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Assessment of Water, Sanitation and Hygiene Practices Among Households, 2019 – Sierra Leone: A Community-based Cluster Survey

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ABSTRACT

INTRODUCTION: In Sierra Leone, diseases related to water, sanitation, and hygiene remain among the leading cause of morbidity and account for 20% of all death. This study assessed the water, sanitation, and hygiene services and practices at household level in Sierra Leone.

METHODS: A cluster survey was conducted among 1002 households in 4 districts of Sierra Leone. Data was collected on water, sanitation, and hygiene indicators, occurrence of diarrhoeal diseases at household level within 14-day prior to the survey. Chi-square test at 95% significant level was computed to compare the difference in accessing improved water sources, sanitation, and hygiene in urban and rural areas.

RESULT: Of the 1002 households surveyed, 650 (65%) had access to improved drinking water sources. In the urban areas, 432 (88%) out of 486 households had improved drinking water source, which is higher as compared to rural areas. Only 218 (42%) out of 516 households had improved drinking water ($P < .001$). Of the total households surveyed, 167 (17%) had improved sanitation with 45 (5%) having a handwashing facility. There were 173 households reporting diarrhoeal disease within 2 weeks prior to the survey, with prevalence of 17%.

CONCLUSION: Majority of households in rural areas do not have access to improved water sources, sanitation, and handwashing facilities. This study found a high prevalence of diarrhoeal disease at the household level. It is recommended that The Ministry of Health and Sanitation work with relevant sectors to increase access to improved drinking water, sanitation, and handwashing facilities in rural areas.

KEYWORDS: Hand washing, sanitation, water supply, diarrhoeal disease, Sierra Leone

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Introduction

Water, sanitation and hygiene services, infrastructure and practices are crucial preconditions for the prevention of disease transmission.[1] However, many low-and middle-income countries are challenged with access to water, sanitation and hygiene infrastructure, services and practices including frequent water system breakdowns, poor quality of latrines and poor behavioural practices.[2]

About 9% of the burden of diarrhoeal diseases and 6% of all deaths globally are due to unsafe water, inadequate sanitation and poor hygiene.[3] Inadequate water, sanitation and hygiene is responsible for almost 7% of the global burden of diarrhoeal diseases as measured by disability-adjusted life years (DALYs), and accounts for more than 4% of all deaths worldwide, most of whom are identified as children in developing countries.[4] Water, sanitation, and hygiene related illnesses often marked by diarrhoeal disease was the eighth largest cause of death among all ages and the fifth in under-5 children.

In Sub-Saharan Africa, especially in rural areas, there is low basic water and sanitation coverage. Thus, people living in those areas are less likely to have access to improved water and sanitation services and infrastructure. A study conducted in rural South Africa reported increased risk of diarrhoeal diseases among those households who store water because of lack of a secure water supply.[5] Diarrhoeal diseases are the major causes of ill health and deaths among children under 5 years. Diarrhoeal diseases can prevent through the provision of improved water, sanitation, and hygiene services and practices. A study in Nigeria which was conducted among children under 5 assessed the impact of household risk factors on the incidence and severity of diarrhoeal diseases. In this study, the incidence of diarrhoeal diseases was higher in rural (67%) than urban (33%) areas and associated with lack of access to water, sanitation and hygiene improved water and sanitation facilities.[6]

In countries with universal improved water sources, adequate sanitation, and proper personal hygiene practices, diarrhoeal death rates of less than 1/100 000 persons have been documented, with diarrhoeal deaths contributing <1% of all deaths. In Sierra Leone, according to the latest WHO data

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published in 2018 Diarrhoeal disease related deaths reached 7946 or 10% of total deaths. The age adjusted Death Rate is 179 per 100 000 of population ranks Sierra Leone #1 in the world. Women and children are disproportionately affected, with residents of rural areas bearing a significantly larger burden than urban.[7]

The Millennium Development Goal (MDG) 2015 report, Goal 7 ensure that households should have access to improved drinking water. Sierra Leone had achieved good progress in accessing drinking water target, but limited progress for the sanitation target. Approximately 50% to 75% of the population uses improved drinking water sources, but less than 50% uses improved sanitation. Improved drinking water sources include public taps or standpipes, tube wells or boreholes, protected dug wells or springs, rainwater collection and piped household water on premises or shared. Improved sanitation facilities include flush/pour flush toilets, piped sewer system, septic tank, pit latrines and composting toilets.[8] Sanitation coverage in rural areas still lags behind urban areas with widespread use of shared sanitation.[9]

In Sierra Leone, 4.3 million (58%) people use unimproved water sources, 1.4 million (19%) practice open defecation, 5 million (68%) practice unsafe hygiene with 95% of improved water sources reported being contaminated as a result of limited knowledge of the population on WASH.[9] Sierra Leone has set a minimum water, sanitation and hygiene targets by 2030 including Basic water supply for National 64% and for basic sanitation is 100%.[10,11]

In spite of the availability and the huge investments in WASH interventions, the desired results of the interventions have not been achieved.[12] Previous studies conducted in Sierra Leone provided limited details about the water utilisation, sanitation and hygiene practices and the occurrence of diarrhoeal disease among households in Sierra Leone. This survey, therefore, aimed to assess water utilisation, sanitation and hygiene services, infrastructure and practices among households in urban and rural areas in Sierra Leone. This study determined the prevalence of self-reported diarrhoeal diseases at household level.

