



Research Article

Water sanitation and hygiene in Sub-Saharan Africa: Coverage, risks of diarrheal diseases, and urbanization



Alexandre Zerbo*, Rafael Castro Delgado, Pedro Arcos González

Unit for Research in Emergency and Disaster, Faculty of Medicine and Health Sciences, University of Oviedo, 33006 Oviedo, Spain

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ABSTRACT

Sub-Saharan Africa (SSA) has a rapidly growing urban population, with water, sanitation, and hygiene (WASH) services representing the central needs for this population. Incidentally, this region has the lowest global WASH coverage. Data from the 'WHO/UNICEF Joint Monitoring Programme for Water supply, Sanitation and Hygiene' and the 'Global Burden of Disease' study from the Institute for Health Metrics and Evaluation were used to assess WASH coverage and related health burden in SSA, its subregions, and rural and urban areas in SSA. WASH coverage in the SSA region appears to be low, but urban coverage is better than that in rural areas; however, there is unequal access to urban WASH and poor urban areas are underserved. In addition, 7.75% (5.99–9.7%) of total deaths due to diarrheal diseases across SSA are attributed to unsafe WASH with a risk factor attribution (RFA) percentage of 95.93% (91.94–98.24%). Therefore, a correlation between WASH coverage and mortality due to diarrheal diseases could be established. There is a lack of data on WASH coverage in poor urban areas, although these areas have high incidence of WASH-related diseases including diarrhea. Disaggregated urban WASH data are needed to better understand the WASH service needs of poor urban areas, which would be helpful in ensuring a more inclusive implementation of WASH services.

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1. Introduction

An approximate 4 billion people, or 55% of the world population, were living in urban areas in 2018, with this proportion predicted to increase to 68% by 2050.¹ The world is becoming increasingly urbanized.² The global urban population is increasing by approximately 220,000 people daily, and this growth in urbanization is occurring mainly in Asia and sub-Saharan Africa (SSA).³

Urbanization is supposed to ensure better living conditions for the population, but the rapid demographic growth in SSA often poses major development challenges such as access to water, sanitation, and hygiene (WASH) services.³ Indeed, the African urban population has been increasing mostly in response to climate change, environmental degradation, conflicts, migration, and poverty, thereby generating poor urban areas with problematic sanitation, access to drinking water, and hygiene issues.¹

WASH services remain essential for a dignified and healthy life.⁴ These are more than a prerequisite for development. As stipulated in the Sustainable Development Goal 6, "ensuring availability and

sustainable management and sanitation for all" constitute a human right that is ratified as the right to drinking water and sanitation.⁵

Furthermore, inadequate access to WASH services has many health consequences; it is the main contributor to the burden of diarrheal diseases that are the leading cause of child mortality globally.^{6–9} In addition, poor access to WASH is associated with the transmission of many NTDs, maternal mortality, and respiratory infections.^{10–12} It is also known that inadequate WASH has an economic, environmental and social impact.⁴

Globally, SSA has one of the lowest levels of access to WASH services, and this access is uneven depending on where people live (SSA subregions and rural or urban areas) and their socioeconomic status.⁴ In addition, there are disparities in access to WASH between wealthy and poor urban areas.

Although people living in rural areas have less access to WASH services compared with people living in urban areas, the presence of inequalities lead to limited access to WASH services for people in poor urban areas.¹³ Moreover, socioeconomic status is a central determinant of access to WASH services. This translates to low coverage in poor urban areas, which hosts a growing population with lower socioeconomic status substantially affected by the burden of WASH-related diseases.³

* Corresponding Author.

E-mail address: crateva@yahoo.fr (A. Zerbo).

