Safely managed drinking water

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Contents

1 Introduction

The WHO/UNICEF Joint Monitoring Programme for Water Supply and Sanitation (JMP) was established in 1990. Since then, the JMP has produced regular estimates of global, regional and national progress on drinking water, sanitation and hygiene (WASH). This thematic report examines safely managed drinking water services in the context of the 2030 Agenda for Sustainable Development.

INTRODUCTION

Over the past 25 years, the JMP has been instrumental in developing global norms to benchmark progress and facilitating critical reflection among WASH sector stakeholders. The JMP was responsible for tracking progress towards the 2015 Millennium Development Goal (MDG) target 7c and will be responsible for monitoring the new 2030 Sustainable Development Goal (SDG) targets 6.1 and 6.2.

The SDG targets aim for universal access to drinking water, sanitation and hygiene and call for enhanced monitoring to ensure that no one is left behind. This report considers the implications of target 6.1, "*by 2030, achieve universal and equitable access to safe and affordable drinking water for all,*" and outlines JMP plans for enhanced global monitoring of drinking water during the SDG era.[1]

The first section examines the SDG vision for universal access and the specific language used in the formulation of global targets. It acknowledges the limitations of indicators based on source type and introduces a more ambitious indicator for SDG monitoring that takes account of accessibility, availability and quality of drinking water. 'Safely managed drinking water services' represents a higher level of service and a new rung at the top of the drinking water 'ladder' used by the JMP for global monitoring.

'Universal access' means everyone. The report draws attention to those populations who remain unserved and outlines JMP plans for tracking inequalities between and within countries. 'Universal' also implies expanding monitoring efforts beyond the household, to include institutions and other settings. The report identifies global indicators that the JMP will use to monitor access to water in schools and health care settings as a first priority.

The second section of the report examines the availability of data on the different elements of safely managed drinking water services and discusses data-related challenges. It illustrates how the JMP will combine data from different sources in order to track the progressive elimination of inequalities in access and service levels, and global progress towards the SDG target over the next 15 years.

The report concludes that monitoring progress towards safely managed drinking water will be more challenging in some countries than others, but estimates are expected to improve over time as more and better data become available.

1 The implications of SDG 6.2 and JMP plans for global monitoring of sanitation and hygiene in the SDG era will be explored in a separate thematic report.

BOX 1

A global goal dedicated to water and sanitation

GOAL 6. ENSURE AVAILABILITY AND SUSTAINABLE MANAGEMENT OF WATER AND SANITATION FOR ALL

TARGETS

6.1 By 2030, achieve universal and equitable access to safe and affordable drinking water for all

6.2 By 2030, achieve access to adequate and equitable sanitation and hygiene for all and end open defecation, paying special attention to the needs of women and girls and those in vulnerable situations

6.3 By 2030, improve water quality by reducing pollution, eliminating dumping and minimizing release of hazardous chemicals and materials, halving the proportion of untreated wastewater and substantially increasing recycling and safe reuse globally

6.4 By 2030, substantially increase water-use efficiency across all sectors and ensure sustainable withdrawals and supply of freshwater to address water scarcity and substantially reduce the number of people suffering from water scarcity

6.5 By 2030, implement integrated water resources management at all levels, including through transboundary cooperation as appropriate

6.6 By 2020, protect and restore water-related ecosystems, including mountains, forests, wetlands, rivers, aquifers and lakes

6.a By 2030, expand international cooperation and capacity-building support to developing countries in water- and sanitation-related activities and programmes, including water harvesting, desalination, water efficiency, wastewater treatment, recycling and reuse technologies

6.b Support and strengthen the participation of local communities in improving water and sanitation management

2

The 2030 Agenda for drinking water

The Sustainable Development Goals call for universal access by 2030. In this section, new ladders for monitoring drinking water services at home, at school and in health facilities are presented, together with proposals for enhanced monitoring on inequalities and affordability during the SDG era.

2.1 A vision for 2030

The 2030 Agenda for Sustainable Development (2030 Agenda)[2] sets out 17 Sustainable Development Goals and 169 targets designed to be universally relevant and applicable to all countries. The SDGs call for an integrated approach to social, economic and environmental dimensions, and this is reflected in Goal 6, which includes targets addressing all aspects of the water and sanitation cycle (Box 1).

The Goal 6 targets for water and sanitation are highly ambitious, but consistent with the overarching ambition of the 2030 Agenda to "end poverty in all its forms" and "leave no one behind." Furthermore, it is recognized that the targets under Goal 6 are closely interdependent, and that progress towards water and sanitation targets is critical for the achievement of other SDG goals and targets (see Box 2).

Target 6.1 relates to drinking water. The target text has been carefully formulated and agreed upon by all the United Nations Member States, and is far more ambitious than the previous MDG target. Firstly, it aims to achieve universal access, rather than just halving the proportion of the population without

BOX 2
WASH in the SDGs

The 2030 Agenda emphasizes the indivisible nature of the 17 Sustainable Development Goals and 169 targets and the need to address the links between the social, economic and environmental aspects of development. UN Water partners have identified a wide range of links and independencies between the Goal 6 targets on water and sanitation and targets under other goals.[3]

Goal 6 calls for an integrated approach to monitoring that takes account of the links between water supply, sanitation and hygiene (6.1 and 6.2) and treatment, recycling and reuse of wastewater (6.3), increasing efficiency and ensuring sustainable withdrawals (6.4) and protection of water-related ecosystems (6.6) as part of an integrated approach to water resources management (6.5). It also focuses attention on the links between development outcomes and means of implementation (6a and 6b). To this end, the JMP will work closely with UN Water partners involved in monitoring targets 6.3–6.6, 6a and 6b under the GEMI initiative for Integrated Monitoring of SDG targets for water and sanitation[4] and the Global Analysis and Assessment of Sanitation and Drinking Water (GLAAS).[5]

Progress on drinking water, sanitation and hygiene is also critical for the achievement of other targets, including reducing poverty and achieving universal access to basic services (1.1 and 1.2); ending all forms of malnutrition (2.2); ending preventable child deaths, combating neglected tropical diseases and waterborne diseases, and achieving universal health coverage (3.2, 3.3, 3.8 and 3.9); providing safe and inclusive learning environments (4a); ending violence against women and girls and reducing gender inequality (5.2 and 5.4); ensuring adequate, safe and affordable housing for all (11.1) and reducing deaths caused by disasters (11.5). The JMP will therefore continue to collaborate with monitoring initiatives from other sectors during the SDG era.

2 United Nations General Assembly, 'Resolution adopted by the General Assembly on 25 September 2015: 70/1. Transforming our world: The 2030 Agenda for Sustainable Development', A/RES/70/1, 21 October 2015, <www.un.org/ga/search/view_doc.asp?symbol=A/RES/70/1&Lang=E>.

3 See ‹www.unwater.org/publications/publications-detail/en/c/429651›.

4 See ‹www.unwater.org/gemi/en›.

5 See ‹www.who.int/water_sanitation_health/monitoring/investments/glaas/en›

access. Secondly, it calls for equitable access, which implies reducing inequalities in service levels between population subgroups. Thirdly, it specifies that drinking water should be safe, affordable and accessible to all.

The JMP has developed a normative interpretation for each of the terms used in target 6.1 (Table 1). While it is not yet possible to measure all of these elements on a routine basis in all countries, the JMP approach to global monitoring aims to reflect this normative interpretation as closely as possible.

In March 2016, the Inter-Agency and Expert Group on SDG indicators published a list of 230 global SDG indicators.[6] The indicator selected for global monitoring of SDG target 6.1 is the 'proportion of population using safely managed drinking water services'. Safely managed drinking water represents an ambitious new global service norm that forms part of the new JMP ladder for global monitoring of household drinking water services.

TABLE 1

JMP normative interpretation of terms used in SDG target 6.1

Target language	Normative interpretation
By 2030, achieve	
universal	Implies all exposures and settings, including households, schools, health facilities, workplaces and public spaces
and ***equitable***	Implies progressive reduction and elimination of inequalities between population subgroups
access	Implies sufficient water to meet domestic needs is reliably available close to home
to ***safe***	Safe drinking water is free from pathogens and elevated levels of toxic substances at all times
and ***affordable***	Payment for services does not present a barrier to access or prevent people from meeting other basic human needs
drinking water	Water used for drinking, cooking, food preparation and personal hygiene
for all	Suitable for use by men, women, girls and boys of all ages, including people with disabilities

6 United Nations Economic and Social Council, Statistical Commission, 'Report of the Inter-Agency and Expert Group on Sustainable Development Goal Indicators', E/CN.3/2016/2/Rev.1*, 19 February 2016, ‹http://unstats.un.org/unsd/statcom/47th-session/documents/2016-2-SDGs-Rev1-E.pdf› .

2.2 A new ladder for household drinking water

Since 2000, the JMP has used a simple improved/unimproved source type classification to compare progress across countries.[7] It has also developed drinking water and sanitation 'ladders' that enable further differentiation of service levels. International consultations with WASH sector stakeholders[8] recommended that future global WASH monitoring should build on established indicators and progressively address the normative criteria of the human right to water.[9]

The JMP has developed a new service ladder to facilitate enhanced monitoring of drinking water during the SDG era (Figure 1). It builds on the established source type classification, thereby providing continuity with MDG monitoring, and introduces additional criteria on the accessibility, availability and quality of drinking water services. The rungs on the ladder are designed to enable countries at different stages of development to benchmark and compare progress over time.

At the bottom of the ladder, the JMP will continue to differentiate populations using surface water such as rivers, lakes and ponds (**no service**) and other unimproved sources that do not protect against contamination (**unimproved**) from populations using improved sources whose design protects against contamination. During the SDG reporting period, the population using improved sources will be subdivided into three levels of service.

If a household uses an improved source that is not readily accessible (i.e., a round trip to collect water, including queuing, exceeds 30 minutes), then it will be categorized as '**limited**' service. But if the improved source is readily

The new JMP ladder for household drinking water services

Service level	Definition
Safely managed	Improved source located on premises, available when needed, and free from faecal and priority chemical contamination
Basic	Improved source within 30 minutes round-trip collection time
Limited	Improved source over 30 minutes round-trip collection time
Unimproved	Unimproved source that does not protect against contamination
No service	Surface water

FIGURE 1 JMP service ladder for household drinking water

7 See WHO/UNICEF Joint Monitoring Programme for Water Supply and Sanitation, 'Definitions & Methods', ‹www.wssinfo.org/definitions-methods›.

8 See WHO/UNICEF Joint Monitoring Programme for Water Supply and Sanitation, 'Post-2015 Monitoring', ‹www.wssinfo.org/post-2015-monitoring›.

9 United Nations 2010, A/HRC/15/31/Add.1 Report of the independent expert on the issue of human rights obligations related to access to safe drinking water and sanitation, Catarina de Albuquerque Addendum Progress report on the compilation of good practices.

accessible close to home (i.e., a round trip to collect water, including queuing, takes 30 minutes or less), it will be categorized as a '**basic**' service. In order to meet the threshold for a '**safely managed**' service, the improved source must meet three conditions:

- source should be located on premises (within the dwelling, yard or plot),
- water should be available when needed, and
- water supplied should be free from faecal and priority chemical contamination.

If any of the three conditions are not met, but the improved source is within 30 minutes of the home, it will continue to be categorized as a 'basic' service.

'Improved' sources are those that are potentially capable of delivering safe water by nature of their design and construction. These include piped water, boreholes or tubewells, protected dug wells, protected springs, and rainwater. Unimproved sources include unprotected dug wells and unprotected springs. The JMP recognizes that bottled water and tanker truck water can potentially deliver safe water, but has previously treated them as unimproved due to lack of data on accessibility, availability and quality. From now on, the JMP will treat them as improved and classify them as 'limited', 'basic' or 'safely managed', based on the criteria outlined above.[10]

The SDG targets are designed to be universally applicable to low-, middle- and high-income countries, and the new drinking water ladder enables countries at different stages of development to benchmark and compare progress in service levels over time.

A top priority for the SDG era will be to extend access to those populations that remain unserved. Many low- and middle-income countries still have work to do to

More than one third of countries are not on track to achieve universal household access to 'improved' drinking water sources by 2030

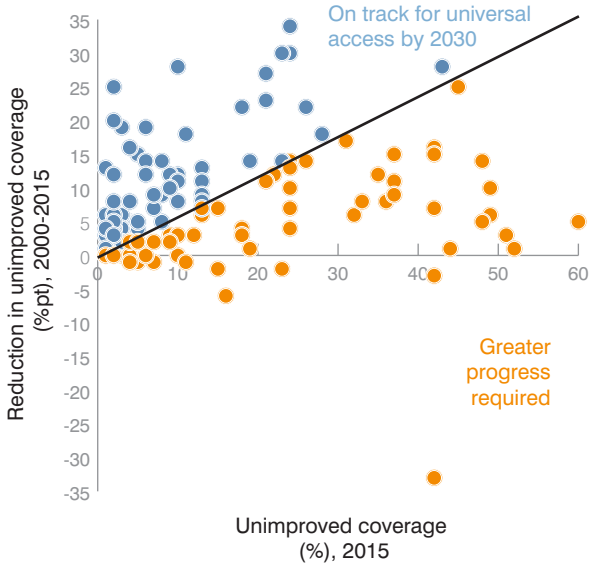


FIGURE 2 Unimproved coverage and percentage rate of reduction (2000-2015)

eliminate the use of surface water and unimproved sources that present the greatest risk to public health. At current rates of progress, more than one third of countries will not achieve universal access to an 'improved' source of drinking water by 2030 (Figure 2).

Achieving universal coverage of 'safely managed' drinking water services will be an even greater challenge. Individual countries will therefore need to establish customized national targets focused on increasing coverage of basic and safely managed drinking water services in line with national strategies for sustainable development. Development partners will also need to consider how to balance support for extending access and improving service levels.

10 For further discussion on delivered and packaged water see Box 4 on page 37.

2.3 Going beyond the household

Monitoring target 6.1, which aims for "universal access" to drinking water "for all", requires going beyond the household and considering access in institutional settings and public spaces. The JMP has developed new service ladders for global monitoring of WASH in schools and health care facilities, and other settings will be included once data become available.

