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Suggestions to Improve WASH Statistics in Mozambique's Survey Data

TECHNICAL NOTE

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In the calculation of water supply, sanitation, and hygiene (WASH) indicators for Mozambique, all nationally representative surveys that were carried out between the mid-1990s to date were considered. The analysis follows closely the guidelines from the Joint Monitoring Programme (JMP) for Water Supply and Sanitation to assess access to improved water or sanitation sources and whether there is additional information to calculate Access Plus[1] indicators.

Of all available surveys in Mozambique, only the household budget surveys (HBS) and the demographic and health surveys (DHS) provide comparable definitions across time to calculate detailed categories of access to improved water or sanitation services. The analysis to answer Core Questions[2] 1 to 3 relies on these surveys but the information to construct even the basic indicators of access to improved water or sanitation services is limited. The main information limitation is that some questionnaires do not distinguish between improved and unimproved latrines or between protected and unprotected wells. Without the distinction, it is not possible to determine directly whether households using latrines or wells were improved sources or not. These limitations are confined to surveys from 2003 and before. The information from these surveys is used sparingly to provide longer time trends of piped water access and use of open defecation. The information in the Census 2007 is also limited but it is adequate for the production of a detailed profile of inequality of access at the subnational level and to define the bottom 40 percent of the population using a wealth index.

Across data sources, wealth is used to define the bottom 40 percent using a standardized wealth index. Wealth was preferred to consumption because the consumption data for the most recent household budget survey (Inquérito de Orçamentos Familiares, 2014/15) was not ready at the time of the analysis and because the use of a wealth index allows the bottom 40 percent to be defined in the DHS-type surveys and the census. The annex in the main report describes the methodology followed to calculate the wealth index and provides a section with the frequency of classification errors into bottom 40 percent groups when using consumption or wealth information. The classification into the bottom 40 percent coincides for over 70 percent of the observations using either the

1. The Access Plus framework considers besides access other aspects of water supply and sanitation services such as quality, affordability, accountability, and availability in the creation of indicators that can monitor the sustainable development goal (SDG) that calls on the global community to "ensure availability and sustainable management of water and sanitation for all."
2. The Poverty Diagnostic for Water Supply, Sanitation, and Hygiene in Mozambique aims to answer four Core Questions (CQ). The questions are: (CQ1) Who are the bottom 40 percent in terms of national income or wealth distribution, and where in the country do they live?; (CQ2) What is the level and quality of water supply and sanitation services experienced by the bottom 40 percent and absolute poor, as compared to the top 60 percent and non-poor?; (CQ3) What are the linkages and synergies between water and sanitation services, and other sectors?; (CQ4) What are the water and sanitation service delivery constraints to, as well as potential solutions for, improving services to the bottom 40.

HIGHLIGHTS OF STUDY FINDINGS

Mozambique's population is experiencing demographic transformations characterized by urban expansion and changes in the distribution of rural and urban populations. The poor are mainly concentrated in rural areas, in the provinces of Nampula and Zambezia, but rural areas have shown little progress in improved water supply coverage.

Lack of access to WASH significantly contributes to maternal health risks, time-poverty, and undernutrition. Reducing distance to water supply and sanitation facilities and improving quality of services benefit the poor by lowering the likelihood of disease and by freeing up time for productive activities and education.

Mozambique has not fully updated and properly enforced its standards and principles governing the quality and reliability of water supply and sanitation services, which pose additional challenges in achieving the SDGs for WASH.

Ongoing governance reforms must focus on sectors' performance to overcome service delivery inefficiencies and improve overall management of water supply and sanitation services. WASH subsectors need to be understood separately only in terms of their budgetary planning, allocations, and managing expenditures.

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consumption- or the wealth-based measure. The frequency of classification errors, however, is higher in years before 2003 and in rural areas.