The results from this study provided the Sierra Leone Ministry of Health and Sanitation (MOHS) with baseline information for revising its plan on water, sanitation and hygiene interventions and policies related to water and sanitation services. The results can also provide baseline data to assist in measuring the future impact of water, sanitation and hygiene interventions. This study was also envisioned to inform the development of educational materials and programmes that can be tailored to create locally relevant and culturally acceptable interventions.

Methods and Materials

Study design and period

A community based cross-sectional study was conducted among households in 4 districts of Sierra Leone from January 2019 through July 2019 to assess the water, sanitation and hygiene services, infrastructures, and practices at household level and determined the association between independent and dependent of water, sanitation and hygiene variables. In this survey, the prevalence of self-reported diarrhoeal disease within 14 days prior to the survey among household members in the selected HHs was determined.



Figure 1. Map of Sierra Leone indicating study areas (Districts).

Study area and population

Sierra Leone is a country in West Africa which is bordered by Guinea to the Northwest, Liberia to the Southeast, and the Atlantic Ocean to the Southwest with a total surface area of 71 740 km (27 699 sq. miles). The country has a tropical climate, with a diverse environment ranging from savannah to rainforests. Sierra Leone is divided into 5 regions namely: Eastern, Northern, Northwest, Southern and Western Area. Twelve of the 14 districts are divided into 149 chiefdoms and 10 017 enumeration areas (EAs). The Western Area region is divided into the Western Area Rural and the Western Area Urban with 4 and 8 administrative wards (equivalent to chiefdoms), respectively, and have 2839 EAs altogether. Our study participants were selected from 4 districts namely: Kenema, Moyamba, Tonkolili, and Western Area Urban see (Figure 1). A total of 30 enumeration areas (EAs) were selected per district.[13] The study population were household members in Sierra Leone. A household is defined as 1 or more persons living in the same dwelling and sharing meals.

Inclusion and exclusion criteria

All households within the selected EAs were eligible for enrolment in the study. Any eligible household which was closed during the day of the survey was excluded from the survey and replaced by the next closer household. Respondent who was severely sick or mentally disabled or refuse informed consent was excluded from the survey.

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Sample size and sampling techniques

A sample size of 1002 was calculated using epi-info version 7.2 (Supplemental Appendix 1). A multi-stage sampling technique was applied to select the required number of households, that is, to reach the final required sampled size. First, 4 districts were selected across the country, one from each region using simple random sampling. Second, each of the selected districts were stratified into rural and urban areas.

Then, the total number of households of each district were divided by the number of EAs in each district to get the sampling interval Kth. In the selected EAs, using systematic sampling technique, the households were selected from the sampling frame (EAs) of households. A total of 30 EAs were selected using sampling interval according to PPS of each district.

Data collection and management

A pre-tested structured questionnaire was adapted based on UNHCR water, sanitation and hygiene KAP survey standard questionnaire.[14] Based on the questionnaire, demographic variables such as age, sex, religion, source of income for each household were collected. Similarly, water, sanitation and hygiene variables on drinking water sources, collection, storage, and treatment; sanitation (type of facility, location, sharing of facility, cleaning, and emptying) and hygiene practices (handwashing, food preparation) at household level were collected. Observation of handwashing facilities/materials by data collectors was used as a proxy for handwashing practices.[8] Data on the occurrence of diarrhoeal illness within 2 weeks prior to the survey was collected.

Data was collected by Field Epidemiology Training Programme (FETP) Intermediate and Frontline participants, FETP graduates, and assisted by public health staff in the study areas. The data collectors were trained on electronic data collection using tablets, selecting study subjects, requesting household for participation and informed consent. A face-to-face interview was done using the structured questionnaire which was uploaded in an electronic format (Epi-Info7).

Definition of outcome variables

Drinking water and sanitation facilities are defined as 'Improved', 'Unimproved' and 'No facility' based on WHO/UNICEF criteria.[8]

'Improved drinking water facility' includes piped supplies, tap water in the dwelling, yard or plot, public standposts non-piped supplies, boreholes/tube-wells, protected wells and springs, rainwater, packaged water (including bottled water and sachet water) and delivered water (including tanker trucks and small carts).