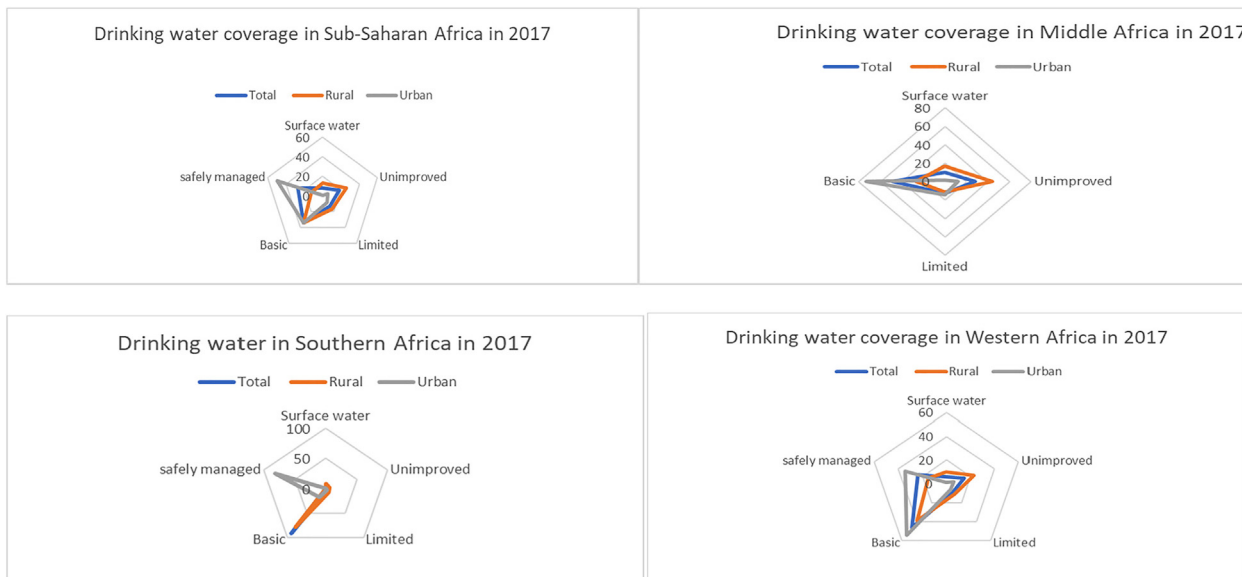


Fig. 1. Drinking water coverage in sub-Saharan Africa (SSA) subregions. Source: WHO/UNICEF Joint Monitoring Programme for Water supply, Sanitation and Hygiene (JMP).

Therefore, an analysis of the urban WASH coverage in SSA and related disease risks is essential. From this perspective, this study aims to analyze urban WASH coverage and the associated risk of diarrheal diseases in SSA subregions.

2. Methods

2.1. Data analysis

Household data from the ‘WHO/UNICEF Joint Monitoring Programme on Water supply, Sanitation and Hygiene (JMP)’ for the year 2017 were used to perform an analysis of WASH coverage in urban areas of SSA. Raw data from the JMP website were used to create graphs (radar charts) of WASH coverage (total, urban,

and rural) of all SSA subregions (western, eastern, central, and southern). Microsoft Excel was used for data visualization and analysis.

The analysis combined data on attributable mortality from both sexes and all age groups with percentages of risk factor attribution (RFA) for WASH coverage. These data were extracted using interactive and visualization tools from the Institute for Health Metrics and Evaluation (IHME) of the University of Washington and are presented in tables for all SSA subregions.

2.2. Data source

WHO/UNICEF Joint Monitoring Programme for Water supply, Sanitation and Hygiene (JMP), 2019.¹⁴ Available from www.wash-data.org