Table 1 provides an overview of the information available on each survey and the Census 2007. For the Core Question 2 analysis, priority was given to time series that were as long and as comparable as possible. For this reason, and considering the surveys' limitations, access to improved water sources combined

Table 1: Available Information to Construct Water and Sanitation Indicators

	Household budget surveys				DHS/AIS/MICS					Other
	IAF 96/97	IAF 02/03	IOF 08/09	IOF 14/15	DHS III-97	DHS IV-03	MICS 08	AIS 09	DHS VI-11	Census 07
Sample size (households)	8,273	8,700	10,832	11,506	9,282	12,315	13,955	6,097	13,919	4.6 million[b]
[W]ealth/ [C]onsumption	[W]/[C]	[W]/[C]	[W]/[C]	[W]/[c]	[W]	[W]	[W]	[W]	[W]	[W]
Access to water		Yes			Yes	Yes		Yes		
Surface water	Yes		Yes	Yes			Yes		Yes	Yes
Improved access		Yes	Yes[a]	Yes		Yes[a]	Yes	Yes	Yes	Yes[a]
Availability (≤ 30 minute round-trip)[d]	Yes		Yes	Yes	Yes	Yes	Yes	Yes	Yes	
Continuity (weeks/hours)			LIM							
Affordability	Yes	LIM								
Household treats water			Yes				Yes		Yes	
Quality perception				Yes						
Access to sanitation	Yes				Yes	Yes	Yes	Yes		
Open defecation		Yes	Yes	Yes					Yes	Yes
Other unimproved		Yes	Yes	Yes			Yes	Yes	Yes	Yes
Improved access		Yes	Yes	Yes		Yes[a]	Yes	Yes	Yes	Yes
Flush to sewage		Yes					Yes	Yes	Yes	
Shared access						Yes	Yes	Yes	Yes	
Child feces disposal						Yes		Yes	Yes	
Hygiene									Yes	

Note: A blank cell denotes that the indicator cannot be calculated due to lack of information in the specific survey considered.
IAF = Inquérito de Agregados Familiares; IOF = Inquérito de Orçamentos Familiares; DHS = Demographic and Health Survey; MICS = Multiple Indicator Cluster Survey; AIS = Aids Indicator Survey.
The AIS-2009 survey was not considered in the main report because of the survey's relatively small sample size and the existence of the MICS-2008 and DHS 2011, as these are similar surveys taken at the same time but with a larger sample that allows for more precise estimations at the subnational level.
Continuity refers to the number of days per week or hours per day in which the households receive uninterrupted service. Affordability implies that the financial expenditure of the bottom 40 percent of the population should not exceed a certain threshold from the household income. LIM: Assuming a fixed cost per liter per day, it is possible to estimate if a household can afford, given their income and an affordability threshold, a minimum quantity of water for all household members. This assumption does not consider how prices for tanker trucks or bottled-water vendors vary per provider, and assumes, when using piped water, that all households pay a unique rate per liter per day.
a. Estimations rely on an imputation method.
b. Estimations from the census use all 4.6 million households in the country.
c. The final and official consumption aggregate for the IOF 2014/15 was not available at the time of writing the report.
d. The availability required standard refers to 30 minutes or less. The survey questionnaire presents categories instead of asking respondents for their estimation in an open-ended question. The first two categories presented to respondents are 0–29 and 30–40 minutes. In open-ended questions, individuals tend to round their responses and typically the response "30 minutes" has a large mass of the responses' distribution. For this reason, it is not possible to calculate the indicator from this survey even if the question is present in the questionnaire.

different survey types[3] whereas access to improved sanitation complemented the household budget survey series with the DHS VI-11. For the Core Question 3 analysis, and to complement other analyses in the report, it was necessary to rely on imputations to distinguish between improved and unimproved wells and latrines. The annex in the main report describes in detail the imputation method followed.

Access Plus and Sustainable Development Goals: Water Indicators

The Access Plus framework captures, besides access, other desirable dimensions—delivery, quality, availability, and affordability—of water and sanitation services. The framework proposes indicators along tiers that start from the basic Millennium Development Goal (MDG) indicator of access to improved water or sanitation to indicators that require minimum standards in other desirable dimensions of water and sanitation services. Table 2 shows a preliminary definition[4] of the household water supply access tiers, the dimensions they consider, and the indicators that cross-cut tiers and dimensions.

Given that the information to even construct the basic MDG indicator of access to improved water is limited, household surveys were not used to provide a systematic analysis of all the different tiers. The main report uses the IOF 2014/15 and the DHS VI-11 to provide estimations only for the second tier.