Drinking water in schools

Advanced service	To be defined at national level (e.g. water is available when needed, accessible to all, free from contamination, etc)
Basic service	Water from an improved source is available at the school
Limited service	There is an improved source but water is not available at the time of survey
No service	No water source or an unimproved source

FIGURE 3 JMP service ladder for drinking water in schools

SDG target 4a includes an explicit reference to drinking water in schools. Countries are expected to report, among other things, on the proportion of schools with access to 'basic drinking water' as a key element of "safe, non-violent, inclusive and effective learning environments."

The JMP service ladder for drinking water in schools (Figure 3) focuses on tracking progress towards the SDG target of 'basic' services for all schools, while recognizing that some countries may wish to specify higher levels of service for the purpose of national monitoring. Definitions of such 'advanced' services would be made at the national or sub-national level and would not be tracked for global reporting purposes.

SDG indicator: the proportion of schools with 'basic' drinking water.

Indicator definition: the proportion of pre-primary, primary and secondary schools with water from an ***improved*** source ***available*** at the school.

The improved source of drinking water does not need to be located on the premises of the school, as long as water is available on the school premises e.g. through storage tanks. However, if a water source is located at the school, but water is not available due to malfunction or service disruption, the school would be classed as having a 'limited service'.

Drinking water coverage in schools is often lower when availability is considered

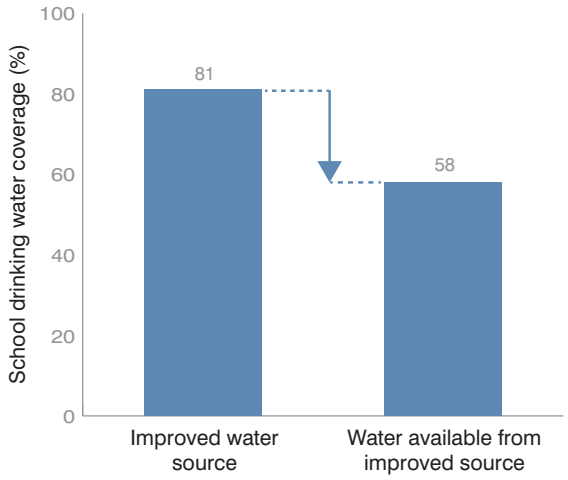


FIGURE 4 Schools with improved water sources and with water available from an improved source

Based on countries with both types of data available in 2013

Data on drinking water services in schools are available for 149 countries, primarily from national Education Management Information Systems (EMIS). However, many countries report coverage for primary schools only. Some countries already report on the criteria for 'basic' drinking water (water available from an improved source), but most do not take account of availability (Figure 4). A review of 55 national EMIS questionnaires found that 13 included questions about source type and water availability, but minor changes would enable national reporting on the SDGs for drinking water in schools.[11]

Water supply in health care facilities

Advanced service	To be defined at national level (e.g. water is available when needed, accessible to all, free from contamination, etc)
Basic service	Water from an improved source is available on premises
Limited service	There is an improved source, but it is not on premises or water is not available
No service	No water source or an unimproved source

FIGURE 5 JMP service ladder for water supply in health care facilities

Access to water is also critically important in health care settings for ensuring quality care for all, including vulnerable populations such as immunocompromised persons, expectant mothers and infants. Because of the importance of water for many purposes in health care facilities, the service ladder is for general water supply, and not limited to drinking water.

The JMP service ladder for water supply in health care facilities (Figure 5) focuses on tracking progress towards the SDG target of 'basic' services for all, while recognizing that some countries may wish to specify higher levels of service for the purpose of national monitoring.

SDG indicator: the proportion of health care facilities with 'basic' water supply.

Indicator definition: the proportion of health care facilities with water from an **improved** source **available on premises**.

A review in 2015 found only 20 low- and middle-income countries with nationally representative data on drinking water coverage in health care facilities.[12] Facility surveys supported by international survey programs are the most common source of data and, to date, these have typically reported the proportion of facilities with an improved source within 500 m. Available data suggest that less than two thirds of facilities in low- and middle-income countries meet this criterion (Figure 6). Given that the global standard for 'basic' services in health care facilities is an improved water source on premises, coverage will be even lower. For example, 87 per cent of health care facilities in Haiti have a water source within 500 m, while only 62 per cent have a water source on premises.

Less than two thirds of health care facilities have an improved water source within 500 m; fewer have water on premises

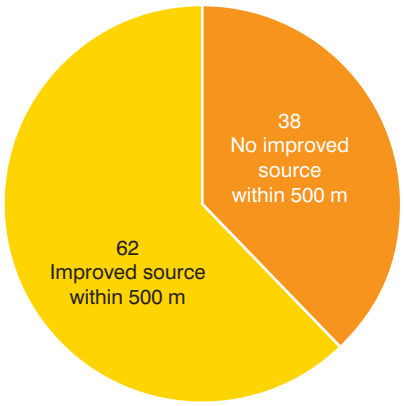


FIGURE 6 Proportion of health care facilities with an improved water source within 500 m

11 United Nations Children's Fund, *Advancing WASH in Schools Monitoring*, Working paper, UNICEF, New York, 2015.

12 World Health Organization, *Water, Sanitation and Hygiene in Health Care Facilities: Status in low- and middle-income countries and way forward*, WHO, Geneva, 2015.

2.4 Tracking inequalities

The 2030 Agenda commits all Member States of the United Nations to "leave no one behind." It states that universal targets can only be considered achieved when met for all subgroups within the population, and specifies that "indicators should be disaggregated, where relevant, by income, sex, age, race, ethnicity, migratory status, disability and geographic location or other characteristics."[13]

The JMP has been highlighting disparities in household drinking water for over 25 years and will continue to focus on the progressive elimination of inequalities during the SDG era. The 2015 update revealed that 2.6 billion people gained access to an improved source between 1990 and 2015.[14] Nearly three quarters of people in the world now use piped water supplies on premises, amounting to an increase from 2.3 billion to 4.2 billion over the same period. While the number of people without an improved source has declined substantially, 663 million people still used unimproved sources in 2015, and among these, 159 million relied on surface water (Figure 8).

13 See 'Transforming our world', A/RES/70/1.

14 United Nations Children's Fund and World Health Organization, *Progress on Sanitation and Drinking Water: 2015 update and MDG assessment, UNICEF and WHO, New York, 2015.*

Despite increases in global coverage, 663 million people still lacked improved drinking water sources in 2015

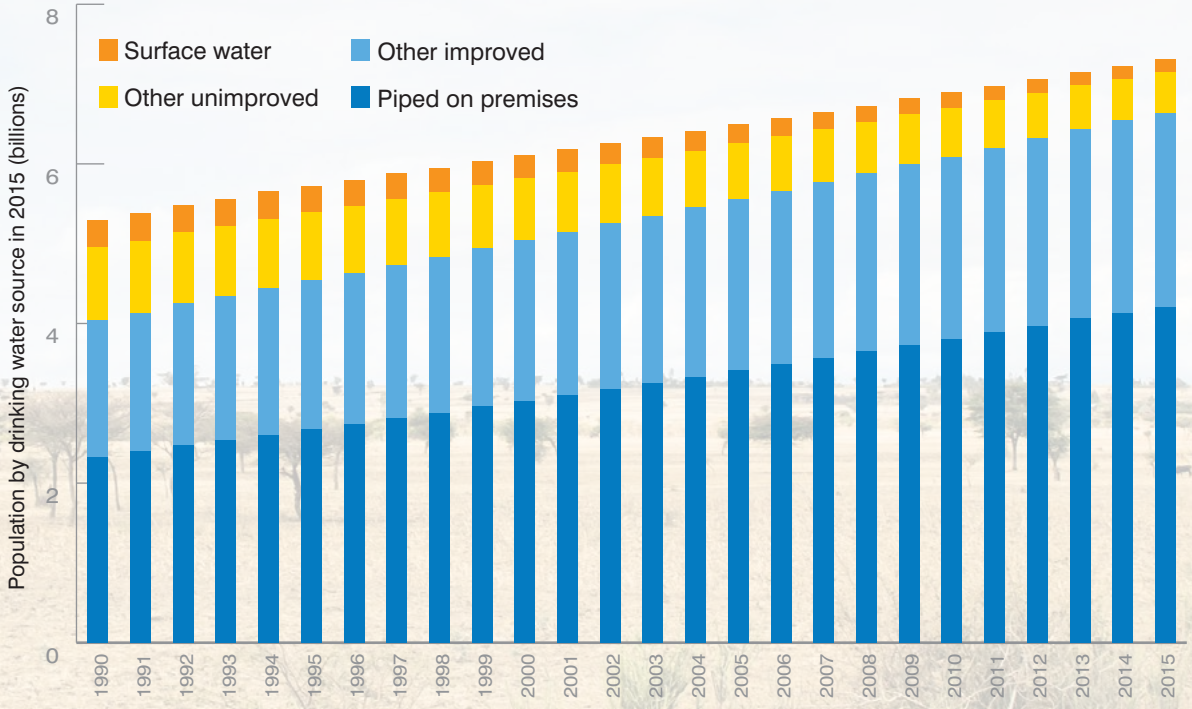


FIGURE 7 Population by water source in 2015 (billions)

Most of the people still using unimproved sources live in rural areas

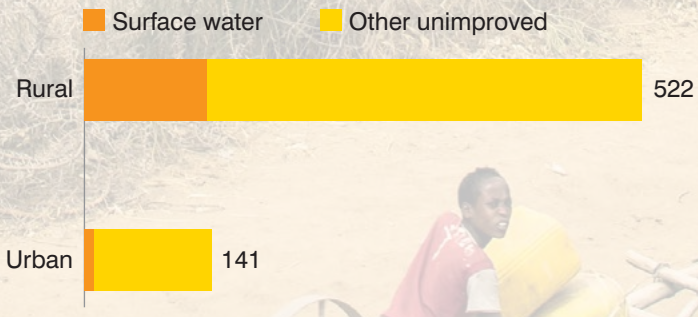


FIGURE 8 Population using unimproved drinking water sources in 2015 (millions)

Achieving universal access by 2030 will be especially challenging for the 41 countries where over one fifth of the population continued to use unimproved drinking water sources in 2015 (Figure 9). These are mainly concentrated in sub-Saharan Africa, but are also found in several other regions. Those who rely directly on rivers, lakes and irrigation canals for drinking face the greatest risks to health and well-being. In seven countries (Angola, Kenya, Madagascar, Papua New Guinea, Sierra Leone, South Sudan and Tajikistan), at least one in five people still rely on surface water for drinking.

Although 147 countries met the MDG target of halving the proportion of population without access to an improved drinking water source, in some countries coverage actually decreased between 1990 and 2015.[15] For example, in the West Bank and Gaza Strip, the use of improved sources has declined by 32 percentage points since 2000. The JMP will continue to report on overall rates of progress

In 41 countries, more than one in five people still used unimproved sources in 2015

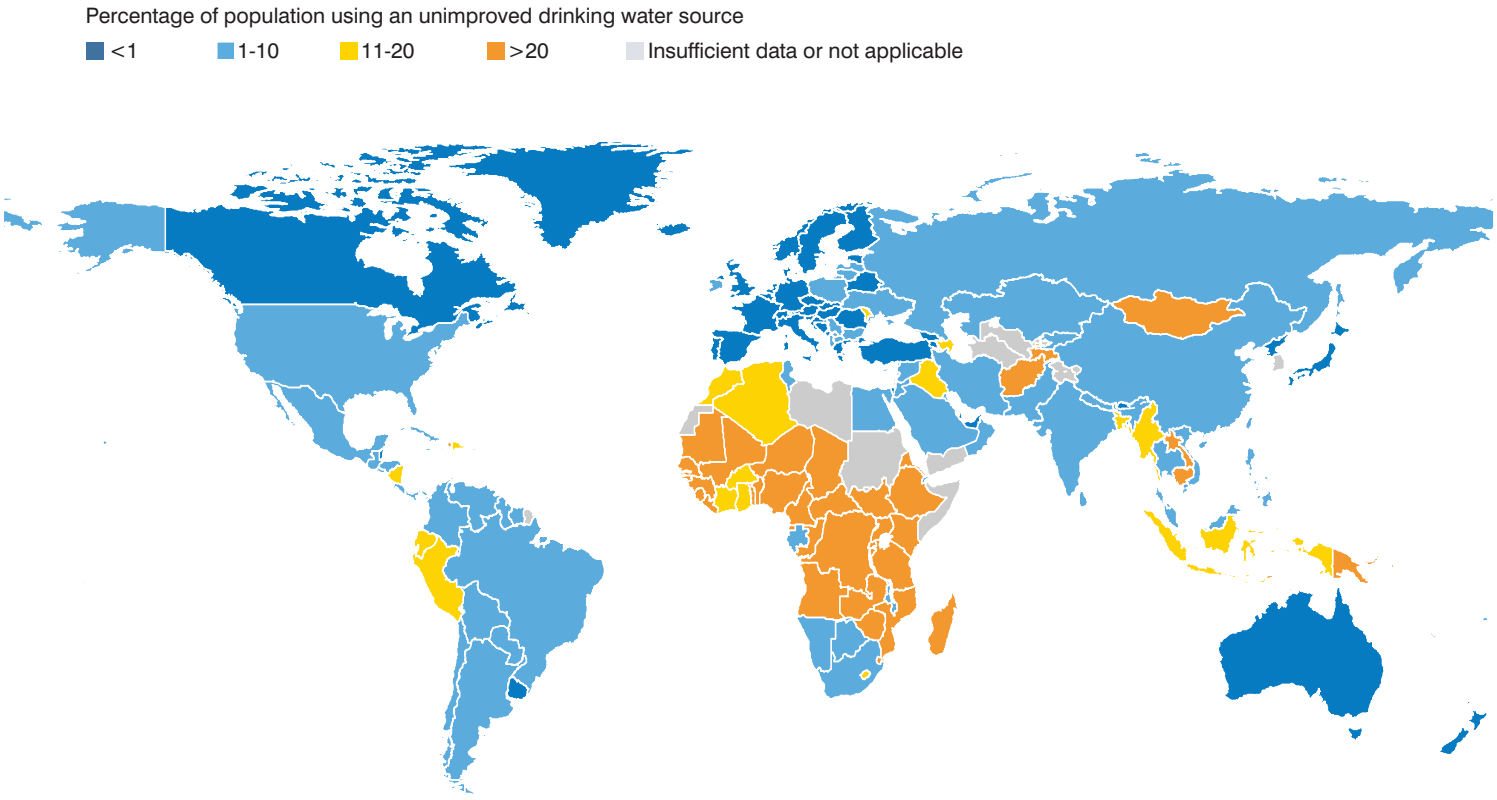


FIGURE 9 Proportion of population using an unimproved drinking water source in 2015 (%)

15 UNICEF and WHO, *Progress on Sanitation and Drinking Water: 2015 update and MDG assessment.*

and highlight those countries where coverage is stagnating or regressing. Further disaggregation will depend on the availability of data for different population subgroups in a given country.