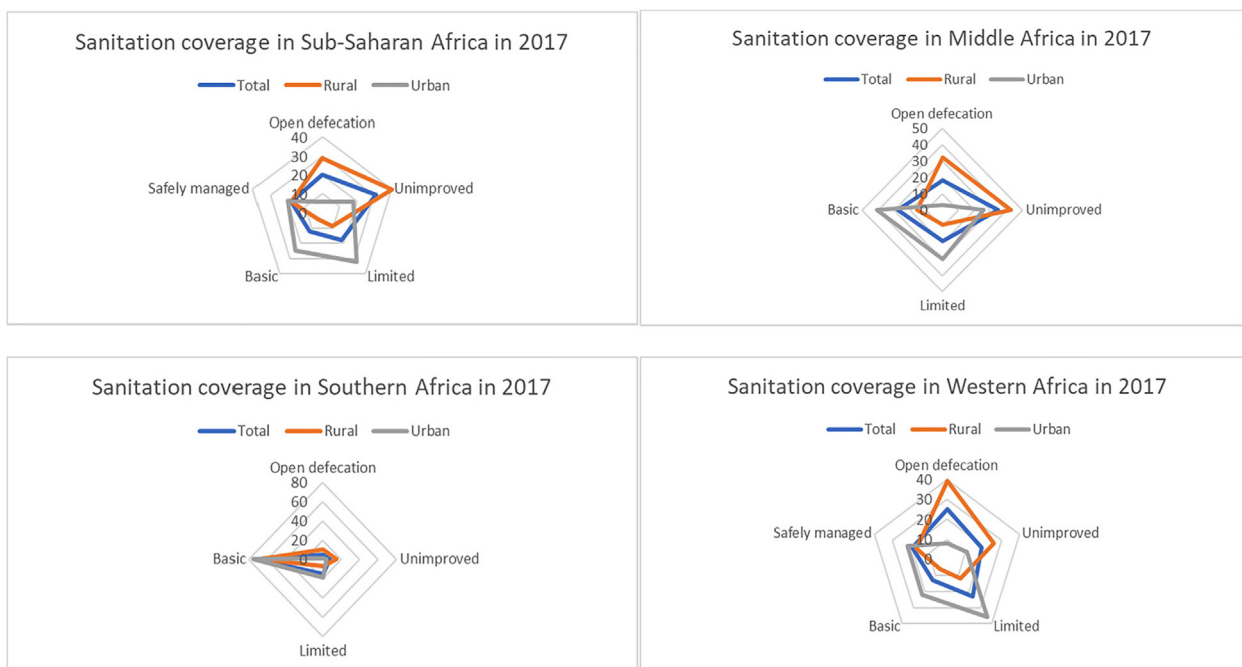


Fig. 2. Sanitation coverage in sub-Saharan Africa (SSA) subregions. Source: WHO/UNICEF Joint Monitoring Programme for Water supply, Sanitation and Hygiene (JMP).

Institute for Health Metrics and Evaluation (IHME). GBD Compare data visualization Seattle, WA: IHME, University of Washington, 2019.¹⁵ Available from <http://ghdx.healthdata.org/gbd-2019/data-input-sources>

3. Results

3.1. WASH coverage in SSA

3.1.1. Drinking water coverage

Drinking water coverage is better in urban areas than rural areas across the SSA. Southern SSA has the best urban coverage in drinking water, followed by urban areas in western and middle SSA. Fig. 1

3.1.2. Sanitation coverage

The coverage of access to sanitation facilities is better in urban areas compared to rural areas across SSA. Southern SSA has the

best urban coverage, followed by urban areas in western and middle SSA. Fig. 2

3.1.3. Hygiene coverage

The coverage of access to handwashing facilities is better in urban areas relative to rural areas across SSA. Southern SSA has the best urban coverage, followed by urban areas in western and middle SSA. Fig. 3

3.1.4. Trends in types of urban WASH facilities

There is an increase in the urban coverage rate of sewers and septic tanks, along with a decrease in urban coverage of running water and latrines. Fig. 4

3.1.5. Estimated number of SSA countries with basic WASH coverage by 2030

Twelve SSA countries are estimated to have made negative progress in coverage of basic WASH services by 2030, while 23 countries are expected to make slow progress, and only 8 will be on track. In addition, 9 countries will have made negative progress

