a parametric probability density function
Comments	https://unstats.un.org/sdgs/metadata/

Social determinants of health	
Indicator name	**Total alcohol per capita consumption in adults aged ≥ 15 years (litres of pure alcohol)**
Data unit	Litres
Data source	WHO Global Health Observatory
Definition	Recorded amount of alcohol consumed per capita (aged ≥ 15 years) over calendar year in country, in litres of pure alcohol
Numerator	Sum of beverage-specific alcohol consumption of pure alcohol (beer, wine, spirits, other)
Method of estimation	Consumption of pure alcohol calculated as sum of beverage-specific alcohol consumption of pure alcohol (beer, wine, spirits, other). To make the conversion into litres of pure alcohol, if beverage volumes are not available in litres of pure alcohol, the alcohol content (% alcohol by volume) is considered as follows: beer (barley beer 5%), wine (grape wine 12%; must of grape 9%; vermouth 16%), spirits (distilled spirits 40%; spirit-like 30%), and other (sorghum, millet, maize beers 5%; cider 5%; fortified wine 17% and 18%; fermented wheat and fermented rice 9%; other fermented beverages 9%)
Comments	https://www.who.int/data/gho/data/indicators/indicator-details/GHO/alcohol-consumption-among-adults-aged-=-15-years-(litres-of-pure-alcohol-per-person-per-year)

Social determinants of health	
Indicator name	**Gender inequality index**
Data unit	Index (0–1)
Data source	UNDP Human Development Data Center
Definition	Loss in potential human development due to inequality between female and male achievements in three dimensions (reproductive health, empowerment, labour market)
Method of estimation	Computed using an association-sensitive inequality measure, which implies the index is based on the general mean of general means of different orders. The first aggregation is by a geometric mean across dimensions; these means, calculated separately for women and men, are then aggregated using a harmonic mean across genders Reproductive health is measured by maternal mortality ratio and adolescent birth rates Empowerment is measured by proportion of parliamentary seats occupied by females and proportion of adult females and males aged ≥ 25 years with at least some secondary education Economic status, expressed as labour market participation, is measured by labour force participation rate of female and male populations aged ≥ 15 years
Comments	Index ranges from 0 (men and women fare equally) to 1 (one gender fares as poorly as possible in all measured dimensions) http://hdr.undp.org/sites/default/files/hdr2020_technical_notes.pdf

	Social determinants of health
Indicator name	**Gini index for income inequality**
Data unit	Index (0–100)
Data source	World Bank DataBank
Definition	Extent to which distribution of income (or, in some cases, consumption expenditure) among individuals or households within economy deviates from perfectly equal distribution
Method of estimation	Lorenz curve plots cumulative percentages of total income received against cumulative number of recipients, starting with the poorest individual or household. Gini index measures area between Lorenz curve and hypothetical line of absolute equality, expressed as percentage of maximum area under line
Comments	Gini index 0 represents perfect equality; Gini index 100 implies perfect inequality https://databank.worldbank.org/metadataglossary/world-development-indicators/series/SI.POV.GINI

	Social determinants of health
Indicator name	**Inequality-adjusted human development index**
Data unit	Index (0–1)
Data source	UNDP Human Development Data Center
Definition	Adjusts the human development index for inequality in the distribution of each dimension across the population Measures level of human development taking inequality into account
Method of estimation	Human development index is a summary measure of achievements in three key dimensions of human development (long and healthy life, access to knowledge, decent standard of living) and is the geometric mean of normalized indices for each of the dimensions Inequality-adjusted human development index adjusts for inequality in distribution of each dimension across population
Comments	http://hdr.undp.org/sites/default/files/hdr2020_technical_notes.pdf

Index

N

P

R

S

T

https://www.who.int/data/health-equity/report_2021_hiv_tb_malaria

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https://www.who.int/data/health-equity/report_2021_hiv_tb_malaria

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