The majority of household surveys and censuses in the JMP database already disaggregate urban and rural populations. While rural coverage of improved drinking water sources has increased globally, from 62 per cent in 1990 to 84 per cent in 2015, significant disparities persist between rural and urban areas. Figure 10 shows that the regions with the largest gaps are Oceania and sub-Saharan Africa. Globally, 8 out of 10 people without improved drinking water live in rural areas.

Many of the surveys in the JMP database can also be used to generate estimates for major subnational regions, and this information will be more systematically extracted in future. As georeferenced data become increasingly available, it will also be possible to produce estimates for specific geographic areas, including informal settlements or slums.

Large gaps remain between urban and rural areas, especially in Oceania and sub-Saharan Africa

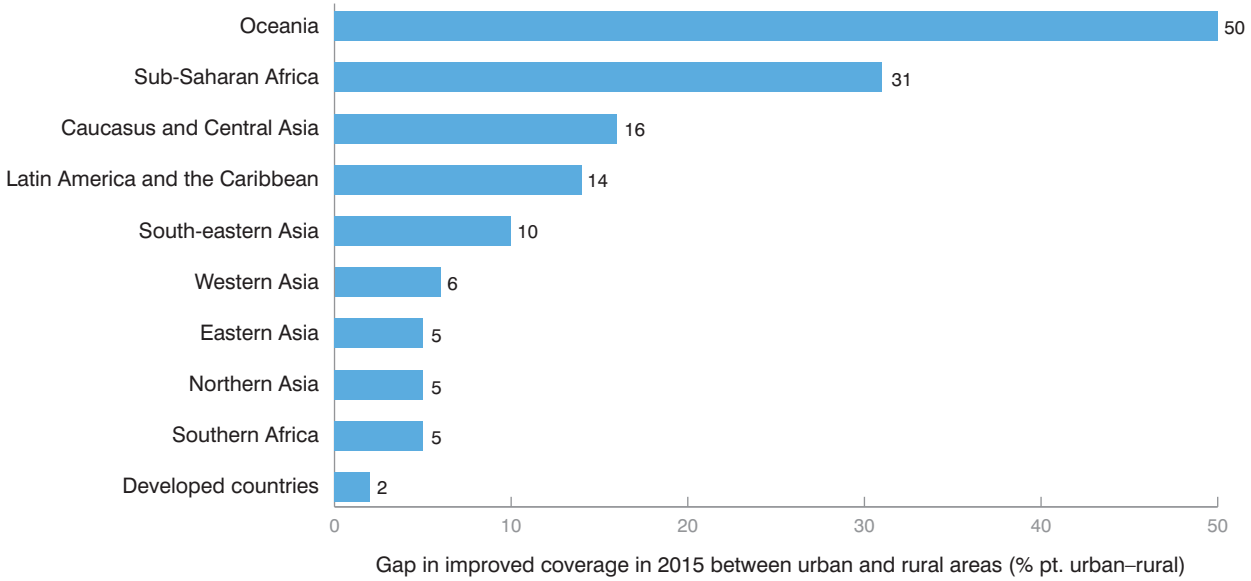


FIGURE 10 Percentage point gap in improved coverage between urban and rural areas in 2015

Significant disparities remain between the richest and poorest in rural and urban areas

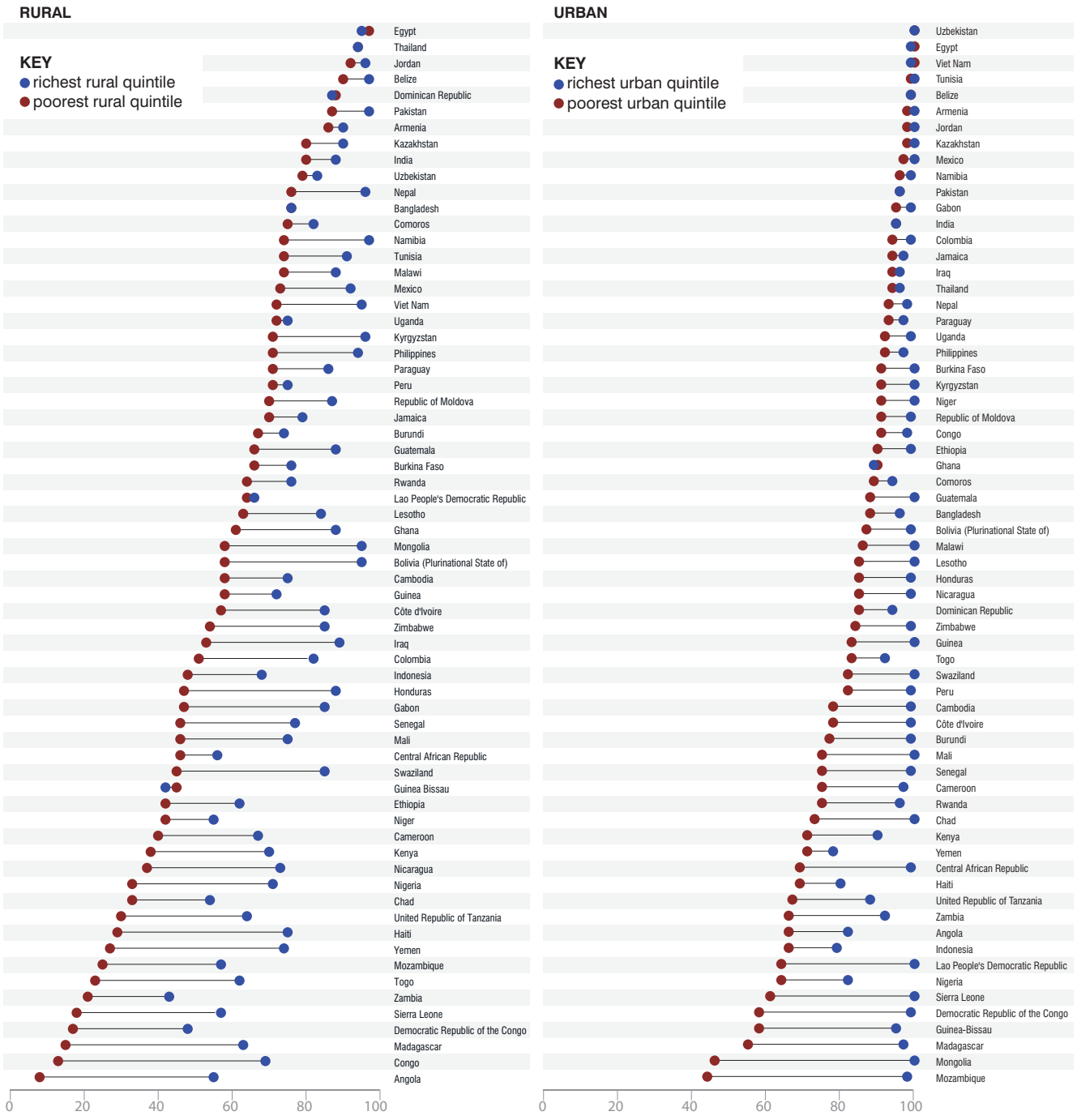


FIGURE 11 Use of improved sources by richest and poorest wealth quintiles, in rural and urban areas (%)

The JMP has calculated rural and urban wealth quintiles based on an analysis of household assets. Some surveys collect household-level information on income and expenditure, but this is typically only done in surveys focusing on economic indicators. In contrast, information on asset ownership is relatively easy to collect and is included in nearly all Multiple Indicator Cluster Surveys (MICS) and Demographic and Health Surveys (DHS). Figure 11 shows the difference in coverage between the richest and poorest 20 per cent of the population in rural and urban areas. Of the 66 countries with data available for 2012, 50 countries have gaps of at least 10 percentage points between the poorest and richest rural quintiles, and 33 countries have gaps of at least 10 percentage points between the poorest and richest urban quintiles.

The JMP task force on inequalities[16] identified a number of other priorities for future disaggregation of WASH data, including by individual characteristics such as sex, age and disability, and by groups disadvantaged on the basis of ethnicity, race, religion, caste, migratory status or other characteristics. The task force also recommended focusing on disparities in access to WASH in institutional settings and collaborating with other sectors to examine links to inequalities in nutrition, health and education outcomes.

16 See WHO/UNICEF Joint Monitoring Programme for Water Supply and Sanitation, 'Report: Task Force on Monitoring Inequalities for the 2030 Sustainable Development Agenda', ‹www.wssinfo.org/fileadmin/user_upload/resources/JMP-Taskforce-on-monitoring-inequalities_meeting-report.pdf›.

2.5 Affordability of drinking water services

SDG target 6.1 aims for universal access to *affordable* drinking water. Human rights to water and sanitation place obligations on States and utilities to ensure affordable services and access for all. Payments for WASH services should not prevent individuals from acquiring other services and goods protected by human rights such as food, housing, health, clothing and education.[17] Many countries have established independent regulators for the water sector, whose mandate includes oversight of water charges and examination of their affordability.

Monitoring affordability presents many challenges, given the diversity of water services and payment structures – ranging from user contributions towards household connections or construction and maintenance of communal water points, and from payments at water kiosks to monthly service bills. While some countries benchmark tariffs against household incomes, there is currently no internationally agreed-upon benchmark for affordability.[18]

Several sources of information can be used to assess the costs of water services. Tariffs and connection fees can be collected from utilities, but these typically only cover populations that are connected to the piped network. Studies have estimated the life-cycle costs of community supplies, but unit costs vary according to context. The JMP focuses on household income and expenditure surveys, which have the advantages of being representative at a national level and providing information on both payments for services and total annual consumption.

In collaboration with the World Bank, the JMP has been exploring several approaches that could be used for global monitoring of WASH expenditure, building on a detailed assessment of consumption across 100 countries.[19] One commonly used approach is to calculate the amount spent on water in relation to a household's total consumption (the sum of all expenditures). For example, Figure 12 shows the proportion of annual household expenditure spent on water services. It shows that in some countries, the majority of households recorded no payments, while in others many households spent over 5 per cent of their annual expenditure on water services.

A further advantage of using data from household income and expenditure surveys is the ability to link information about costs to household characteristics, including the household's main source of drinking water. This is illustrated in Figure 13, which shows that in United Republic of Tanzania, users of delivered water are most likely to pay over 5 per cent of their annual expenditure.

A general challenge with survey data is the tendency to underreport unaffordability when the survey does not capture all costs to the user. Fluctuations in income and costs can also mean that yearly or monthly averages do not adequately reflect financial barriers. While information is usually available on regular payments, surveys rarely include categories for construction or capital maintenance, and packaged water is not always reported separately from other beverages. The JMP plans to develop guidance on questions to include in income and expenditure surveys, with a view to strengthening the collection of information on the costs associated with water, sanitation and hygiene. As more and better data become available, the JMP will benchmark expenditures between and within countries and facilitate dialogue among WASH sector stakeholders on how to define and measure 'affordability'.

17 United Nations General Assembly, 'Report of the Special Rapporteur on the human right to safe drinking water and sanitation', A/HRC/30/39, 5 August 2015, ‹http://www.ohchr.org/EN/HRBodies/HRC/RegularSessions/Session30/Documents/A_HRC_30_39_ENG.docx›.