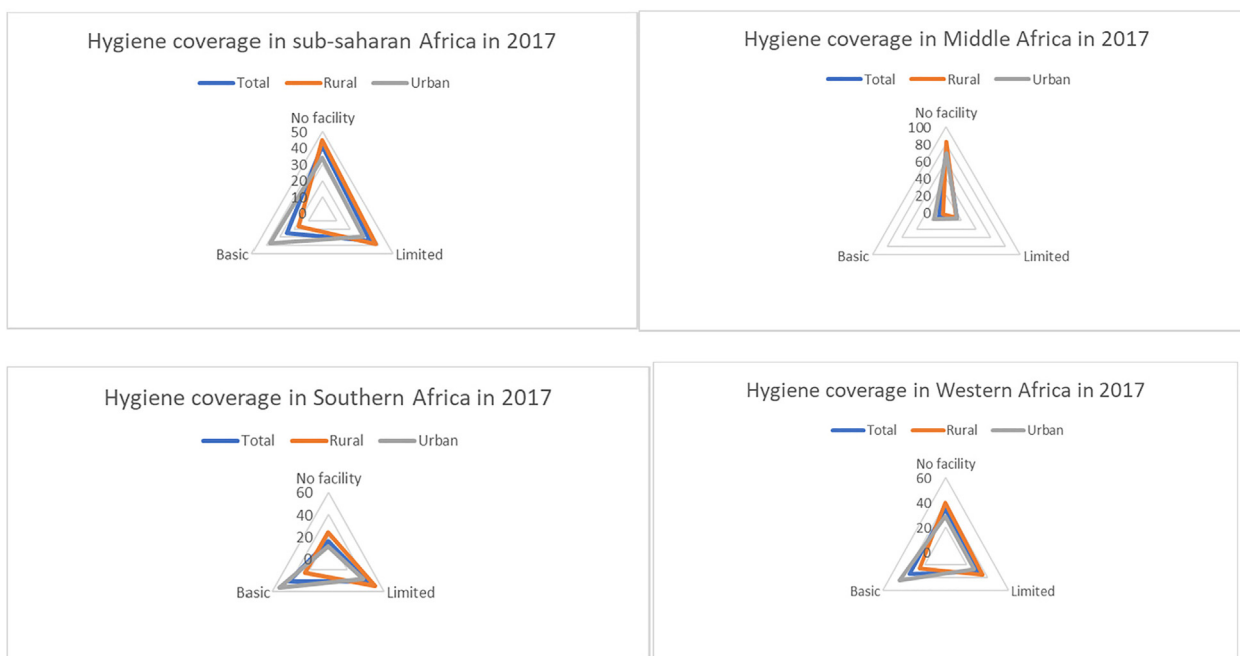


Fig. 3. Hygiene coverage in sub-Saharan Africa (SSA) subregions. Source: WHO/UNICEF Joint Monitoring Programme for Water supply, Sanitation and Hygiene (JMP).

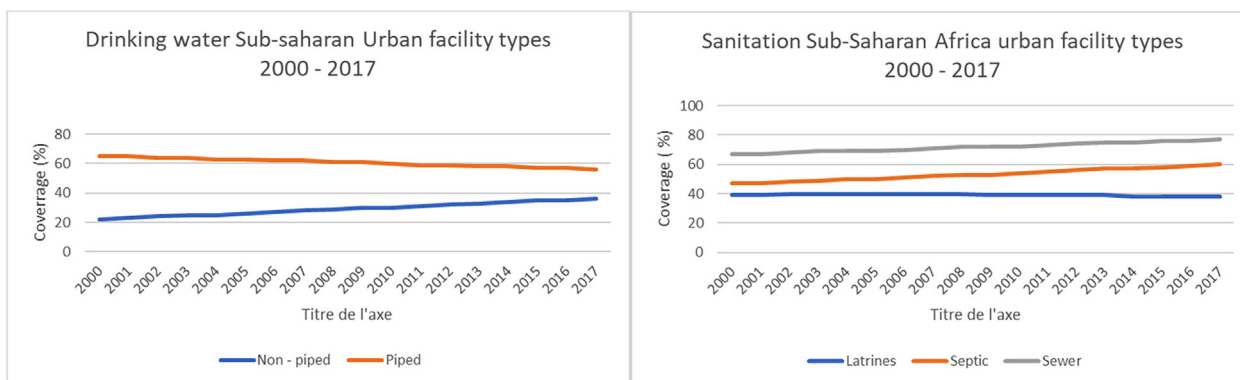


Fig. 4. Trends in water, sanitation, and hygiene (WASH) coverage in sub-Saharan Africa (SSA) subregions in the period from 2000 to 2017. Source: WHO/UNICEF Joint Monitoring Programme for Water supply, Sanitation and Hygiene (JMP).