The analysis was complemented with other sources as follows. The main report uses Afrobarometer survey data (2012) on water outages and government reports of continuity of supply. To analyze compliance with fecal and priority chemical standards, government reports were used as well. One survey, the IOF 2014/15, provides additional information on quality perception of drinking water used by the household—whether it is bitter or turbid, for example—and other surveys ask whether the household treats the water before consumption. The information, however, was not systematic across sources and was not used in the report. Service satisfaction is not present in the household surveys considered but the Afrobarometer provides information on the perception of the quality of service received from water providers and the information was analyzed. Although the household budget surveys capture expenditure on water, the information in the most recent survey uses a daily time recall period instead of monthly period and thus it is not strictly comparable with previous years. Moreover, the available consumption aggregates in the datasets collate expenditure on water, electricity, and other services and the disaggregated survey data are not available for some of the surveys. Water affordability was analyzed using academic papers that carried out their own affordability studies.

Access Plus and Sustainable Development Goals: Sanitation Indicators

The basic Access Plus indicator considers whether or not sanitation facilities are shared. This information is widely available across DHS-type surveys but only the recent surveys (MICS 2008 onwards) allow the calculation of access to improved

3. Access to improved water sources calculations use the following surveys: Inquérito de Agregados Familiares 2002/03, Multiple Indicator Cluster Survey 2008, Demographic and Health Survey 2011, and the Inquérito de Orçamentos Familiares, 2014/15.
4. These definitions and some of the details of the indicators considered are a work in progress. The tables presented in this document, however, do capture the intent of the JMP and properly characterize the tiers and their relation with the dimensions so far considered.

Table 2: Summary of the Multi-Tier Matrix for Household Water Supply Access

Dimensions			Tier 1 (MDG)	Tier 2	Tier 3	Tier 4	Tier 5
1. Access	Drinking water source		Improved water source			Piped water	
	Time to source			Within 30 minute round-trip (walking)	On premises		In dwelling
2. Quality					Standard (1)	Standard (2)	Standard (3)
3. Availability	Continuity	Days per week			Not interrupted for a full day in the past 2 weeks	Available 7 days on every week	
		Hours per day				Available 24 hours per day	
	Quantity					50 liters	100 liters
4. Affordability						Affordable	
5. Accountability	Management of service					Knows provider	Satisfied with provider and can channel complaints
	Intra-household decision making					Women participate equally in payment for services decisions	
6. Other dimensions						Sustainability dimensions	

Source: JMP 2016. *WASH in the 2030 Agenda. New global indicators for drinking water, sanitation, and hygiene.*
Note: These definitions and some of the details of the indicators considered are a work in progress. The quality standards refer to maximum values of bacteria or chemicals permitted in the water. Each standard adds specific bacteria or chemicals tested and lowers the maximum values admissible. The quantity refers to liters per person per day. Affordability implies that the financial expenditure of the bottom 40 percent of the population should not exceed a certain threshold from the household income. The other dimensions consider indicators on financial sustainability, institutional sustainability, or water sustainability. MDG = Millennium Development Goal.

sanitation as they differentiate improved latrines. Most household budget surveys allow the estimation of access to improved sanitation but they do not provide information on whether sanitation facilities are shared. The main report uses the DHS VI-11 to provide estimations for unshared improved facilities.

The information regarding child feces disposal is available in the DHS IV-03 and the DHS VI-11. A detailed analysis of child feces disposal using the DHS VI-11 is provided in the main report to answer Core Question 2 while information in both surveys is used to answer Core Question 3 in the econometric analysis of the relation of access to improved water and sanitation services and child malnutrition.

Table 3 shows the household sanitation supply access tiers.

Table 3: Summary of the Multi-Tier Matrix for Household Sanitation Access

Dimensions		Tier 1 (MDG)	Tier 2	Tier 3	Tier 4	Tier 5
1. Access	Type of sanitation	Using an improved facility not shared beyond the household		Besides using a non-shared improved facility, there is safe management and disposal on site or safe transport and treatment off-site		
	Handwashing			Availability of a place of handwashing with soap and water present at the dwelling		
	Child feces disposal				Feces put or rinsed in latrine or toilet or child uses latrine or toilet and the household safely manages sanitation	
	Menstrual hygiene management				Access to suitable facilities—with space, privacy, water, and soap—and materials for menstrual hygiene	
2. Affordability					Affordable	
3. Accountability	Management of services				Knows provider	Satisfied with provider and can channel complaints
	Intra-household decision making				Women participate equally in payment for services decisions	
4. Conveyance					Manual	Mechanical
5. Other dimensions					Two dimensions: Treatment of sludge and effluent, and safe use and disposal after treatment	

Source: JMP 2016. *WASH in the 2030 Agenda. New global indicators for drinking water, sanitation and hygiene.*
Note: These definitions and some of the details of the indicators considered are a work in progress. Affordability implies that the financial expenditure of the bottom 40 percent of the population should not exceed a certain threshold from the household income. Conveyance refers to the method used to empty the latrine or septic tank. MDG = Millennium Development Goal.