'Unimproved drinking water facility' includes non-piped supplies as well as unprotected wells and springs, while 'Unimproved sanitation' is comprised of on-site sanitation, pit latrines without slabs, hanging latrines and bucket latrines.

Surface water and open defecation are classified as 'No drinking water facility' and 'No sanitation facility', respectively.

'Improved sanitation' includes networked sanitation- flush and pour flush toilets connected to sewers; on-site sanitation-flush and pour flush toilets or latrines connected to septic tanks or pits, ventilated improved pit latrines, pit latrines with slabs, composting toilets (including twin pit latrines and container-based systems).[8]

Data management and analysis

Descriptive statistics was performed based on variables from the questionnaire using Epi-info version 7.22. Median and range for age, proportions and ratio for categorical variables such as sex, education level, income level, how water is stored and treated, among many others were calculated. Measures of statistical test using Chi-square was computed to compare proportions among rural and urban settings. For all analyses, variables were considered statistically significant at *P*-value of $<.05$. The results were then summarised and displayed using frequency tables, charts and graphs.

Results

Demographic and household characteristics

A total of 1002 households (516 in rural and 486 in urban) were surveyed in 4 districts. The heads of the households were interviewed. The median age of respondents was 45 years (range: 18-100 years) (Table 1). Female represented 468 (47%) of the respondents (Figure 2). Of the total respondents, 491 (49%) did not attend school (Figure 3). The majority were Muslims representing 744 (74%) of the respondents (Figure 4). Temne and Mende accounted 342 (34%). The main source of income was farming, 437 (44%), followed by small businesses representing 221 (22%) (Figure 5). Four hundred ninety-seven (54%) households earned below the national minimum wage per month. Of the households surveyed, 616 (62%) reported to have radio and 679 (68%) had at least one mobile phone in a household. A total of 244 (32.2%) of the households had less than 5 house members, and 229 (30.5%) households had more than 10 house members (Table 1).

Drinking water sources

Of the total 1002 households, 650 (65%) had access to improved water sources. The proportion of household that had access to improved water sources was higher in urban 432 (89%) compared to rural areas 218 (42%), $P<.001$. Surface water (lake, pond and river) was used by 183 (18%) households with statistical difference between urban and rural (0.8% vs 35% respectively, $P<.001$. Of 937 (93.5%) respondents fetching

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Table 1. Demographic characteristics of respondents, Sierra Leone, 2019.

VARIABLE	TOTAL		URBAN		RURAL	
	N	%	N	%	N	%
Location of the household	1002	100	486	48.5	516	51.5
Age of respondents						
18 year and above	1002	100	486	48.5	516	51.4
Number of people in the household						
⩽5	242	32.2	212	43.4	166	32.3
6-7	109	14.5	100	20.49	124	24.1
8-10	171	22.8	80	16.4	91	17.7
>10	229	30.5	96	19.7	133	25.9
Monthly income (Leones)						
Households earning below the minimum wage	497	54.2	162	36.5	350	74
Households earning the minimum wage and above	420	45.8	282	63.5	123	26
Median and range	Median: 400 000		Median: 500 000		Median: 200 000	
	Range: 10 000-15 000 000		Range: 10 000-15 000 000		Range: 10,000-250 000	
Household with radio						
Yes	616	61.5	424	87.2	272	53.2
No	386	38.5	62	12.8	239	46.8
Household with at least a mobile phone						
Yes	679	67.8	424	87.2	255	49.4
No	323	32.2	62	12.8	261	50.6
Last time the household received health message						
1 week ago	192	19.2	49	10.1	143	27.7
1 month ago	268	26.7	66	13.6	202	39.1
6 month ago	161	16.1	84	17.3	77	14.9
1 year ago	152	15.2	126	25.9	26	5.0
Never	229	22.8	161	33.1	68	13.2

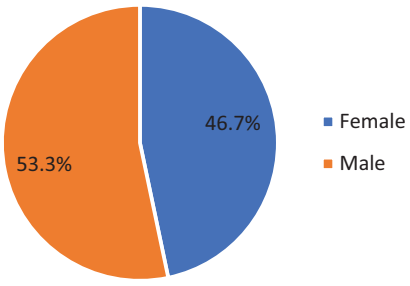


Figure 2. Gender of respondents, Sierra Leone, 2019 (N = 1002).

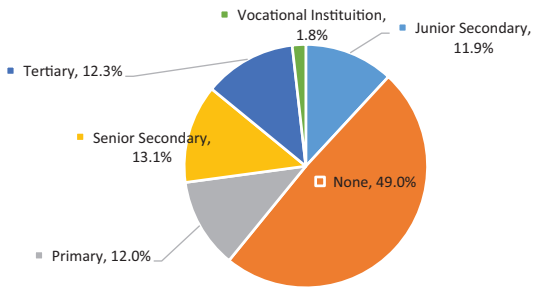


Figure 3. Highest level of education of respondents, Sierra Leone, 2019 (N = 1002).