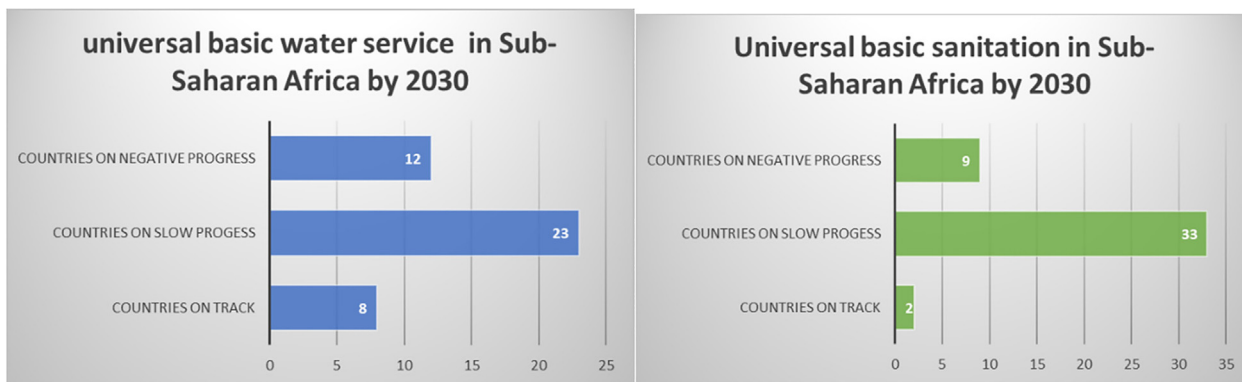


Fig. 5. Estimated water, sanitation, and hygiene (WASH) coverage in sub-Saharan Africa (SSA) countries by 2030. Source: WHO/UNICEF Joint Monitoring Programme for Water supply, Sanitation and Hygiene (JMP). Website, www.washdata.org, data accessed 10 November 2020.

Table 1

Burden of diarrheal diseases attributable to unsafe water, sanitation, and hygiene (WASH) practices in sub-Saharan Africa (SSA) in 2019. Source: Institute for Health Metrics and Evaluation (IHME). GBD Compare data visualization. Seattle, WA: IHME, University of Washington, 2018. Available from <http://vizhub.healthdata.org/gbd-compare>. (Accessed 10 November 2020).

	SSA	Central SSA	Eastern SSA	Southern SSA	Western SSA
Death rate	7.75% (5.99–9.7%)	6.61% (4.18–9.71%)	6.94% (5.05–8.98%)	2.9% (1.99–4.48%)	9.67% (7.54–11.99%)
RFA	95.93% (91.94–98.24%)	96.15% (92.3–98.36%)	96.29% (92.61–98.42%)	88.4% (79.96–94.09%)	96.19% (92.3–98.39%)

Table 2

Burden of diarrheal diseases attributable to unsafe water, sanitation, and hygiene (WASH) practices in sub-Saharan Africa (SSA) by 2030. Source: Institute for Health Metrics and Evaluation (IHME). GBD Compare data visualization. Seattle, WA: IHME, University of Washington, 2018. Available from <http://vizhub.healthdata.org/gbd-compare>. (Accessed 10 November 2020).