18 See Hutton (2012)http://www.wssinfo.org/fileadmin/user_upload/resources/END-WASH-Affordability-Review.pdf

19 See IHSN food consumption project: ‹http://www.ihsn.org/home/food›.

Payment for water services varies widely between countries

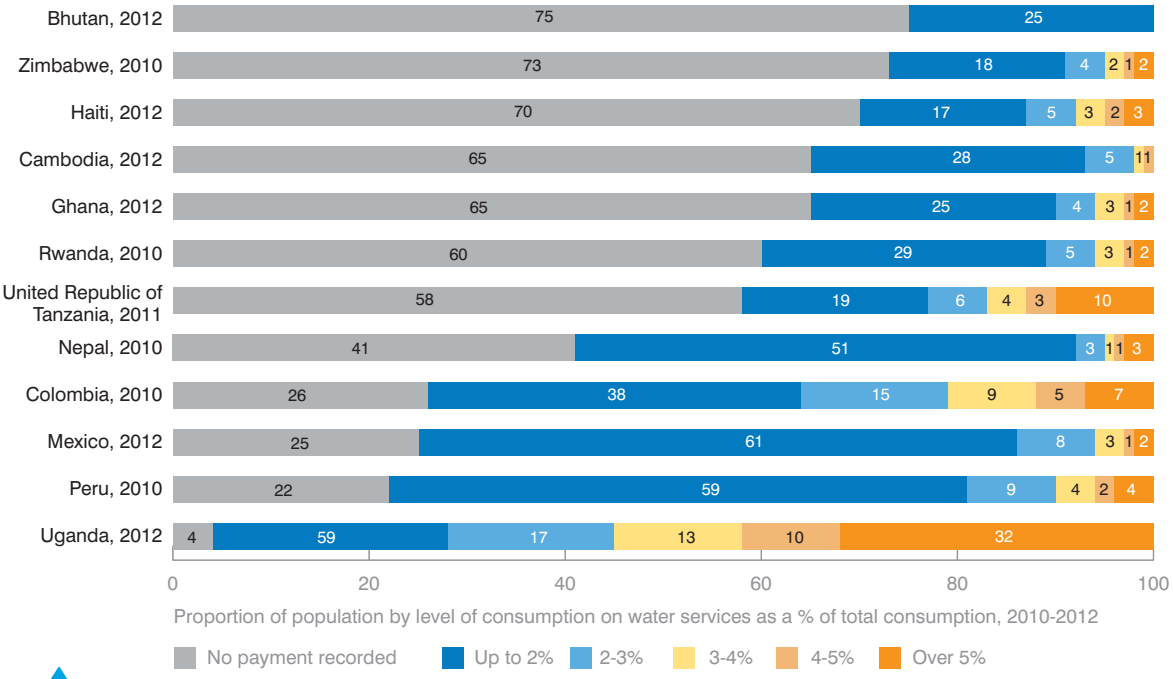


FIGURE 12 Proportion of household consumption on water services, by country (%)

In Tanzania, households using tanker/vendor water are most likely to spend over 5 per cent of their annual budget

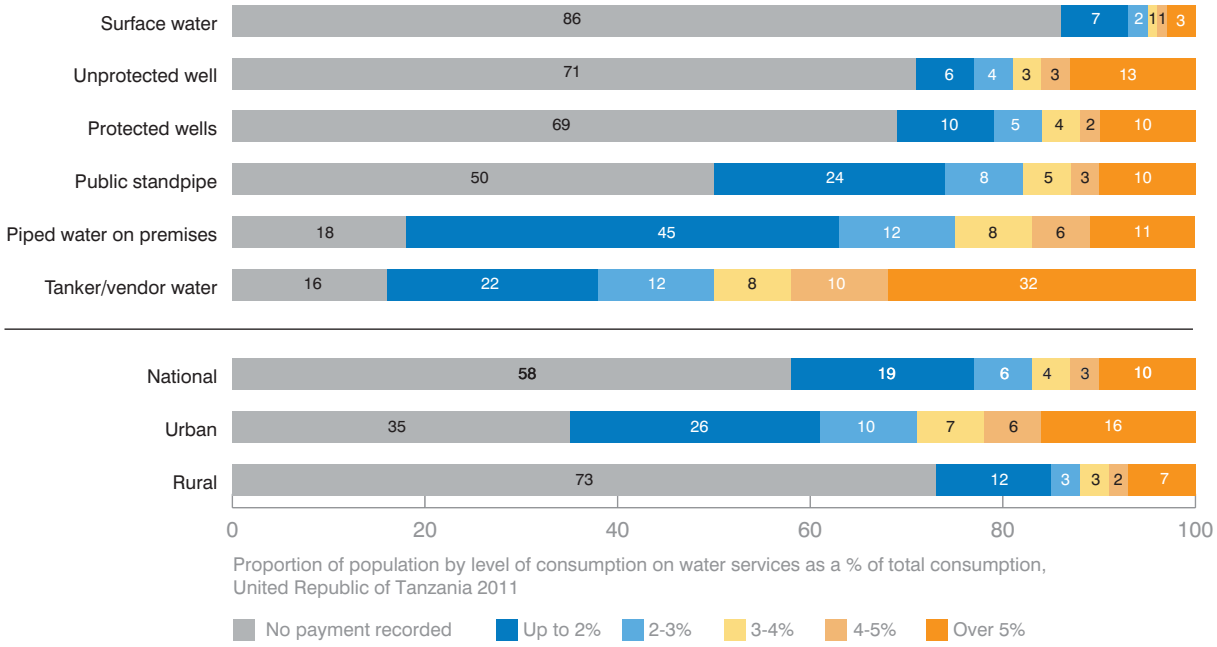


FIGURE 13 Proportion of household consumption on water services, by source type and residence (%)

Source: Tanzania HBS 2011-2012

3

Elements of safely managed drinking water services

In this section, examples are presented of available data on the new elements that contribute to the indicator of safely managed drinking water services – namely, **accessibility**, **availability** and **quality**. For each of these elements, data might be available from household surveys and censuses or from administrative sources such as drinking water regulators. The examples provided illustrate the types of data inputs the JMP will use to calculate estimates of safely managed drinking water services during the SDG era.

3.1 Accessibility

Accessibility will be a criterion for both 'basic' and 'safely managed' drinking water services. The JMP will use a travel time indicator for accessibility that is routinely collected in national household surveys and censuses. Typically, survey teams ask respondents to estimate the amount of time required to travel to the water source, queue if necessary, fill containers, and return to the household. While self-reported journey times are not always precise, they nevertheless provide a useful indicator of the relative time burden of water collection.

Water collection is a major burden in many countries, especially in sub-Saharan Africa

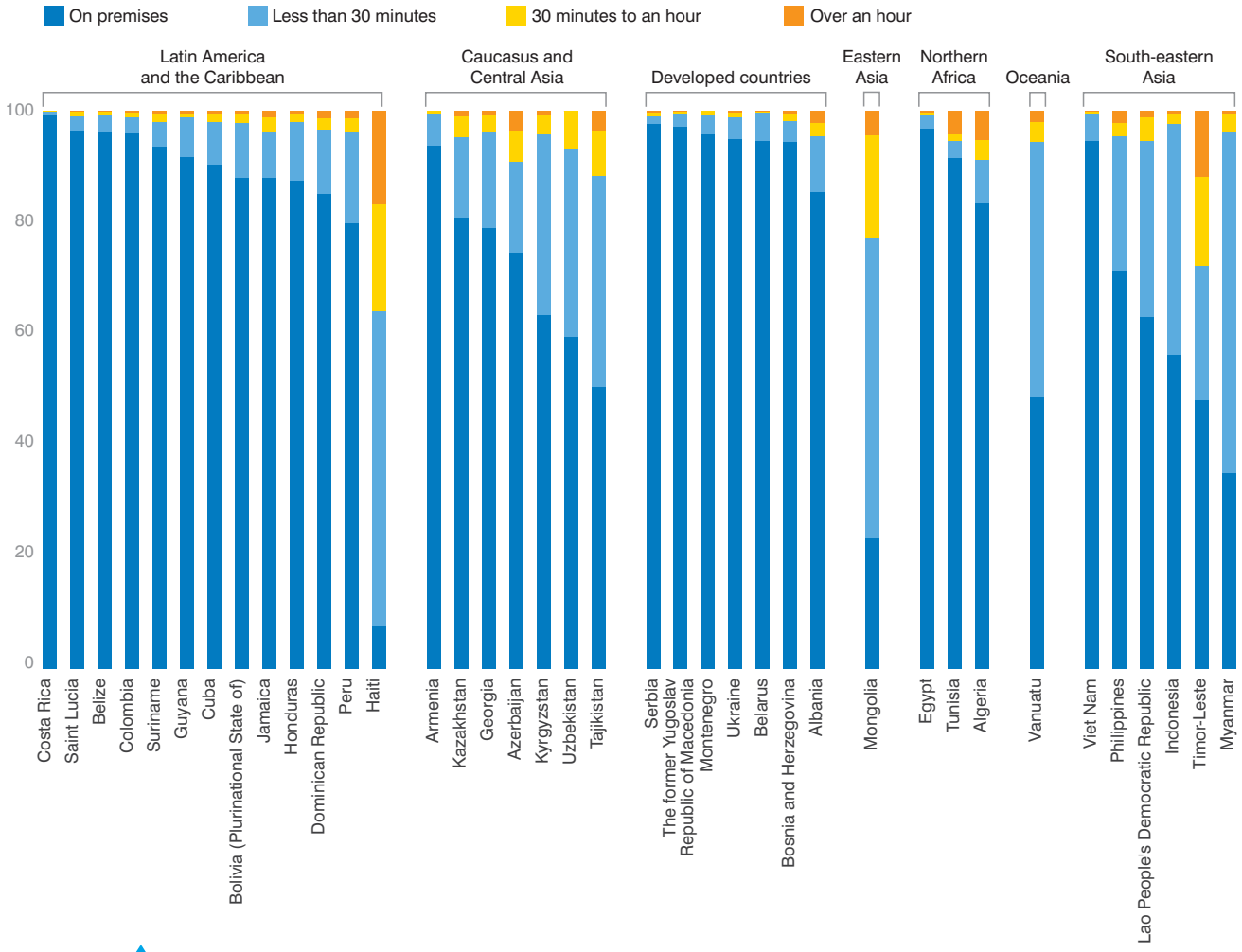
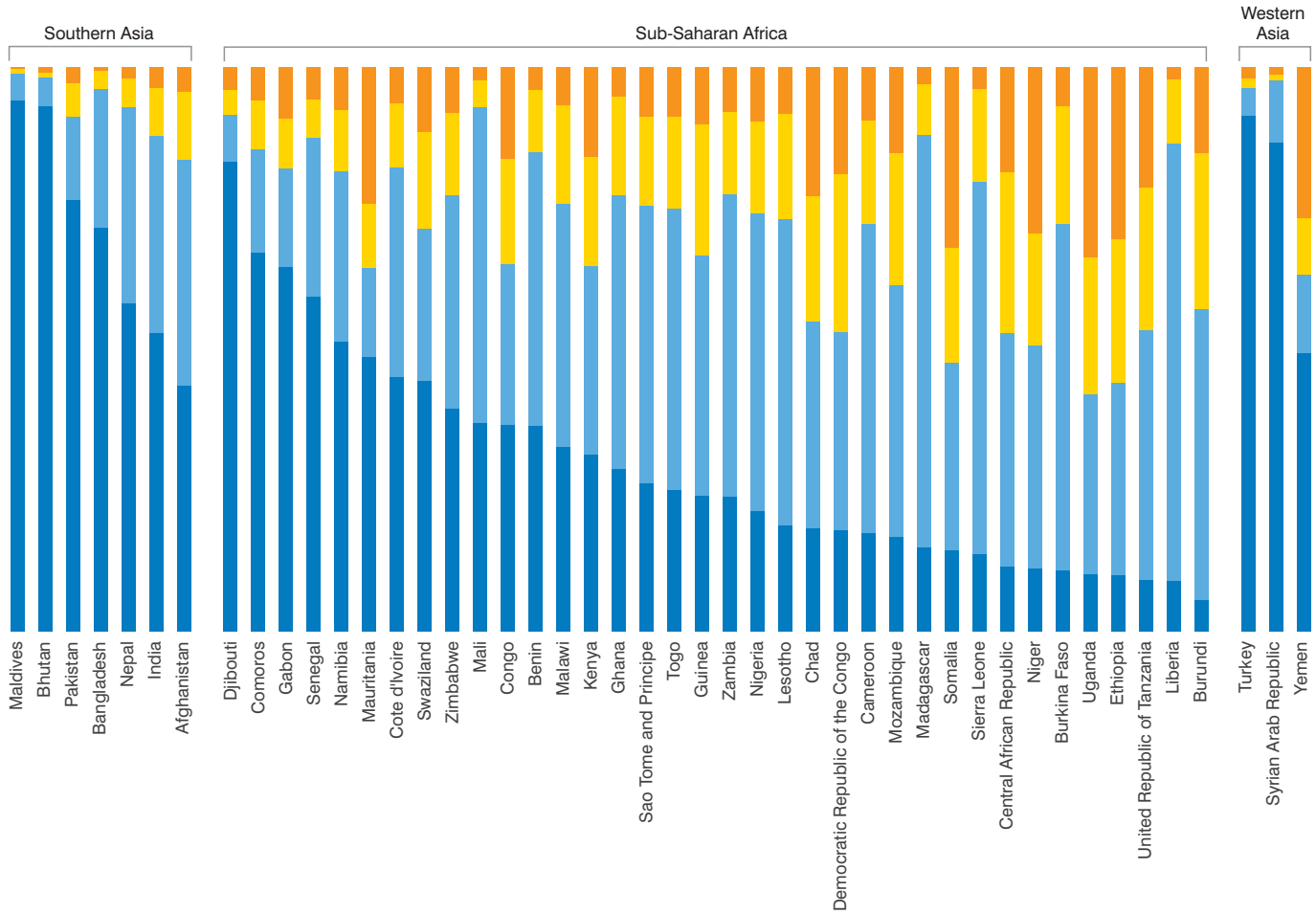


FIGURE 14 Time taken per trip to collect drinking water, by country (minutes)

Household survey data show that in most countries, the majority of the population report either having water on premises or spending less than 30 minutes collecting drinking water, thereby meeting the criteria for 'basic' service (Figure 14). But in some countries, especially in sub-Saharan Africa, a significant proportion of people report spending over 30 minutes, with the yellow and orange bars on the graph showing the proportion spending 30 minutes to one hour, or over an hour, per trip to collect water. If the water source is improved, people living in these households will be classified as having 'limited' service.



In some countries, most of the sources people use are located on premises, including piped water, boreholes, rainwater and protected wells and springs

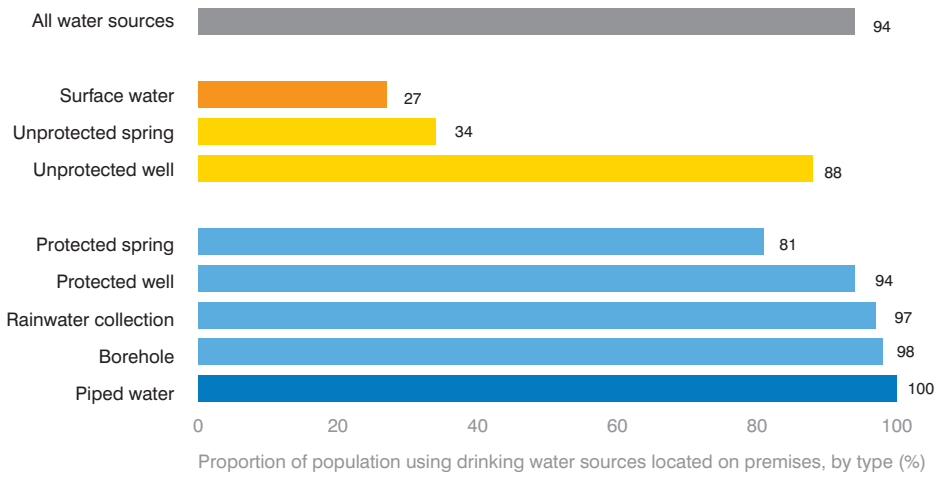


FIGURE 15 Location of drinking water sources in Viet Nam in 2014, by type (%)

Source: Viet Nam MICS 2014

Drinking water sources located on premises are not limited to piped water but include a wide range of improved and unimproved source types. In Viet Nam, for example, a large proportion of unprotected wells and springs are located on premises and could potentially be upgraded to improved facilities at relatively low cost (Figure 15).