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water out of their houses, 573 (66%) had sources of drinking water at less than 100 m away from their houses (Table 2).

Household water collection, storage and treatment

Of the total 1002 surveyed households, 428 (43%) collect water using open container with a high proportion in rural compared to urban (60% vs 24% respectively, $P < .001$). A total of 140 (14%) households including 47% in urban and 93% in rural areas stored their water in an open container with inlet big enough to allow a hand through with a statistical difference between urban and rural areas (10% vs 18%, $P < .001$). The proportion of households not treating water was higher in rural (89%) compared to urban area (76%), $P < .001$. The number of households had enough water to meet their needs were 502 (53.7%), where 57% of them in urban and 44.8% in rural (Table 3).

Types of toilets, defecation practices, location and sharing of facility

The common type of toilets used was household latrine 561 (56%) with no statistical difference between urban and rural (57% vs 56% respectively, $P = .4722$). Open defecation was higher in rural areas 110 (22%) when compared with urban areas 1 (0.2%), $P < .001$. The proportion of improved latrine in the urban setting was higher 163 (34%) compared with the rural setting 4 (0.8%) with statistical difference, $P < .001$. Of the total of 1002 households, 621 (62%) shared toilets with their neighbours. There was a statistical difference between the proportion of households sharing toilets in rural 335 (74%) compared to urban setting 286 (60%), $P < .001$ (Table 4).

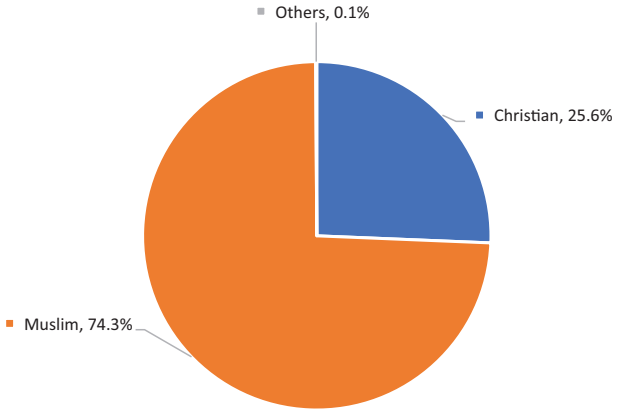


Figure 4. Religion of respondents, Sierra Leone, 2019 (N = 1002).

Hand washing facilities with soap and water

The study showed that of 995 households observed including 483 in urban and 512 in rural area, only 45 (5%) households had hand washing device in their house with statistical difference between the proportion in urban 450 (93%) compared with rural setting 12 (2%), $P < .001$. Only 44% household had soap at hand washing facility and the proportion of households having soap was higher in urban compared with rural area (58% vs 16% respectively, $P < .001$) (Table 5).

Prevalence of self-reported diarrhoeal disease

At household level, of 1002 households surveyed, 173 (17%) had at least one case of diarrhoeal diseases during the 2 weeks prior to household survey administration. In rural, 106 (21%) households had self-reported diarrhoeal diseases. Similarly, of the total 516 households surveyed in urban, 67 (14%) had self-reported diarrhoeal disease, $P < .004$ in (Table 6).

Discussion

The study assessed the water utilisation, sanitation and hygiene practices at household level; determined the prevalence of self-reported diarrhoeal disease among household members.

Access to water sources

Use of unimproved water sources is known to contribute to the burden of diarrhoeal diseases, which leads to the second biggest

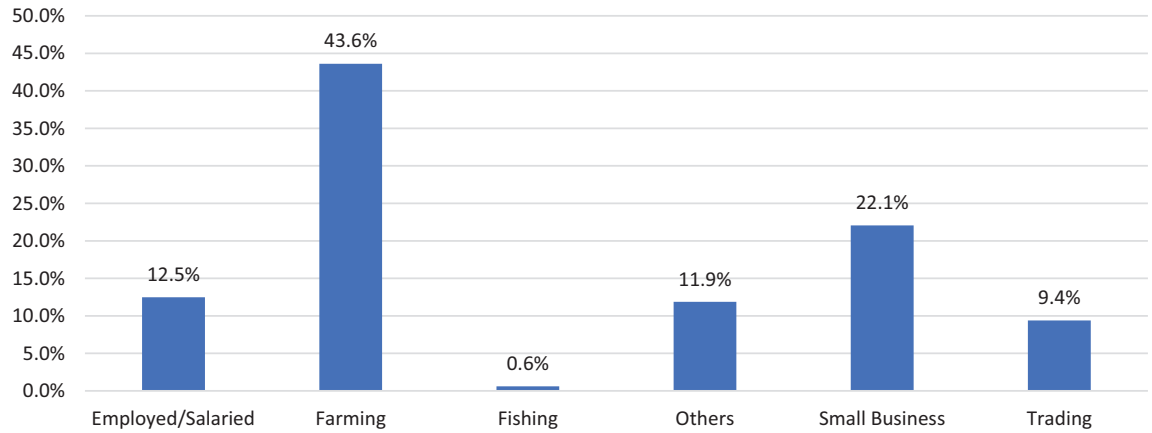


Figure 5. Source of household income, Sierra Leone, 2019 (N = 1002).