	SSA	Central SSA	Eastern SSA	Southern SSA	Western SSA
Death rate	6.77% (2.39–15%)	6.63% (2.11–15.48%)	8.49% (2.63–18.82%)	3.24% (0.98–4.7%)	6.29% (2.43–14.4%)
RFA	93.15% (82.8–98.13%)	94.11%(84.86–98.49%)	93.97% (84.4–98.41%)	87.21% (73.16–95.91%)	92.68% (81.44–98.04%)

in coverage of basic sanitation service, 33 will be making slow progress, and only 2 will be on track.[Fig. 5](#)

3.2. Mortality attributable to unsafe WASH

3.2.1. Mortality associated with diarrheal diseases for both sexes and all age groups related to WASH coverage in 2019

An estimated 7.75% (5.99–9.7%) of total deaths from diarrheal diseases across SSA is attributable to unsafe WASH practices with a risk factor attribution (RFA) of 95.93% (91.94–98.24%).

Western SSA has the highest percentage of deaths attributable to WASH at 9.67% (7.54–11.99%) with a RFA of 96.19% (92.3–98.39%), while southern SSA has the lowest at 2.9% (1.99–4.48%) with a RFA of 88.4% (79.96–94.09%).[Table 1](#)

3.2.2. Predicted mortality associated with diarrheal diseases for both sexes and all age groups related to WASH coverage by 2030

SSA is projected to have 6.77% (2.39–15%) deaths attributable to unsafe WASH with a RFA of 93.15% (82.8–98.13%) by 2030.

The highest percentage is projected to be in eastern SSA at 8.49% (2.63–18.82%) and a RFA of 93.97% (84.4–98.41%), and the lowest percentage of deaths will be in southern SSA at 3.24% (0.98–8.47%) and a RFA of 87.21% (73.16–95.91%).[Table 2](#)

4. Discussion

Despite the low coverage of WASH in SSA, urban areas have better WASH services than rural areas. Southern SSA has the best urban WASH coverage, followed by western and middle regions.

A low WASH coverage is noted for its contribution to mortality associated with diarrheal diseases across SSA, since diarrheal diseases may originate from inadequate access to WASH services. Indeed, for the year 2019, 7.75% (5.99–9.7%) of all deaths in SSA from diarrheal diseases were attributable to unsafe WASH with a RFA of 95.93% (91.94–98.24%).

Unless actions are taken to improve WASH access in SSA, theoretical estimates do not predict much progress in reducing the mortality of diarrheal diseases attributable to unsafe WASH services by 2030. Indeed, diarrheal diseases are expected to be the cause of 6.77% (2.39–15%) of all deaths with a RFA of 93.15% (82.8–98.13%).

In fact, many SSA countries are predicted to show a negative progress in WASH coverage by 2030.

In the context of low WASH coverage and associated health burden in the SSA region, urban areas were not spared from this issue. Even though WASH coverage is better in urban areas than in rural areas, social inequalities in urban areas have implications for access to WASH services and health risks associated with

inadequate WASH.¹⁶ Therefore, poor urban areas have low coverage of WASH services relative to wealthy urban areas; consequently, poor urban residents are at a higher risk for transmission of WASH-related infections such as diarrhea.¹⁷ However, it is difficult to obtain data on the health burden in poor urban areas, since there are no disaggregated data available for urban health in SSA.¹⁸

Fecally transmitted infections are often the result of poor WASH. Indeed, inadequate WASH access enables the interlinked pathways in the Wagner F diagram [fluids (or water), field (or soil), flies, fingers, and food] for transmission of fecal–oral diseases, such as diarrheal diseases, to flourish.^{19,20}

5. Conclusion

The SSA region has a low WASH coverage, leading to WASH-related diseases, with diarrhea being the main health burden. Although urban areas have better overall WASH coverage than rural areas, poor urban areas remain underserved owing to intra-urban inequalities in access to WASH services. In addition, there is not much data available on WASH coverage and the associated health burden in poor urban areas. Disaggregated data on urban WASH access could help in inclusive WASH service implementation in poor urban areas.

CRedit authorship contribution statement

Alexandre Zerbo: Conceptualization, Methodology, Software, Data curation, Writing – original draft, Visualization, Investigation, Software, Validation, Writing – review & editing. **Rafael Castro Delgado:** Supervision. **Pedro Arcos González:** Supervision.

Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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