Figure 16 shows the proportion of different water supply types that are located on premises, for selected countries. Piped water is almost exclusively on premises in many countries, but in Malawi, Nepal, and Sao Tome and Principe, people must often travel to collect water from public taps. In most of the countries shown, the population using rainwater and boreholes or tubewells usually has a source located on premises, whereas protected dug wells and springs are equally likely to be found off premises. Unprotected sources and surface water sources are usually not on premises.

Overall, improved drinking water sources are more likely to be located on premises, while collection from unimproved sources is more likely to take more than 30 minutes (Figures 17 and 18). In Sudan, for example, 41 per cent of households using improved sources access those sources on premises, compared with just 1 per cent of those using unimproved sources. Of households using improved sources, 17 per cent report spending over 30 minutes collecting water, compared with 52 per cent of those using unimproved sources.

Use of water sources located on premises varies widely by source type and between countries

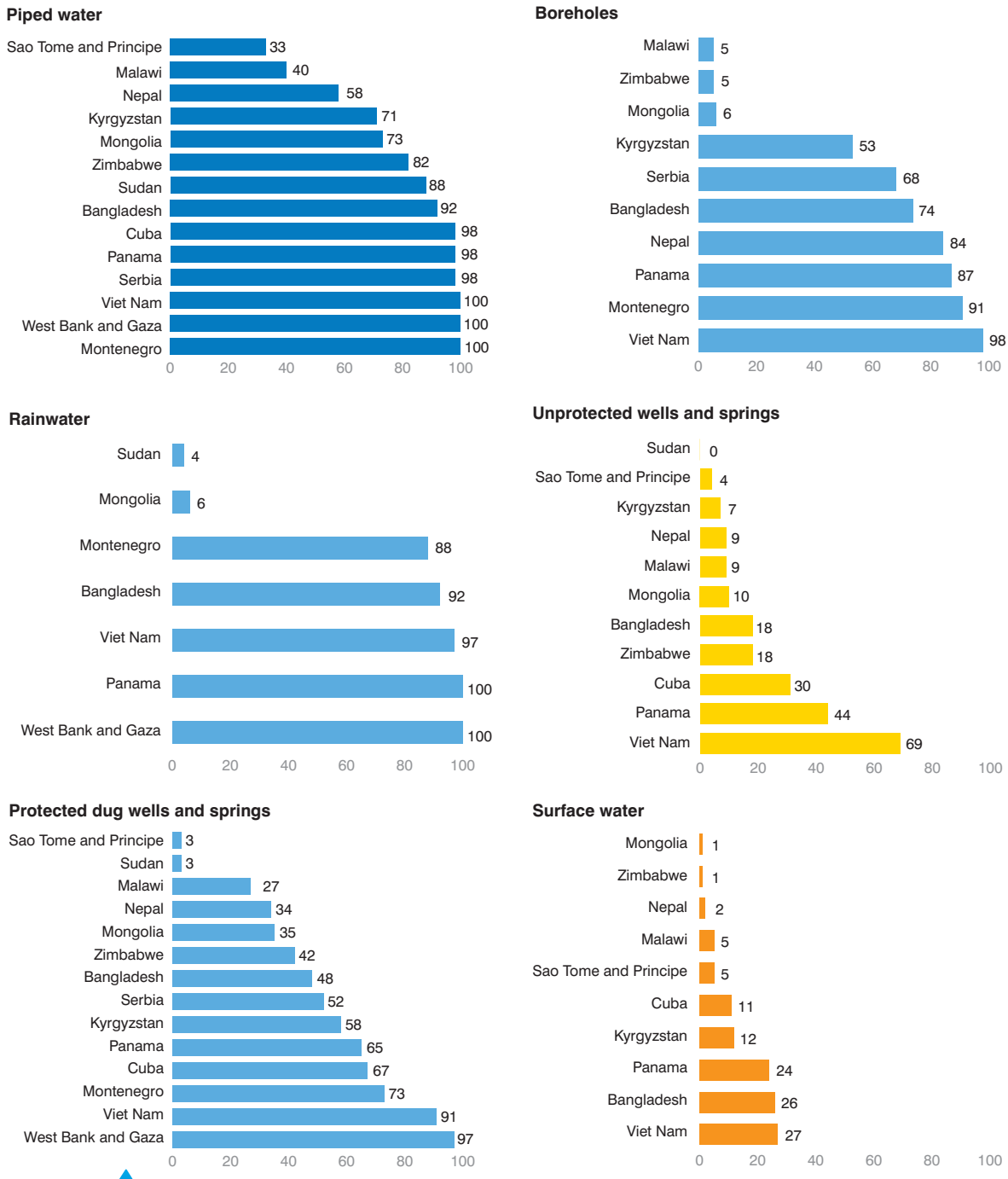


FIGURE 16 Proportion of population using a drinking water source on premises, by type of drinking water source (%)

Source: 15 MICS surveys, 2012–2014

Improved drinking water sources are more likely to be on premises than unimproved sources

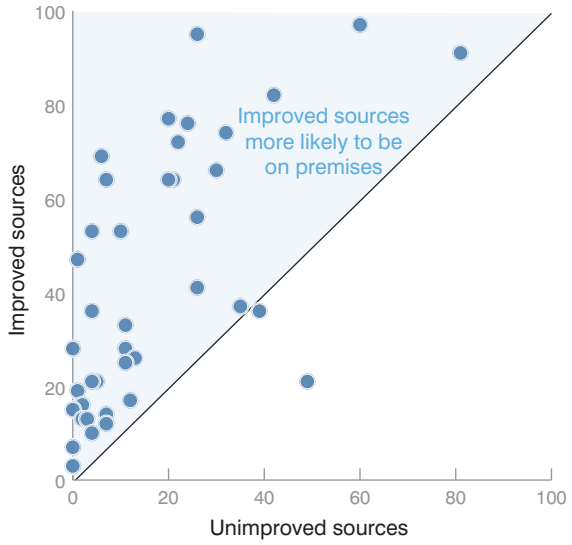


FIGURE 17 Population with improved and unimproved sources on premises, by country

Source: 41 MICS and DHS surveys, 2010–2015

Collecting water from unimproved drinking water sources is more likely to take over 30 minutes

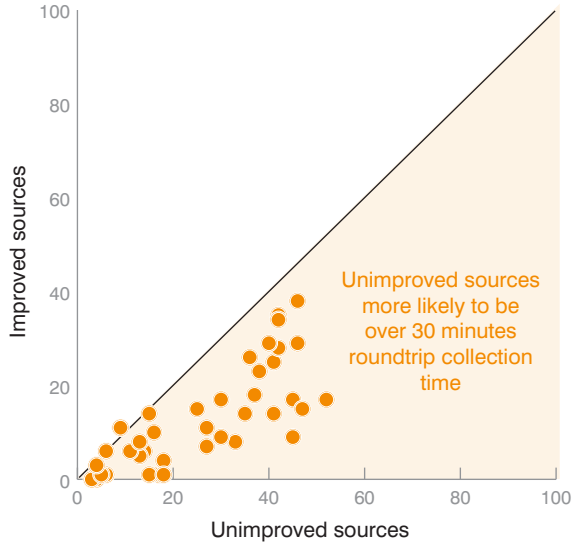


FIGURE 18 Population with improved and unimproved sources over 30 minutes roundtrip by country

Source: 41 MICS and DHS surveys, 2010–2015

Women and girls are responsible for water collection in 8 out of 10 households with water off premises

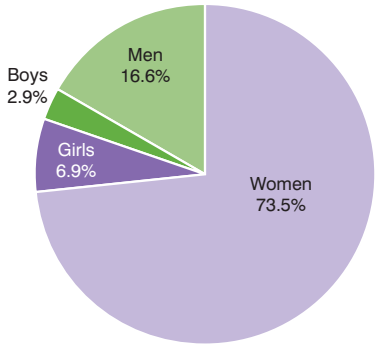


FIGURE 19 Person primarily responsible for water collection across 61 countries

Note: 61 DHS and MICS surveys, weighted by the population with water off premises

When drinking water sources are not located on premises, households must spend time and energy collecting water. However, the burden of water collection is far from evenly distributed among household members. Figure 19 is based on the JMP's analysis of MICS and DHS data for the ***Women's World Report*** in 2015, and clearly shows that the burden of hauling water falls disproportionately on women. In 53 out of 73 countries, over half of households with water off premises rely on women to collect water. In a few countries (e.g., Mongolia), men are primarily responsible, and in 14 countries, the burden also falls on children, with a boy or girl under 15 primarily responsible in at least 1 in 10 households.

In most countries, the burden of water collection falls mainly on women

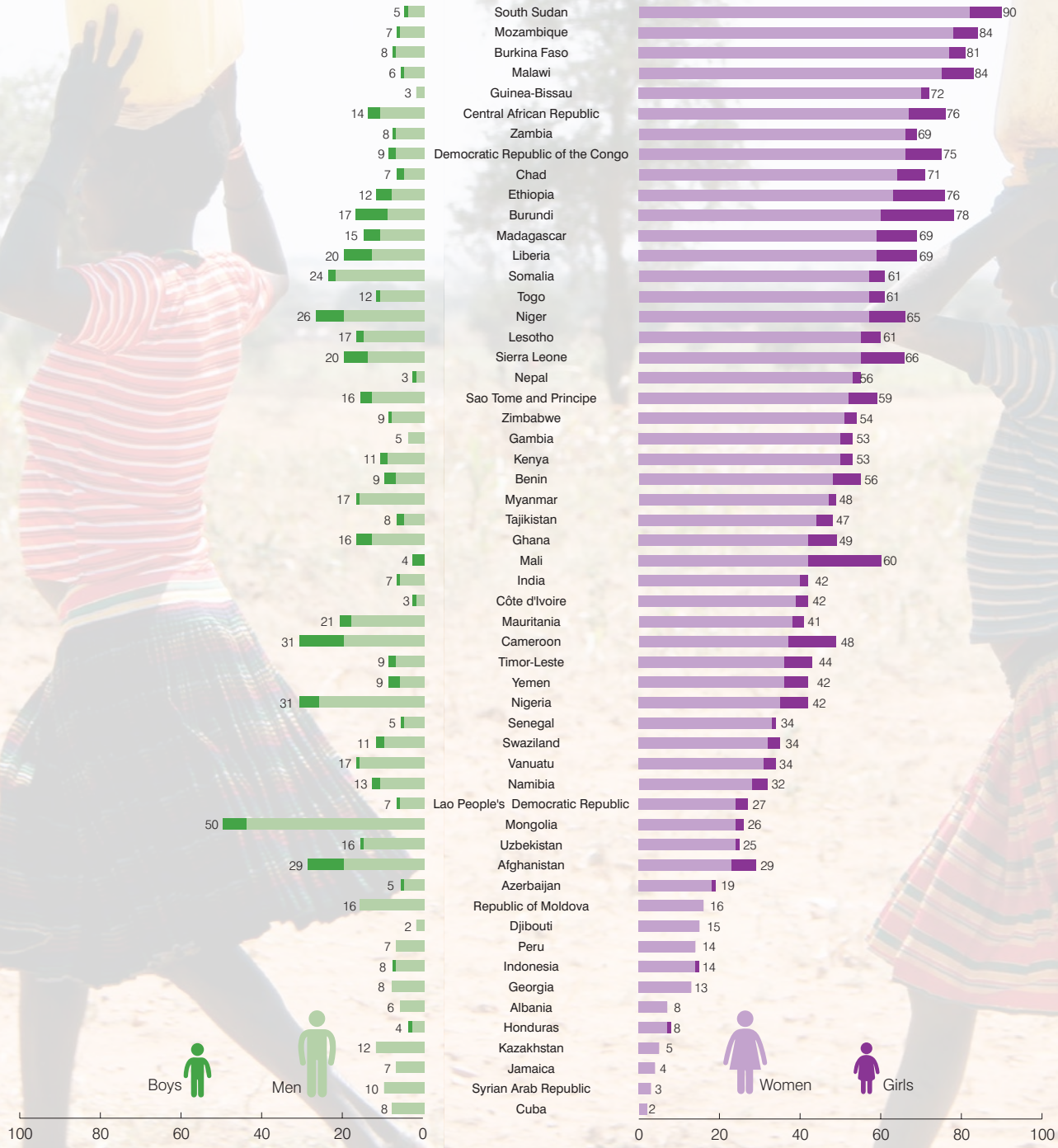


FIGURE 20 Primary responsibility for water collection in rural areas, by gender and age (%)

Note: Restricted to countries where at least 1 in 10 households have water off premises

BOX 3

Use of multiple sources at home

Most national surveys and censuses only collect information about the main source of drinking water used by household members. However, it is well known that households often use other sources. This may be due to problems with the main source at certain times of the year, or a matter of convenience, or preference for other sources. Secondary sources may provide a higher or lower level of service, and can be an important way to ensure access to sufficient quantities of water throughout the year.

Use of multiple water sources is common in many parts of the world, as illustrated by in-depth surveys that have examined water use in several countries. For example, the 69th round of the Indian National Sample Survey in 2012 found that one in four households (76 per cent) needed to use a supplementary source. The Performance Monitoring and Accountability 2020 surveys conducted in Ethiopia and Ghana in 2015 found that around half of households (56 per cent and 58 per cent, respectively) regularly used only one source of drinking water. Comparatively few households in Ethiopia reported regularly using more than two water sources (6 per cent), whereas this was over one in four in Ghana (28 per cent). Particularly in urban Ghana, the widespread use of sachet water contributes to the high number of households reporting use of multiple sources.