Suggestions to Improve Household Survey Questionnaires

Limitations in the surveys' questionnaires to calculate access to improved water or sanitation sources are confined to the first iterations of the DHS questionnaires; recent surveys are adequate and even provide some information related to Access Plus indicators. The following are suggestions to improve survey questionnaires to better capture Access Plus-related information:

- *Incorporate the types of questions that the Afrobarometer uses to assess quality of water service provision.* The Afrobarometer has a small set of questions that are adequate to assess the management of services aspect of the accountability dimension. This suggests that modifications to the DHS or household budget questionnaires can be small while providing enough information.

- *Incorporate the question of continuity of water supply service available in the DHS Phase 7 (2013–18) questionnaires.* The most recent phase of DHS

surveys includes a simple question, "In the past two weeks, was the water from this source not available for at least one day," that adequately captures a minimum standard of the continuity dimension.

- *The analysis of compliance with fecal and priority chemical standards can be complemented with quality perception of drinking water used by the household (available in the IOF 2014/15) and with whether households treat (and how) water before consumption.* Systematic information about fecal and chemical composition is difficult to obtain using nationally representative household surveys but some household budget surveys and recent DHS surveys capture whether households treat water before consumption and what methods they use. With this information it is possible to characterize the households that do not treat water before consumption and thus are at risk. The IOF 14/15 provides an example of information on quality perception of drinking water used by the household that can also be easily incorporated into survey questionnaires to complement the analysis.

- *A simple question available in older questionnaires could provide a rough estimate of expenditure on water.* The DHS III-97, DHS IV-03, and the IAF 96/97 questionnaires had after the question on drinking water source a simple question, "How much did you pay last month for water consumption (Meticais)," that is no longer available in recent questionnaires. This simple question can provide a basis for affordability analysis and if it was not discarded for valid reasons—for example, if the information capture was deemed of poor quality—the question should be brought back into the questionnaires.

- Incorporate in the household budget surveys whether or not the sanitation facilities are shared with other households.

Suggestions to Improve the Census Questionnaire

It is difficult to add questions to a census questionnaire because of its nature, but small modifications to the Census 2007 questionnaire and the addition of two questions would allow the estimation of the second tiers of water and sanitation supply. The main problems in the Census 2007 are that the response categories do not distinguish between protected and unprotected wells without pumps and that there are no questions about time to water source and whether sanitation facilities are shared.

Table 4 compares the Census 2007 in Mozambique to the census in the 2010 round of censuses[5] in selected neighboring countries. Of this group of seven countries, the census in Mozambique presents more limitations. In all countries, except for Mozambique and South Africa, the questionnaires distinguish between protected and unprotected wells. In South Africa and Zimbabwe there are questions to capture distance to water source and in Swaziland there is a question about time to water source. This question, however, is not an open-ended question and presents categories instead. Service continuity is only considered in the South African questionnaire. In all countries, except for Zimbabwe, the questionnaires distinguish between improved and unimproved latrines. Few questionnaires ascertain whether the facility is connected to

5. 2020 World Population and Housing Census Programme (database), United Nations (accessed April 28, 2017), http://unstats.un.org/unsd/demographic/sources/census/censusdates.htm#AFRICA.

Table 4: Comparison of Census Questionnaires in Dimensions Related to Water and Sanitation Services

	Mozambique 2007	Malawi 2008	Tanzania 2012	South Africa 2011	Swaziland 2007	Zambia 2010	Zimbabwe 2012
Water							
Differentiate wells	No	Yes[a]	Yes[a]	No	Yes[a]	Yes	Yes
Time to water source	No	No	No	Yes[b]	Yes	No	Yes[b]
Service continuity	No	No	No	Yes	No	No	No
Sanitation							
Differentiate latrines	Yes	Yes	Yes	Yes	Yes	Yes	No
Flush to sewage	No	No	Yes	Yes	No	Yes	No
Shared or unshared	No	No	No	No	No	Yes	No

a. Differentiates between protected and unprotected springs.
b. Distance to water source in meters.

sewage and only the questionnaire in Zambia asks whether or not the facility is shared with other households.