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Table 2. Main sources of water for households, Sierra Leone, 2019.

VARIABLE	TOTAL		URBAN		RURAL		*P*-VALUE
	N	%	N	%	N	%	
Main source of water supply	1002		486		516		
Bottle water	21	2.1	20	4.1 (2.7-6.3)	1	0.2 (0.1-1.1)	<.001
Hand pumps/boreholes	229	22.8	46	9.5 (7.2-12.4)	183	35.5 (31.5-39.7)	<.001
other (please specify)	7	0.7	4	0.8 (0.3-2.1)	3	0.6 (0.2-1.7)	.58
Piped connection to house (or neighbour's house)	34	3.4	34	7.0 (5.1-9.6)	0	0.0 (0.0-0.7)	<.001
Protected spring	8	0.8	7	1.4 (0.7-2.9)	1	0.2 (0.0-1.1)	.01
Public tap/standpipe	295	29.4	266	54.7 (50.3-59.1)	29	5.7 (3.9-8.0)	<.001
Rain water collection	3	0.3	2	0.4 (0.1-1.5)	1	0.2 (0.0-1.1)	.46
Surface water (lake, pond, dam, river)	183	18.3	4	0.8 (0.3-2.1)	179	34.7 (30.7-38.9)	<.001
Unprotected hand-dug well	91	9.1	18	3.7 (2.4-5.8)	73	14.1 (11.4-17.4)	<.001
Unprotected spring	71	7.1	28	5.8 (4.0-8.2)	43	8.3 (6.3-11)	.01
Water seller/kiosks	60	5.9	57	11.7 (9.2-14.9)	3	0.6 (0.2-1.7)	<.001
Improved/Unimproved water source	1002		486		516		
Improved	650	64.9	432	88.9 [85.8-91.4]	218	42.2 [38-46.5]	<.001
Unimproved	352	35.1	54	11.1 [8.6-14.2]	298	57.7 [53.4-62]	<.001
How far is the water source outside the household (m)	937		426		511		
0-20	283	30.2	150	35.2 (30.8-39.9)	133	26.0 (22.4-30)	<.001
21-100	290	30.9	133	31.2 (27-35.8)	157	30.7 (26.9-34.9)	.8
101-500	237	23.7	80	18.8 (15.4-22.8)	157	30.7 (26.9-34.9)	<.001
501-1000	86	8.6	33	7.7 (5.6-10.7)	53	10.3 (8.0-13.3)	.02
>1000	41	4.1	30	7.0 (5-9.9)	11	2.1 (1.2-3.8)	<.001

killer of children.[15] This study revealed that, overall, almost two-third of the households had access to improved water sources and around a quarter had no access to any water sources and are still using surface water. Accessibility to improved water source was lower in rural areas compared to urban areas. This pattern is similar to that observed in the 2017 Sierra Leone Multi-Indicator Cluster Survey and in a systematic review from several studies.[9,15] This finding highlights the required interventions particularly with more focus in rural settings to meet the sustainable development goal target of universal access to improved water sources by 2030.

Water utilisation and treatment

Even though more than three-fourth of the households used clean drinking water containers, majority of them did not treat water before drinking. Findings of this study indicated that, the practice of water treatment at the point of use was poor; in addition, water storage practices may have compromised the quality of water sourced from improved water sources. The finding of this this study is similar to what was found in a study conducted in India where almost three-quarters of the households reported cleaning water storage utensils at least once a day and one-quarter reported doing nothing to make the water safe for drinking.[16]

Access to sanitation

This study revealed that majority of the households used unimproved latrines and more than 1 in 10 were using open defecation. This finding was similar to the report of Sierra Leone multiple indicator cluster survey, 2017 where open defecation

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Table 3. Water collection, storage and treatment, Sierra Leone, 2019.