Given the scarcity of national data on secondary sources of water used by household members, with the exception of those who primarily drink packaged water, the JMP will continue to focus on the main source for the purposes of global monitoring.

While available data that focus solely on the person primarily responsible for water collection may not reflect the full extent of the time burden or its gender dimension, they suggest that the accessibility criterion in the SDGs is particularly important for women.

Time-use surveys that collect information on water collection as part of a child labour or household chores questionnaire can provide further insights on intra-household inequalities and the share of water collection among household members.

3.2 Availability

Availability is another important criterion for assessing drinking water service levels. The human right to water specifies that water should be "available continuously and in a sufficient quantity to meet the requirements of drinking and personal hygiene, as well as of further personal and domestic uses, such as cooking and food preparation, dish and laundry washing and cleaning. […] Supply needs to be continuous enough to allow for the collection of sufficient amounts to satisfy all needs, without compromising the quality of water."[20]

While drinking water should be available in sufficient quantities at all times, such levels of service are unlikely to be attained by all countries in the short term. Where services are unreliable or intermittent, households typically store water to ensure that it is available when needed. Households may also restrict their water consumption when water sources are far away, available only for a few hours a day or at certain times of the year, or out of service.

A number of very different concepts can be used to measure availability. These include the quantity of water available or used in a given time period, the hours of service per day (typically for piped supplies), or the frequency of breakdowns and the time required for repairs (typically for point sources such as boreholes).

Piped systems that are not continually pressurized are more vulnerable to microbiological contamination in the distribution network, so a system meeting the availability requirement might fail the quality requirement. However, for the purposes of monitoring target 6.1, quality will be addressed directly and separately from availability.

In this section, examples are given from data that have been collected to date by national statistical agencies, regulators and utilities. In all cases, it is difficult to quantify the amount of water used by individual households or to benchmark volumes used given that these vary considerably between settings and throughout the year. For the purpose of SDG monitoring, the JMP will therefore focus on the amount of time when water is available, rather than quantity of water delivered, using two main types of data.

Where possible, the JMP will use household responses to questions on *availability of drinking water when needed* in nationally representative surveys or censuses. Households reporting not having sufficient water available when needed during the last week or month would be categorized as 'not available when needed'. This indicator would capture problems caused by non-functioning water points.

In the absence of such data from surveys or censuses, the JMP will use data from regulators or utilities on the *number of hours of service per day,* usually only for piped networks. Regulators may specify different thresholds for different types of utilities – for example, in Kenya, utilities serving over 100,000 people are expected to provide water for at least 20 hours per day, while smaller utilities should provide at least 12 hours per day.[21] Where national or locally relevant standards for hours of service are not available, a minimum of 18 hours per day will be used as the global benchmark for 'available when needed'.

Further research is required to compare the different measures of availability, but a key advantage of household surveys and censuses is that information is available at a household level, which facilitates analysis of inequalities across the population.

20 United Nations General Assembly, Report of the independent expert on the issue of human rights obligations related to access to safe drinking water and sanitation, Catarina de Albuquerque on 1 July 2010: A/HRC/15/31/Add.1', ‹https://documents-dds-ny.un.org/doc/UNDOC/GEN/G10/148/57/PDF/G1014857.pdf?OpenElement›.

21 WASREB, 2015. IMPACT: A performance review of Kenya's water services sector 2013-2014. Water Services Regulatory Board, Nairobi, Kenya.

By contrast, regulatory data on the number of hours per day would usually be available only at the utility level, and may thus average out differences across the network. Where both sources of data are available, the JMP will therefore generally use household survey data.

Many high-income countries publish information on the level of service provided by utilities. Figure 21 shows trends in the proportion of households experiencing interruptions in water services in different regions of Italy. In 2014, over 20 per cent of households living in the Islands region reported irregularities, compared with less than 5 per cent in the northern regions. Service levels have improved since 2000, particularly in southern Italy and the islands.

The South African General Household Survey has collected information on interruptions in municipal piped supplies since 2002 and has used the same questions since 2009: "Has your municipal water supply been interrupted at any time during the last 12 months? [...] Was any specific interruption longer than two days?" Figure 22 shows the proportion of the population using municipal supplies that had interruptions of at least two full days between 2009 and 2014. In most provinces, there has been comparatively little change in reported interruptions of greater than two days, although a higher proportion of households reported 'any interruption' – in 2014, 27 per cent nationally and up to 63 per cent in Mpumalanga Province.

Preliminary analysis shows that data are available from a number of national household surveys and censuses, demonstrating that countries recognize the importance of monitoring availability. However, many of the surveys to date have used different questions, complicating comparisons between countries and over time. A further limitation is that questions about availability are sometimes only asked about users of piped water and have focused on understanding interruptions in services. Table 2 provides examples of existing questions in household surveys. An interesting example is Iraq, which shows that for some households, water that is not available 24 hours a day is still considered sufficient. Harmonized questions will greatly improve the comparability of information from different data sources.

Reported interruptions in piped water services can be used to examine trends in availability

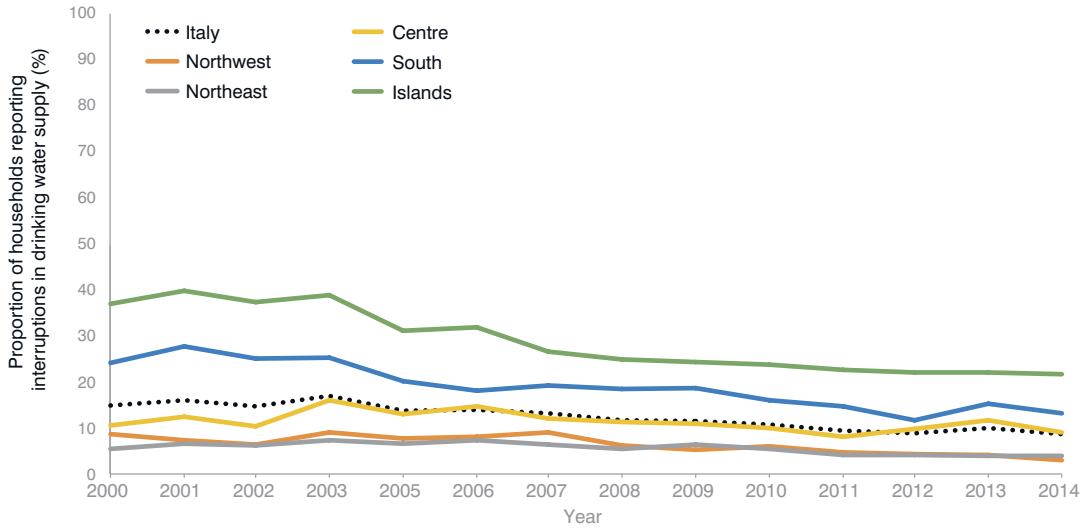


FIGURE 21 Proportion of households reporting interruptions in water supply by region in Italy, 2000–2014 (%)

Household survey data can reveal subnational disparities in the availability of piped drinking water

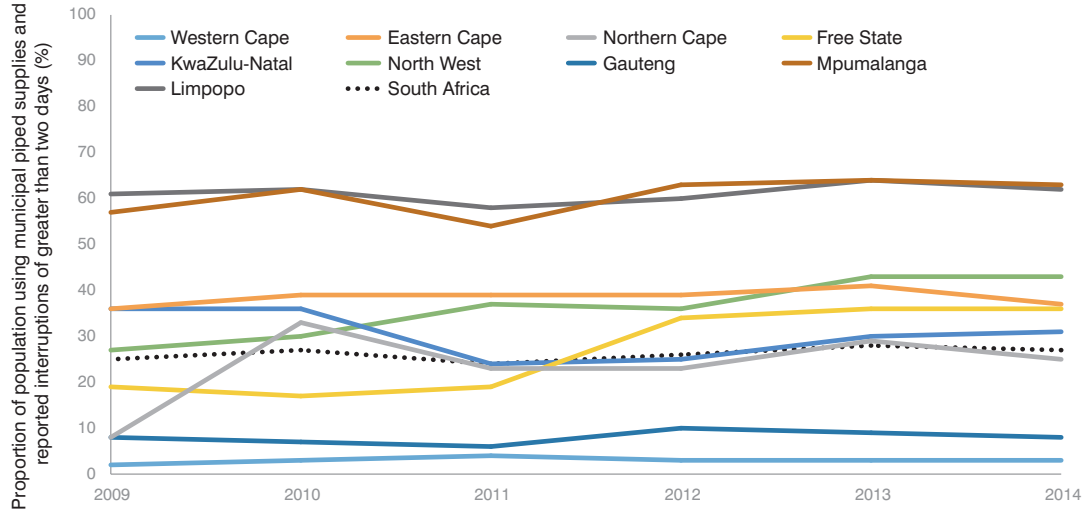


FIGURE 22 Population reporting interruptions in municipal piped supplies for at least two full days, South Africa, 2009–2014 (%)

TABLE 2

Different surveys use different measures of availability

Country	Source	Year	Question	Sources covered	Reported availability
Albania	LSMS	2012	Do you have water continuously? How many hours in a day, on average, did dwellings receive water during last week?	Piped only	60.8% continuous; 69.4% available at least 12 hours per day
Colombia	ENCV	2010	Does water arrive seven days a week? How many days? For those days when water is available is the service for 24 hours?	Piped excluding standpipes	87% available all daily, of which 8.15% not available continuously throughout the day
India	NSS	2012	During which calendar months of the year availability of drinking water was not sufficient?	All water resources	85.8% rural and 89.6% urban sufficient throughout the year
Iraq	IHSES	2012	Are there interruptions in the availability of water from public network? Is the water coming from the public network sufficient?	Public network only	Despite daily interruptions (69.4%) most households are reporting water as being sufficient (74.7%)
Italy	Multiscopo	2014	Are there any irregularities in the water service? If yes to irregularities, how often in the last year?	All water resources	Any irregularity in water supply, 8.7% nationally
Mexico	ENIGH	2014	How many days a week does water arrive?	Piped on premises	72% available daily
Panama	MICS	2013	How often is water available during the dry/wet season? 24 hours a day? Part of the day? Occasionally?	Piped	61.2% 24 hours in the dry season and 23.1% part of the day, 69% in the rainy season and 18.4% part of the day
Paraguay	EPH	2014	Normally does service provider provide water 24 hours a day?	Piped	86.5% normally provides 24 hour supply
South Africa	GHS	2014	Has your municipal water supply been interrupted at any time during the last 12 months? Was any specific interruption longer than two days? Was it more than 15 days in total?	Municipal piped	40% with interruptions, 22% at least two days
Sri Lanka	HIES	2012	Was there enough water to drink, bathe and wash during last year?	All water resources	7.2% not sufficient for drinking, 11.3% not sufficient for bathing and washing

BOX 4

Delivered and packaged drinking water

In some countries, large numbers of people report using water delivered by tanker trucks or small carts with drums as their main source of drinking water. In the top 10 countries by population, over 20 million people use delivered water (Figure 23). Tanker trucks supply 12 per cent of the total population in Algeria (4.7 million people), and delivery operations are regulated by local authorities. Delivered water can be significant in rural areas: 10 per cent of rural Azerbaijan and 11 per cent of rural Armenia rely on tanker trucks. In the West Bank and Gaza Strip, over two thirds (68 per cent) of the population relies on tanker trucks. If well regulated and monitored, delivered water can provide a reasonably high level of service.

Packaged water in large or small bottles or sachets is also increasingly common as a primary source of water for consumption (Figure 24). To date, the JMP has classified bottled water as an improved source if the household also uses an improved source for other purposes such as washing, cleaning, cooking and personal hygiene. In approximately 9 out of 10 cases, households using packaged water for consumption also reporting using an improved secondary source, so bottled water was counted as improved. Bottled water use is more common in urban areas, and the most frequent secondary source is piped water.

The JMP recognizes that bottled water and tanker truck water can potentially deliver safe water, but has previously treated both source types as unimproved due to lack of data on accessibility, availability and quality (and affordability). This type of data is increasingly available, so from now on the JMP will treat water packaged in bottles or sachets or delivered by tanker trucks as improved, and classify them as either 'limited', 'basic' or 'safely managed' based on the criteria outlined above.

Over 20 million people rely on delivered water in the 10 most populous countries with data

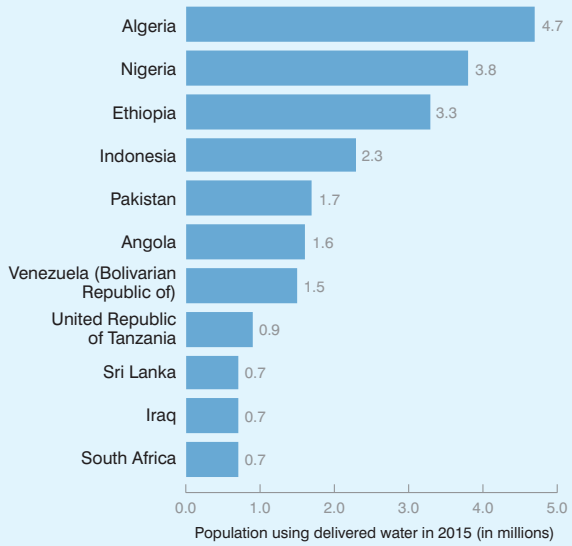


FIGURE 23 Population using delivered water in 2015 (millions)

Use of packaged water in urban areas has increased rapidly in some countries

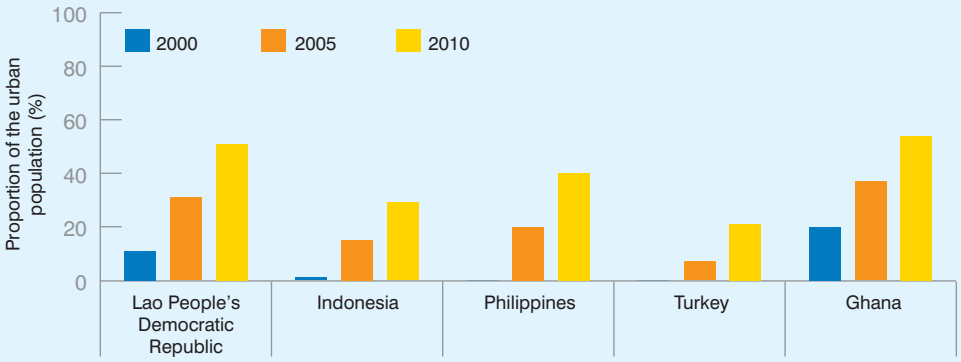


FIGURE 24 Trends in bottled and sachet water use in five countries

3.3 Quality

To be considered safe, drinking water must be free from pathogens and elevated levels of harmful substances at all times. Assessment of drinking water quality provides an important measure of safety, and most countries have national standards that are in many cases aligned with WHO *Guidelines for Drinking Water Quality*. The highest priority water quality parameter globally, and in most countries, is contamination of drinking water with faecal matter.