Specific Suggestions

- *Update the response categories of the question about source of water to distinguish between protected and unprotected wells.* The current question has an ambiguous category, "Water from well without pump," that cannot be assigned to either improved or unimproved categories.

- *Add a simple question for time to water source.* Recent DHS surveys incorporate two questions[6] to assess time to get to the water source and return, but one simple, open-ended question would be enough in the census questionnaire: "How long does it take to go there, get water, and come back?"

- *Incorporate in the census questionnaire whether or not the sanitation facilities are shared with other households.* "Do you share this toilet facility with other households?"

- *If possible, incorporate the question "In the past two weeks, was the water from this source not available for at least one full day?" to assess service continuity.* These types of questions are present only in the South African questionnaire.

Table 5 presents the specific question response categories suggested to improve the Census 2007 questionnaire. The response categories suggested are those used in the DHS Phase 7 and are provided only as guidance.

Expounding on data gaps in the current SDG indicators, this note proposes concrete changes to improve WASH statistics in Mozambique. These suggested changes allow

6. "Where is the water source located?" (In own dwelling, in own yard/plot, or elsewhere), if the response is "elsewhere," the follow-up question is "How long does it take to go there, get water, and come back? Minutes___ Don't know (write "998" as the answer).

Table 5: Specific Suggestions to Improve the Census 2007 Questionnaire

Census 2007	
Water access Piped into dwelling Piped to yard/plot Public tap/standpipe Water from protected well with pump Water from well without pump Surface water from rivers/lakes Rainharvest/rainwater Bottled/purified water Other	*Sanitation access* Toilet linked to septic tank Improved latrine Improved latrine (traditional) Pit latrine Without toiled or latrine
Suggestions	
Water access *(Responses DHS)* 11 Piped into dwelling 12 Piped to yard/plot 13 Public tap/standpipe 14 Piped neighbor's house 31 Protected well 32 Unprotected well 33 Borehole with pump 43 River/dam/lake/ponds/stream/ canal/+++ 51 Rainwater 61 Tanker truck 71 Bottled water 96 Other	*Sanitation access* *(Responses DHS)* 11 Flush to piped sewer system 12 Flush to septic tank 13 Flush to pit latrine 14 Flush to somewhere else 15 Flush, don't know where 21 Ventilated improved pit latrine 22 Pit latrine with slab 23 Pit latrine without slab/open pit 31 Composting toilet 41 Bucket toilet 51 Hanging 61 No facility/bush/field 96 Other
Distance to water source How long does it take to go there, get water, and come back? - Minutes ___ - In own dwelling, yard, or plot (write "996" as the answer) - Don't know (write "998" as the answer) *Service continuity (if possible)* In the past 2 weeks, was the water from this source not available for at least 1 full day? 1. Yes, 2. No, 8. Don't know	*Sharing* Do you share this toilet facility with other households? 1. Yes, 2. No, 8. Don't know

Note: The suggestions are based in the questionnaires of the Census 2007 and the Demographic and Health Survey (DHS; phase 7).

WASH priorities in the SDG framework to report consistent measures and tracking of universal access to basic water and sanitation, raising service levels to deliver safely managed water and sanitation services, a progressive elimination of inequalities, and reduction in ambiguous categories of access to improved and unimproved sources.

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About the WASH Poverty Diagnostic Initiative

The WASH Poverty Diagnostic is a global initiative that aims to have local impact by understanding the extent to which the social contract for delivering WASH services is working for all—particularly the poor and vulnerable—and if it not, who is not benefiting and why? The initiative ultimately aims to better understand binding constraints in service delivery and search for solutions that are both technically and politically feasible to overcome them. Results from this initiative are intended to be public goods to inform country-level policy dialogue and programming as well as the methods and frameworks for broader consumption by a variety of specialists. The initiative is led by the World Bank's Water and Poverty Global Practices in close collaboration with the Governance and Health, Nutrition, and Population Global Practices. This initiative also collaborated closely with the UNICEF/ WHO Joint Monitoring Programme (JMP).

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