CONTAINER TO COLLECT WATER	TOTAL		URBAN		RURAL		*P*-VALUE
	N	%	N	%	N	%	
	1002		486		516		
Covered container	178	17.8	84	17.3 (14.2-20.9)	94	18.2 (15.1-21.8)	.58
Jerrycan	394	39.3	285	58.6 (54.2-62.9)	109	21.1 (17.8-24.8)	<.001
Open container	428	42.7	115	23.7 (20.1-27.6)	313	60.6 (56.4-64.8)	<.001
Others	2	0.2	2	0.4 (0.1-1.5)	0	0 (0.0-0.9)	.15
Water storage	1002		486		516		
Closed container	490	48.9	217	44.6 (40.3-49.2)	273	52.9 (48.6-57.2)	<.001
Jerrycan	281	28.0	189	38.9 (34.7-43.3)	92	17.8 (14.8-21.4)	<.001
Open container with inlet big enough to allow a hand through	140	13.9	47	9.7 (7.3-12.6)	93	18 (14.9-21.6)	<.001
Open container with inlet not big enough to allow a hand through	75	7.5	28	5.8 (4-8.2)	47	9.1 (6.9-11.9)	<.001
Others	6	0.6	2	0.4 (0.1-1.5)	4	0.8 (0.3-2)	.18
We don't store water	10	0.01	3	0.6 (0.2-1.8)	7	1.3 (0.6-2.8)	.03
How often the household clean drinking water containers	968		463		505		
At least once a month	14	1.4	13	2.8 (1.6-4.7)	1	0.2 (0.0-1.1)	<.001
At least once a week	156	15.8	90	19.4 (16.1-23.3)	66	13.1 (10.4-16.3)	<.001
At least once a year	3	0.3	3	0.6 (0.2-1.9)	0	0 (0-0.7)	.08
Don't know	3	0.3	1	0.2 (0.0-1.2)	2	0.4 (0.1-1.4)	.32
Every time we use them	781	79.1	350	75.6 (71.5-79.3)	431	85.3 (82-88.1)	<.001
Never	11	1.1	6	1.3 (0.6-2.9)	5	1 (0.4-2.3)	.54
How the household clean drinking water containers	966		464		502		
Don't know	2	0.2	1	0.2 (0.0-1.2)	1	0.2 (0.0-1.1)	.99
Other	12	1.2	11	2.4 (1.3-4.2)	1	0.2 (0.0-1.1)	<.001
Rinse them with water	261	27.0	79	17 (13.9-20.7)	182	36.2 (32.1-40.5)	<.001
Wash them by using rocks/sand and shaking	9	0.9	5	1.1 (0.5-2.5)	4	0.8 (0.3-2.0)	.51
Wash them with a piece of tissue/sponge	39	4.0	14	3 (1.8-5)	25	5 (3.4-7.2)	.009
Wash them with a specific product (such as detergent or bleach, soap powder, etc.)	643	66.6	354	76.3 (72.2-80)	289	57.6 (53.2-61.8)	<.001
Water treatment before drinking	990		480		510		
Don't know	34	3.4	31	6.4 (4.6-9.0)	3	0.6 (0.2-1.7)	<.001
No, do not treat it before drinking	820	82.8	365	76.0 (72-79.6)	455	89.2 (86.2-91.6)	<.001
Yes, always treat it before drinking	82	8.3	54	11.2 (8.7-14.4)	28	5.5 (3.8-7.8)	<.001
Yes, sometimes treat it before drinking	54	5.4	30	6.2 (4.4-8.8)	24	4.7 (3.1-6.9)	<.001

(Continued)

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Table 3. (Continued)

CONTAINER TO COLLECT WATER	TOTAL		URBAN		RURAL		*P*-VALUE
	N	%	N	%	N	%	
Is the household collect enough water to meet all your households' needs	966		470		496		
Yes	502	53.7	262	55.7 (51.2-60.2)	240	48.4 (44-52.8)	<.001
No	464	46.3	208	44.2 (39.8-48.8)	256	51.6 (47.2-56)	<.001
Reasons for not collecting enough water	464		208		256		
There are water shortages	409	88.1	190	91.3 (86.7-94.5)	219	85.5 (80.7-89.3)	.016
Water is too far	195	42.0	96	46.2 (39.5-52.9)	99	38.7 (32.9-44.8)	.027
Waiting time at the water point is too long	128	27.6	93	44.7 (38.1-51.5)	35	13.7 (9.9-18.4)	<.001
Limitation of volume of water that can be collected at water point	104	22.4	50	24.0 (18.7-30.3)	54	21.1 (16.5-26.5)	.299
Don't have enough storage containers	81	17.4	20	9.6 (6.3-14.4)	61	23.8 (19.0-29.4)	<.001
Other	35	7.5	20	9.6 (6.3-14.4)	15	5.9 (3.6-9.4)	.022
Can't afford to buy enough	34	7.3	31	14.9 (10.7-20.4)	3	1.2 (0.4-3.4)	<.001
It is too dangerous to get water	9	1.9	7	3.4 (1.6-6.8)	2	0.8 (0.2-2.8)	<.001
Don't know	2	0.4	2	1.0 (0.3-3.4)	0	0.0 (0.0-1.5)	<.001

was found to be 17%.[13] However, this finding is different to what was reported in a study conducted in rural India were nearly 85% of the household members in the study were practicing open defecation.[17] This study showed that open defection was higher in rural compared to urban areas and this may be attributed to various factors differentiating the 2 settings such as individual behaviour and socio-economic status.