Faecal contamination of drinking water is usually identified through the detection of indicator bacteria such as *Escherichia coli* (*E. coli*) in a 100 mL sample. However, contamination can be highly variable in time, and brief contamination events can escape detection with routine surveillance but still have serious public health outcomes. Furthermore, the preferred measure of faecal contamination, *E. coli*, is more easily inactivated in treatment than some other pathogens, such as *Cryptosporidium parvum*. While the presence of *E. coli* in drinking water indicates that the water is faecally contaminated and unsafe, the absence of *E. coli* does not guarantee safety.

The JMP recognizes that the best way to ensure water safety is through a holistic risk management approach such as water safety plans (see Box 6). However, only a small number of countries currently have data on the proportion of people using systems that are covered by a verified water safety plan. Data on the proportion of people using water supplies that are chlorinated, or the extent to which residual chlorine persists at the household level, are also available for some countries and can serve as important service indicators for national monitoring. However, for the purposes of global monitoring, the principle indicator of water safety used by the JMP will be the absence of faecal indicator bacteria in a 100 mL sample.

A systematic review commissioned by the JMP, estimated that at least 1.8 billion people used drinking water sources that were contaminated with faecal indicator bacteria in 2012.[22] This figure includes both improved and unimproved sources, but is based on a snapshot of water quality rather than regular monitoring, and addresses only microbial contamination, so is likely to underestimate the number of people using unsafe drinking water. Figure 25 shows the proportion of contaminated supplies, by supply type, drawn from the systematic review and related publications. The review confirmed that improved sources are more likely to be free of microbial contamination than unimproved sources, but that contamination is nevertheless widespread.

In many countries, reliable data on water quality are already available for the majority of the population from national authorities. In others, data are either not available at all or focus only on certain water source types or population groups, such as people with access to utility piped water. Where there are major data gaps, one option is to test drinking water through household surveys (see Box 5).

In collaboration with UNICEF's MICS programme, the JMP has developed a cost-effective approach that enables integration of drinking water quality testing in household surveys. The water quality module has now been implemented in several countries, providing

Improved sources are more likely to be free of microbiological contamination than unimproved sources

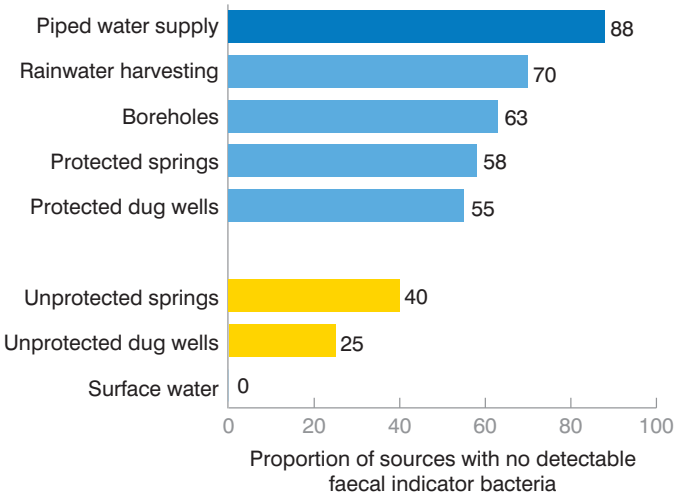


FIGURE 25 Proportion of population using water sources free of faecal contamination[23]

Source: Re-analysis of tabulations from Bain et al, 2014.[24]

In some countries, large numbers of people use improved water sources that do not meet water quality standards

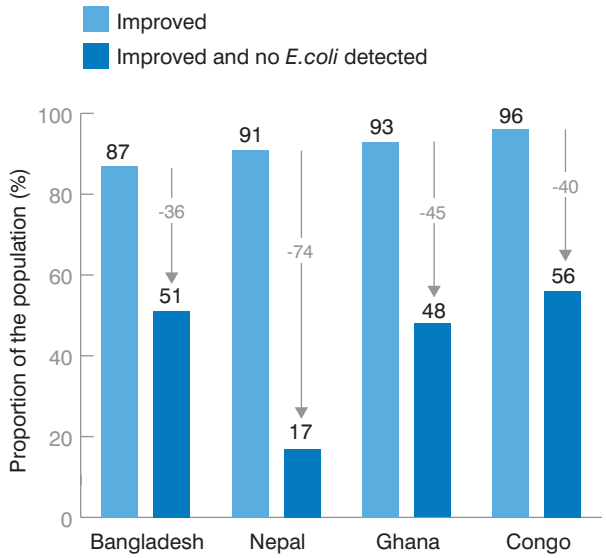


FIGURE 26 Coverage of improved drinking water sources and proportion of improved sources free from faecal contamination (%)

22 Bain R, Cronk R, Hossain R et al. Global assessment of exposure to faecal contamination through drinking water. Tropical Medicine & International Health. 2014

23 Note that data on contamination of surface water were not available, so for this analysis it was assumed that all such drinking water sources were faecally contaminated.

24 Bain R, Cronk R, Wright J et al. *Fecal Contamination of Drinking-Water in Low- and Middle-Income Countries: A Systematic Review and Meta-Analysis*. PLOS Med. 2014

nationally representative information on water quality and enabling detailed analysis of inequalities in use of contaminated drinking water.

Final reports are currently available for four of these countries (Bangladesh, Congo, Ghana and Nepal). Figure 26 shows that while coverage of improved drinking water sources in these four countries ranges from 87 to 96 per cent, the proportion of the population using improved drinking water sources free of faecal contamination is significantly lower, illustrating the extent of the adjustment for microbial water quality in low- and lower-middle-income countries.

BOX 5

Water quality testing in household surveys

A growing number of nationally representative household surveys have integrated direct testing of drinking water quality with support from the JMP. In these surveys, field teams test for an indicator of faecal contamination, ***E. coli***, using membrane filtration and dehydrated growth plates. The results can be used to assess the level of risk for different water sources and across population groups, to identify inequalities. Water is tested from a glass of drinking water as well as directly from the place where the water was collected. Intensive training and field supervision are combined with 'blank' tests to provide quality control and quality assurance. Drinking water has also been tested for chemicals such as arsenic and fluoride, either in the field or by sending samples to a laboratory.

An advantage of integrating water quality testing in household surveys is the ability to link this information to household characteristics ranging from those directly related to drinking water, such as the type of water source and household water treatment, to socio-economic characteristics such as wealth. Quantification of *E. coli* can also help to identify population groups, settings and source types that pose the greatest risk.

These surveys confirm that bacteriological water quality can deteriorate significantly between collection and use (Figure 27). There are many possible explanations, but storage of drinking water can play an important role and is widespread in many parts of the world, especially where water supplies are not on premises or available only intermittently. For example, according to the 2012 National Sample Survey in India, almost everyone stores water before drinking, while the Nepal MICS 2014 found that water samples were provided from an uncovered storage container in over one in five households. Household water treatment, in particular boiling, is also commonplace in many countries and has the potential to substantially improve the quality of drinking water if correctly and consistently applied.

Water quality often deteriorates between collection and use

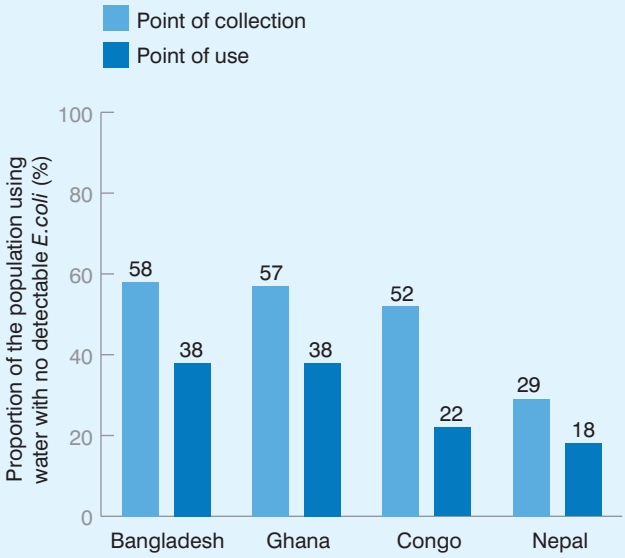


FIGURE 27 Proportion of the population using water with no detectable *E. coli* at the point of collection and point of use

Data from regulators in Europe show that while large water systems usually deliver water that is free from microbial contamination, water quality in small systems is a particular challenge even in the European context (Table 3). Only 3 countries out of 27 reported the highest compliance rate of over 99 per cent, and in six countries at least 1 in 10 small systems were found to be contaminated.

For the purposes of estimating safely managed drinking water services, the JMP will use data on the quality of water at the point of delivery. The JMP recognizes that this may differ from the quality of water at the point of consumption, but data on the latter remain scarce. Data on water quality will primarily come from administrative sources, such as regulators, who compile information on whether the quality of water supplied by service providers meets national standards. A focus on the point of service delivery will therefore enable the full use of regulatory data, while ensuring international comparability of estimates.

The JMP will continue to support countries to measure water quality at both the point of delivery and the point of consumption in order to better understand how handling, storage or treatment of water influences the quality of water consumed by different populations (Box 5).

TABLE 3

Data from regulators in Europe show that microbial contamination is more common in small than in large systems

Microbial compliance	Large systems	Small systems
<90%	0	6
90-99%	0	4
95-99%	4	14
>99%	23	3

Microbial compliance of large and small systems in 27 countries reported by EUROSTAT

In addition to microbial contamination, high-priority chemical parameters at a global level are arsenic and fluoride. Naturally occurring arsenic is a major challenge in Bangladesh. The Bangladesh MICS 2012–2013 collected information on arsenic levels in addition to *E. coli* (Figure 28). The data show that there are many parts of the country where arsenic levels exceed the national standard of 50 parts per billion. Although arsenic contamination is known to be widespread in areas of Bangladesh, its extent in other countries is uncertain, including in countries where it may be a particular risk based on geology.[25]

Excessive fluoride in drinking water is also a global concern. Efforts are needed to understand levels in countries where limited testing has been done to date. One country known to have high fluoride levels in some regions is Ethiopia, notably in the Rift Valley. Testing for fluoride is ongoing as part of the water quality module of the nationally representative Ethiopia Socio-economic Survey.

Arsenic exceeds national standards in many areas of Bangladesh

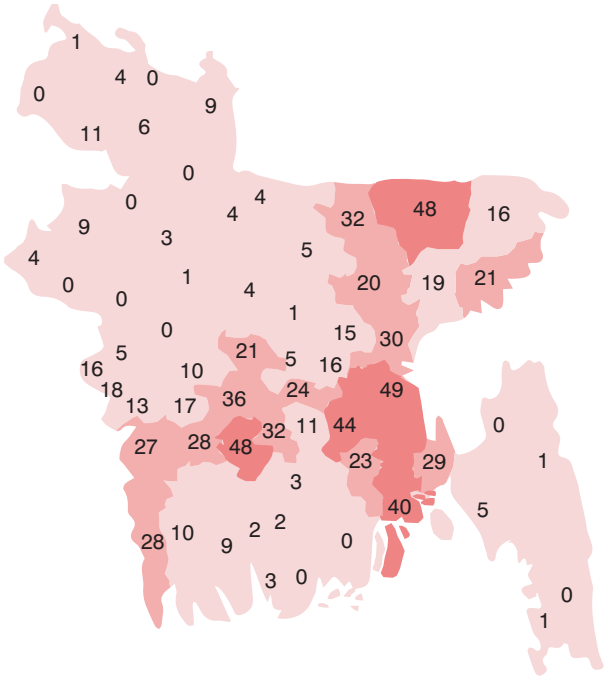


FIGURE 28 Proportion of the population using a drinking water source with arsenic exceeding the Bangladesh national standard

Source: MICS 2012–2013.

25 See ‹http://www.who.int/topics/arsenic/en›

BOX 6

A framework for safe drinking water

Microbial compliance alone does not guarantee safety. To ensure safe drinking water, WHO and UNICEF promote a *Framework for Safe Drinking Water,* as described in the WHO Guidelines for Drinking Water Quality and related tools.[26] This framework comprises three key components: target setting, water safety plans and independent surveillance.

Target setting. National standards should be established for contaminants that occur frequently at significant concentrations and that have the greatest health impact. WHO guideline values for a range of contaminants can be used as a point of departure for developing national standards and regulations, but countries should consider all exposure pathways. National standards may be higher or lower than the WHO guideline values.

Water safety plans. Water safety plans (WSPs) are a systematic risk assessment and risk prevention approach encompassing all steps in the water supply system, from the catchment through to the consumer. By identifying the greatest risks and putting in place barriers, WSPs offer water suppliers a tool for managing the risks related to water and a framework to achieve water quality targets included in national standards and regulations. The principles of WSPs can be implemented for both large- and small-scale supplies. For example, simplified risk assessments with a stronger focus on risks related to transport and storage are more appropriate for community-managed systems.

Independent surveillance. In a WSP approach, surveillance of water quality at critical points in the system is important, as it provides independent assurance that the WSP is appropriate, and that the chosen barriers are correctly implemented and effective in ensuring that water quality is meeting national standards. Findings from surveillance inform water safety policies and programmes and can provide inputs to revisions to national standards and regulations. In some countries, the presence of validated WSPs could be a better indicator of water safety than microbiological compliance alone. Simpler risk assessment tools, such as sanitary inspections, can also yield valuable information about risks to water supplies. Figure 29 shows that in Canada, the proportion of First Nations water supply systems inspected and rated as 'low-risk' has more than doubled since 2009–2011.[27]

The proportion of First Nations water supply systems rated as 'low-risk' has more than doubled since 2009–2011

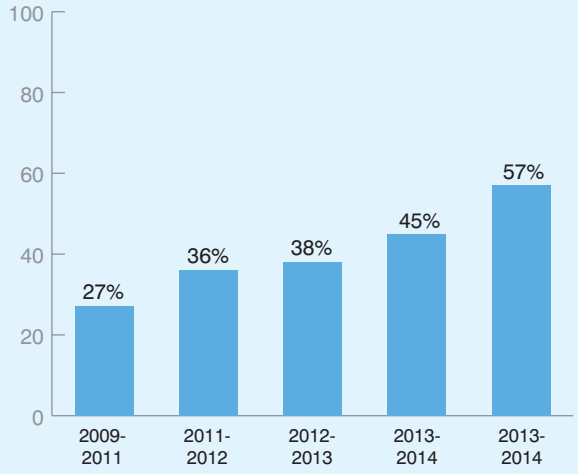


FIGURE 29 Proportion of inspected First Nations water systems classified as 'low-risk'[27]

26 WHO, 2011; Think Big, Start Small, Scale Up: A road map to support country-level implementation of water safety plans, WHO, 2010, ‹www.who.int/water_sanitation_health/dwq/thinkbig_small.pdf›.

27 Environment and Climate Change Canada, Canadian Environmental Sustainability Indicators: First Nations water and wastewater system risk, 2016, ‹www.ec.gc.ca/indicateurs-indicators/default.asp?lang=en&n=EA902CF7-1›.

4

Estimating safely managed drinking water

This section outlines how the JMP will combine the different elements described in Section 3 to produce national, regional and global estimates of the population using safely managed drinking water services.

The JMP approach builds on the established indicator 'use of an improved source', which is widely used in national household surveys and censuses. Existing data can be readily used to estimate the population using 'basic service', 'limited service', 'unimproved facilities' and 'surface water', but the JMP database will need to be expanded in order to incorporate the data on the new elements of 'safely managed' drinking water services – that is, accessibility, availability and quality.

Combining these different elements to produce estimates that are robust and comparable between countries and over time poses a number of challenges. Some of these are not new, and there are well-established methods to overcome them, but developing and refining methodologies to overcome others will take time (Box 7).

Household surveys and censuses will remain the primary source of data on the types of water source used and their accessibility. These data will be combined with data from regulatory or administrative sources, where available. As discussed in previous sections, household surveys, regulators and administrative sources all produce relevant data on accessibility, availability and quality of drinking water, but this is not yet standardized or available for all countries and population groups. For a preliminary analysis of the availability of data on different elements of safely managed drinking water services, see Annex 1.

The JMP will only make a safely managed drinking water estimate where data are available on quality and at least one other element for at least half of the population. In the first few years of SDG reporting, many countries will lack one or more of the elements for at least part of the population. In particular, rural areas and non-piped supplies are likely to suffer from data gaps, and the JMP will initially need to make assumptions.

BOX 7

Key methodological challenges

1. Generating estimates when few data are available

The 2015 JMP progress update was able to make estimates that drew upon at least five datasets for 142 countries representing over 90 per cent of the world population. However, for some countries, estimates are based on fewer inputs of variable quality. The JMP uses a simple linear regression model to produce estimates for any given reference year, while minimizing reliance on any single data point. Only data approved by the national statistical office are used, and where problems are identified with individual data points, these are excluded from the analysis.

For SDG monitoring, the JMP is considering a range of statistical approaches that would allow more sensitivity to changes in the rate of progress, compared to simple linear regression. A modelling approach will be used to produce estimates for individual rungs on the drinking water ladder, as well as estimates of individual elements of the 'safely managed' indicator: accessibility, availability and quality. It is anticipated that few data points will be available for individual elements in the early years of SDG monitoring, but that data availability will continue to improve with time.

2. Drawing data from multiple sources

Where data are available from both household surveys and administrative sources, choices will need to be made. For example, Albania has information on the availability of drinking water from the regulator, from household surveys and from service providers. According to the regulator, the average number of hours of service per day in 2013 was 11.8, which is somewhat lower than the 13.8 reported by service providers through IBNET in 2012, and much lower than the 17.6 hours per day reported in the 2012 Living Standard Measurement Study.

In general, the JMP will give preference to data from household surveys and censuses, but for some types of information, administrative data are likely to be of better quality. Data on the type of source used and travel time for collection of water are more likely to be available from household surveys, while data on availability and quality may be more available from administrative sources. Data sources will be selected in consultation with national authorities, and different sources will only be combined in the same estimation model if the data are closely comparable.

3. Integrating elements of safely managed services

Ideally, the elements of safely managed drinking water services should all be assessed together at the household level, but this is usually not possible. In some countries, data elements are only available at the level of the service provider or an administrative unit. In many cases, data elements will need to be drawn from different sources, and so can only be integrated at the lowest common scale. For the purposes of global reporting, the JMP will initially combine individual elements of safely managed at the national level. This will ensure comparability of estimates between countries. Where possible, elements will also be integrated at lower levels, such as rural/urban or regulated/unregulated services.

4. Disaggregating estimates to track inequalities

Estimates based on data from household surveys and censuses can be disaggregated on the basis of location, wealth, race, ethnicity and a wide range of other socio-economic characteristics (see the JMP 2014 progress update for a detailed examination of tracking inequalities). However, such information is generally not available to water service providers or to the ministries and regulators that oversee them. Stratifiers used by statistical offices, such as 'urban' and 'rural', may be difficult to apply to service provider networks that do not closely follow administrative boundaries. Disaggregation of 'safely managed services' will therefore pose a major challenge.

Substantial disaggregation and exploration of inequalities will, however, be possible for lower rungs in the ladder, such as access to basic drinking water services. Where possible, the JMP will also highlight inequalities in individual elements of safely managed services.

A 'data completeness' score will be used to highlight data gaps and any assumptions made when generating estimates. If information on either accessibility or availability is missing for part of the population, then the JMP will assign a lower data completeness score to the resulting estimate. The data completeness score will indicate differing levels of confidence in country estimates, and incentivize countries to improve data availability over time.

Figure 30 illustrates the implications of taking into account the accessibility, availability and quality of drinking water. This hypothetical example draws on data from low- and middle-income countries. It shows that at the end of the MDG period, 80 per cent of the population used an improved drinking water source. But if improved sources requiring more than 30 minutes' collection time (hypothetically 8 per cent) are excluded, then only 72 per cent would meet the criteria for 'basic' service. An even smaller proportion would meet the criteria for 'safely managed' drinking water. While in this example 60 per cent of improved sources are located on premises and 64 per cent are available when needed, just 56 per cent are estimated to be free from contamination. Because the three elements are interrelated, the minimum of the three factors (in this case, water quality) is used to estimate the proportion of the population using safely managed drinking water services.

Household surveys are likely to remain the primary source of data for unregulated drinking water supplies. Surveys and censuses routinely collect information on the type of water source used by household members and whether it is located on premises (within the

The population using 'safely managed' drinking water is likely to be significantly lower than the population using 'improved' sources

FIGURE 30 Population using improved, basic and safely managed drinking water services (%)

dwelling, yard or plot) or within 30 minutes collection time. Some also collect information on whether water is available when needed. A growing number of household surveys test the quality of water at the source, and this is expected to increase as low-cost field tests become more widely available.

Regulatory and administrative information will be the main source of data in high-income countries and the 30–40 low- and middle-income countries that have drinking water regulators. Service-level information is usually collected at the level of the service provider. Table 4 illustrates how regulatory data from multiple service providers will be combined to generate estimates of the total population using regulated supplies that are safely managed. In this hypothetical example, a regulator oversees three large utilities providing piped water supplies to a combined population of 5 million (out of a total population of 10 million). The three large utilities serve different numbers of people with either household connections or public stand posts, and each reports the average numbers of hours per day and average compliance with water quality standards across their networks.

These data can be used to calculate averages for the entire population using regulated supplies. All of the regulated supplies are piped water and therefore categorized as improved. Of the population using improved regulated supplies, 87 per cent have connections 'on premises', 74 per cent meet the national standard for availability (i.e., at least 18 hours per day), and 86 per cent meet the water quality benchmark (95 per cent compliance).

The JMP will use the minimum of these three values (74 per cent) to estimate the proportion of the regulated population using safely managed drinking water. The remaining population is distributed between the 'basic' and 'limited' service levels.

In the majority of cases, data on accessibility, availability and quality will be integrated at the national level, or separately for regulated and non-regulated supplies. For the purpose of international comparability, the JMP will report the three elements separately at these levels, and use the minimum value for each domain to estimate coverage of safely managed drinking water. While this approach overestimates the extent to which the three criteria are concurrently met, it allows consistent comparison among countries.

If the three elements were integrated at the service provider level, the result would be only 54 per cent meeting the safely managed indicator (the weighted average of the three service providers). However, for global monitoring purposes, modelled estimates for any given element will potentially be based upon multiple data inputs over different points in time, necessitating integration at the aggregate level. In this example, integration is made at the regulator level by taking the minimum of the three elements, which in this case is 74 per cent (meeting the availability standard).

Estimates can also be calculated in a similar way for unregulated supplies. The proportion of the population using different types of water supplies can be calculated from household surveys and

TABLE 4

Aggregating data from regulated service providers

		IMPROVED		ACCESSIBLE		AVAILABLE		QUALITY				
Regulated services providers	Population served ('000)	Percentage	Population	Served with house connections	Served off premises within 30 min	Hours of service (piped supply)	Meeting national standard (18 hours per day)	Percentage free from contamination	Meeting national standard (95% compliance)	Safely managed service	Basic service	Limited service
Service provider 1	3,000	100%	3,000	90%	10%	18	100%	99%	100%	90%	10%	0%
Service provider 2	1,300	100%	1,300	85%	15%	16	0%	97%	100%	0%	100%	0%
Service provider 3	700	100%	700	80%	10%	19	100%	93%	0%	0%	90%	10%
Total	**5,000**	**100%**	**5,000**	**87%**	**11%**		**74%**		**86%**	**54%**	**45%**	**1%**

censuses. The proportion of these supplies that are covered by regulatory oversight can be deducted, leaving the unregulated population by supply type. Where household surveys are available, the travel time (accessibility) criterion should also be readily available. However, data for availability and quality of unregulated supplies are likely to be missing for many countries, and assumptions will have to be made in order to produce estimates. Table 5 uses a hypothetical example to illustrate how these elements can be integrated to estimate the proportion of unregulated populations using safely managed drinking water services.

Population-weighted estimates for regulated and unregulated supplies can then be combined in order to produce the SDG water ladder, including estimates of the population using basic and safely managed drinking water services.

By making available estimates for all rungs on the drinking water ladder, from surface water to safely managed services and its constituent elements, future SDG reports will provide policy-makers at the national and international levels with a rich set of information that can inform policy and programming throughout the SDG period, for countries at all stages of development. Countries will be able to compare themselves to their peers, in terms of both service levels and the quality of the monitoring data that underpin the estimates. The initial years of SDG reporting will be difficult, and many challenges will need to be overcome, but with time, both service delivery programmes and national monitoring of sectoral progress will improve in tandem.

TABLE 5

Aggregating data from non-regulated service providers

Unregulated services	Population served ('000)	Percentage improved	On premises	Accessible off premises within 30 minutes	Available when needed	Meeting national standard (95% compliance)	Safely managed service	Basic service	Limited service	Unimproved	Surface water
Piped supplies	700	100%	80%	10%	71%	87%	71%	19%	10%	0%	0%
Other improved	3,200	100%	10%	75%	80%	50%	10%	75%	15%	0%	0%
Unimproved	900	0%					0%	0%	0%	100%	0%
Surface water	200	0%					0%	0%	0%	0%	100%
Total	**5,000**	**78%**	**18%**	**49%**	**61%**	**44%**	**16%**	**51%**	**11%**	**18%**	**4%**

Preliminary analysis of data availability by region

The JMP 2015 report drew upon nearly 2000 data sources: 1363 household surveys, 300 censuses, and 312 datasets from administrative or sectoral sources. These sources contain information which will largely be sufficient for monitoring the four bottom rungs of the drinking water ladders: no services, unimproved serviced, limited services, and basic services.

Some of these data sources also contain information on the three new elements required for the safely managed services rung of the ladder: accessibility, availability and quality. Data from administrative records and regulatory frameworks will play an increasingly important role in monitoring of safely managed drinking water services, as information on the availability and quality of drinking water supplies is often not collected in household surveys and censuses. The JMP has begun compiling publicly available datasets from sectoral sources which can be used for calculation of the safely managed indicator. As of the writing of this report, at least one sectoral data set was available for 194 countries, areas or territories, though in many cases some elements are missing, or are available for only a portion of the population.

The JMP will continuously collect data from both population-based and sectoral sources throughout the SDG period, and the number of datasets available is expected to increase dramatically. For more information on the elements of safely managed services, see www.wssinfo.org/sdg-baselines, or contact the JMP at sdgbaselines@wssinfo.org.

Preliminary analysis of data availability by region

MDG Region	Number of countries, areas and territories	Data on basic services from household surveys and censuses	Sectoral data on safely managed drinking water services			
			Accessibility	Availability	Quality	Total
Caucasus and Central Asia	8	8	–	7	4	7
Developed Countries	55	49	1	27	43	52
Eastern Asia	6	4	–	4	4	5
Latin America and the Caribbean	46	32	1	40	19	44
Northern Africa	6	5	1	5	–	5
Oceania	20	12	1	16	11	18
Sub-Saharan Africa	51	49	2	34	13	36
Southern Asia	9	9	2	6	4	7
South-eastern Asia	11	10	–	7	5	9
Western Asia	13	9	–	10	3	11
World	**225**	**187**	**8**	**156**	**106**	**194**

Safely managed drinking water represents an ambitious new global service norm that forms part of the new JMP ladder for global monitoring of household drinking water services.

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