Sanitation practices

It was also shown that in Sub Saharan Africa, 23% of the population were still using open defecation compared with 34% in Asia.[18] Sharing sanitation facilities has been found to be associated with an increase in diarrhoeal diseases compared with households who do not share.[19] The results in this current study showed that almost two-third of the households used shared toilets/latrines. This was higher than the global average of 27% and the regional average of 44% as estimated by the systematic review conducted in 2015. This finding is however similar to what was found in a study conducted in India where one-fourth of the study respondents shared toilets.[16]

Hygiene practices

This study revealed that the majority of the households wash wands with water and soap and almost one-third wash their hands with water only. In addition, the majority of the households reported to wash hands after defecation and before eating. These findings are different from what were found in India where it was found that less than two-thirds of the household members of the study used water and soap and over 90% of them cleaned their hands only with water before and after meals.[16] This high prevalence of hand washing in our survey may be attributed to the interventions that are being implemented by countries to meet the SDGs targets. The finding of this study was higher than what was observed in a study in Ethiopia where 9% reported washing their hands after defecation.[20]

Prevalence of diarrhoea

This study found high prevalence of self-reported diarrhoeal diseases 2 weeks prior to the day of the study at household level. This prevalence is similar to what was found in a study conducted in South Africa where the prevalence was found to be 20%.[5] The prevalence of self-reported diarrhoeal disease in this study was lower than observed in a similar study (33%) in Ethiopia.[21] The difference in prevalence of self-reported diarrhoeal disease in rural and urban areas might be explained by the disparities in improved water, sanitation and hygiene infrastructures on prevention of diarrhoeal disease in both settings.

Water related factors of diarrhoeal

Households who treat water for drinking were more likely to experience diarrhoeal disease. This finding might suggest that

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Table 4. Sanitation facilities, Sierra Leone, 2019.

VARIABLE	TOTAL		URBAN		RURAL		*P*-VALUE
	N	%	N	%	N	%	
Type of toilet facility used (N)	995		484		511		
Household latrine	561	56.4	277	57.2 (52.8-61.6)	284	55.6 (51.2-59.8)	.4722
Flush toilet	167	16.8	163	33.7 (29.6-38)	4	0.8 (0.3-1.9)	<.001
Communal latrine	128	12.9	34	7.0 (5.1-9.6)	94	18.4 (15.3-21.9)	<.001
Open defecation	111	11.2	1	0.2 (0.04-1.2)	110	21.5 (18.2-25.3)	<.001
Bucket Toilet	7	0.7	6	1.2 (0.5-2.7)	1	0.2 (0.03-1.1)	<.001
Plastic bag	1	0.1	1	0.2 (0.04-1.2)	0	0 (0.0-0.7)	<.001
Don't know	3	0.3	0	0 (0.0-0.78)	3	0.6 (0.2-1.7)	.08
Other	17	1.7	2	0.4 (0.11-1.49)	15	2.9 (0.8-4.8)	.001
Classification of toilet facility (N)	995		486		509		
Improved	167	16.8	163	33.5 (29.5-37.8)	4	0.8 (0.3-2.0)	<.001
Unimproved	828	83.2	323	66.5 (62.1-70.5)	505	99.2 (98-99.7)	<.001
Is this facility shared?	931		480		451		
Yes	621	66.7	286	59.6 (55.1-63.8)	335	74.3 (70.05-78.1)	<.001
No	310	33.3	194	40.4 (36.1-44.9)	116	25.7 (21.9-29.9)	<.001
Is toilet facility outside the house?	922		477		445		
Yes	725	78.6	301	63.1 (58.7-67.3)	424	95.3 (92.9-96.9)	<.001
No	197	21.4	176	36.9 (32.7-41.3)	21	4.7 (3.1-7.1)	<.001
Availability of a toilet facility at your school	607		334		273		
Yes	559	92.1	327	97.9 (95.7-98.9)	232	85.0 (80.2-88.7)	<.001
No	48	7.9	7	2.1 (1.1-4.3)	41	15.0 (11.3-19.7)	<.001
Type of the toilet facility at school	557		327		230		
Flush toilet	185	33.2	179	54.7 (49.3-60.0)	6	2.6 (1.2-5.6)	<.001
Bucket Toilet	2	0.4	2	0.6 (0.2-2.2)	0	0 (0.0-1.6)	<.001
Don't know	7	1.3	1	0.3 (0.05-1.7)	6	2.6 (1.2-5.6)	.009
Others	2	0.4	0	0 (0.0-1.2)	2	0.9 (0.2-3.1)	.084
Pit latrine	288	51.7	125	38.2 (33.1-43.6)	163	70.9 (65.7-76.4)	<.001
Ventilated Improved Pit (VIP)	73	13.1	20	6.1 (3.9-9.2)	53	23.0 (18.1-28.9)	<.001
Ways of disposing faeces of children under 5	593		268		325		
Buried it	5	0.8	3	1.1 (0.4-3.2)	2	0.6 (0.2-2.2)	.271
Collected and disposed in latrine	476	80.3	236	88.1 (83.6-91.4)	240	73.8 (68.8-78.3)	<.001
Collected and disposed of elsewhere	88	14.8	25	9.3 (6.4-13.4)	63	19.4 (15.4-24.0)	<.001
Nothing is done with it	14	2.4	0	0 (0.0-1.4)	14	4.3 (2.6-7.1)	.0005
Other	10	1.7	4	1.5 (0.6-3.8)	6	1.8 (0.8-3.9)	.705

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Table 5. Hand washing facilities, Sierra Leone, 2019.

VARIABLE	TOTAL		URBAN		RURAL		*P*-VALUE
	N	%	N	%	N	%	
Hand washing facility	995		483		512		
Yes	45	4.5	33	6.8 (4.9-9.4)	12	2.3 (1.3-4.0)	<.001
No	950	95.5	450	93.2 (90.5-95.1)	500	97.6 (95.9-98.6)	<.001
Handwashing facility at the latrine	973		469		504		
Yes	85	8.7	69	14.7 (11.8-18.2)	16	3.2 (1.9-5.1)	<.001
No	888	91.3	400	85.3 (81.8-88.2)	488	96.8 (94.9-98.0)	<.001
Availability of soap at the hand washing station	57		38		19		
Yes	25	43.9	22	57.9 (42.2-72.1)	3	15.8 (5.5-37.6)	<.001
No	32	56.1	16	42.1 (27.8-57.8)	16	84.2 (62.4-94.5)	<.001

Table 6. Prevalence of self-reported diarrhoeal disease at household and individual level among respondents, Sierra Leone, 2019.

GROUPS	OVERALL %	URBAN	RURAL	*P*-VALUE
		N = 486	N = 516	
		% (95% CI)	% (95% CI)	
Households (N = 1002)	173 (17.3)	13.8 (11-17.1)	20.5 (17.3-24.2)	.004
0-11 month (n = 255)	12.9	7.2 (3.8-13.2)	19.7 (14-27)	.02
12-59 month (n = 362)	18.6	8.2 (4.3-13.8)	20.7 (15.6-26.9)	<.001
Under 5 year (n = 617)	14.9	8.7 (5.6-12.6)	20 (16.1-24.6)	<.001
6-17 year (n = 686)	12.4	13.8 (10.6-7.7)	10.9 (8-14.7)	.26
⩾18 year (n = 926)	11.9	10.7 (8.3-13.8	13.1 (10.3-16.5)	.27

water treatment was not appropriate at the level of the household. This result is similar to what was found in a study conducted in Indonesia.[22] It may be explained by the fact that water contamination can occur during the process of treatment or during the storage after treatment.[23] The finding of this study is inconsistent with findings from a study conducted in Ecuador that found a protective effect among households that practiced water treatment[24] and a systematic review that observed a reduction in the risk of diarrhoeal diseases among households that practiced water treatment.[25] On contrary, several studies conducted in Ghana, India and Democratic Republic of Congo reported no difference in diarrhoeal disease between households that treat drinking water with those that did not.[26-28] Further analysis revealed that the most common method of water treatment was to allow water to settle (84%). This practice is not known to improve water quality.

Sanitation related factors

This study found that majority of households in this study shared latrine/toilet facilities and large families might have further aggravated accessibility and cleanliness of those facilities.

Limitation of the study

This study could not determine the causal and temporal relationship of water, sanitation and hygiene components and diarrhoeal diseases which is a common limitation of cross-sectional design. Secondly, the occurrence of diarrhoeal disease was based on self-reports of having experienced diarrhoeal disease in 2 weeks prior to the survey with potential recall bias of respondents. In addition, the occurrence of diarrhoeal disease may vary with seasons and our findings might have been affected by these factors.

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Conclusion

This study found high proportion of households with access to improved water sources, basic sanitation and hygiene facilities compared with the national water, sanitation and hygiene targets. This study also found a high prevalence of diarrhoeal disease in Sierra Leone, that is above the estimated Sub-Saharan Africa average of 10%. The majority of households in urban areas had higher access to improved water sources, sanitation and practices when compared with rural areas. The Ministry of Health and Sanitation in collaboration with the Ministry of Education to develop intervention strategies to improve water storage and treatment practices which may help to reduce the high prevalence of diarrhoeal disease, break its transmission rout, and avoid diarrhoeal diseases risk factors.

Supplemental Material

Appendix 1: https://www.cdc.gov/epiinfo/index.html.

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