

SWASH+ BASELINE REPORT

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SWASH+
*Sustaining and Scaling School-Based Water, Sanitation, and Hygiene
Plus Community Impacts*



INTRODUCTION

In June 2007, the Center for Global Safe Water at Emory University (CGSW) in collaboration with CARE USA, CARE Kenya, Great Lakes University of Kenya (GLUK), Millennium Water Alliance (MWA), Sustainable Aid in Africa International (SANA), and Water Partners International (WPI), completed a baseline survey of school enrollment and water and sanitation infrastructure for the project Sustaining & Scaling School Water, Sanitation, & Hygiene Plus Community Impacts (SWASH+) in Nyanza Province, Kenya.

SWASH+ has three primary objectives:

- **Objective 1:** Identify, develop, and test innovative approaches to school- and community-based water, sanitation, and hygiene interventions that promote sustainability and scalability.
- **Objective 2:** Provide and test an integrated safe water, sanitation, and hygiene-promotion program in schools and communities that maximizes impact, equity, sustainability, and cost-effectiveness.
- **Objective 3:** Develop and implement a scalable model for the delivery and financing of safe water, sanitation, and hygiene promotion to schools and communities based on lessons learned and innovative approaches that address the varying conditions found in schools and communities.

The first three years of SWASH+ are led by an applied research agenda. This applied research is intended to document impacts of the project on the health and educational attainment of school children and the health of children under the age of five in associated communities. In order to document impacts in schools and communities, school- and community-based improvements have been implemented in a series of packages:

- **Base Package:** Schools receiving the base package will receive water treatment supplies (one case of WaterGuard¹), safe storage containers (plastic buckets with taps and securely fastening lids), and handwashing facilities (large plastic buckets with spigots for handwashing) and hygiene education
- **Sanitation Package:** Schools receiving the Sanitation Package will receive sanitation improvements in the form of new sanitation facilities and sanitation training and education. Schools will be provided with sufficient latrines to meet the government recommendation of 25 girl pupils per latrine and 30 boy pupils per latrine, up to a total of 10 new latrines per school.
- **Community Water Package:** The community water package is intended for schools and communities currently lacking access to an improved source. With the school and community water package, an improved water source (usually a borehole) will be constructed with the intent of providing water to both the school and its associated communities.

All schools included in the applied research phase will receive the base packages. In addition to the three identified packages, two additional packages are included in the SWASH+ project: a school-based water package (typically rainwater harvesting) and a community-based hygiene and point-of-use water treatment promotion program implemented a select number of district health facilities.

¹ WaterGuard is 1.2% sodium hypochlorite solution manufactured by Population Services International (PSI) in Kenya.

Eligibility Criteria

Appropriate eligibility criteria to determine which schools and communities receive which packages were developed by SWASH+ partners in collaboration with representatives from the Government of Kenya. Final eligibility criteria are defined below:

- **Base and Sanitation Packages:** Schools with access to any water source in the dry season within one kilometer of the school were selected for inclusion in the base and sanitation packages. No restrictions were placed on the type of water source, as WaterGuard and other forms of water treatment have proven effective on turbid water and surface water sources. Additionally, schools were required to exceed the Government of Kenya (GoK) recommended ratios of 25 girl pupils per latrine and 30 boy pupils per latrine..
- **Water, Sanitation, and Base Packages:** Schools without access to an improved source during the dry season within one kilometer of the school or access to any water source within two kilometers of the school were selected to receive the water, sanitation, and base packages. Schools were also required to not meet the government student latrine ratio standards.

District/Division Selection

District selection for the applied research phase of SWASH+ included secondary data on poverty level; rapid assessment data on school latrine and improved water source access; previous and on-going SWASH+ partner program; number of schools eligible for the implementation packages; current water, sanitation, and hygiene programming by other organizations in the region; and logistical constraints. Three geographic clusters were identified:

- **Kisumu District** (Kadibo Division) and **Nyando District** (Miwani and Muhoroni Divisions)
- **Rachuonyo District** (East Karachuonyo and Kabondo Divisions)
- **Suba District** (Lambwe, Gwassi, and Central Divisions)

Intervention Assignment

After schools from the three clusters were identified and assessed against eligibility requirements, schools were assigned to one of two main study groups. The first study group included schools that qualifying for the Base and Sanitation Packages but were not eligible for the Water Package. Schools in this group were randomly assigned to one of three intervention groups: 1) schools receiving the Base Package, 2) schools receiving the Base and Sanitation Packages, and 3) schools that will serve as controls for the applied research. Control schools will be provided the full intervention following the first two years of project activities. A total of 135 schools were included in this large study group. Schools qualifying for the Water Package were randomly assigned into intervention and control groups, with control schools again receiving the intervention after the applied research phase of the project is complete.

Research Design:

The applied research phase of SWASH+ uses a randomized group trial (see eligibility and intervention assignment above). Indicators will be compared for each intervention group against the appropriate control group, as well as compared against information in the baseline. Schools receiving the Base and Sanitation Packages will be assessed separately from school receiving the Water Package.

DATA COLLECTION METHODS AND DATA ANALYSIS

Data for the applied research and impact assessment consist of four principle data collection activities: facility-level data collection, pupil-level data collection, community-level data collection, and environmental sampling of household and school stored drinking water. Data were collected from January 2007 until July 2007. Details on the specific data collection methods are provided below:

- **Facility-Level Data:** Trained enumerators completed a detailed facility survey at each school included in the first phase of the SWASH+ project. The facility survey collected information on school water sources, school water storage and water treatment practices, previous NGO involvement with the school, and school sanitation and handwashing facilities. Data were also collected on school enrollment and school absenteeism. More detailed information on enrollment and absenteeism were collected through a second facility survey, which gathered information on enrollment and absenteeism divided by month (results of the second facility survey not shown).
- **Pupil-Level Data:** Enumerators completed a detailed survey of pupil knowledge, attitudes, and practices regarding water, sanitation, and handwashing with approximately 25 pupils at 155 of the 185 SWASH+ schools. In a separate data collection activity, stool samples were collected from 25 pupils at 20 schools selected to receive the Sanitation Package and 20 schools selected to serve as controls. Samples were returned to a laboratory and analyzed to assess the prevalence of helminth infections. Pin-prick blood samples were also collected from each student providing a stool sample in order to determine levels of hemoglobin and prevalence of anemia.
- **Community-level data collection:** Enumerators completed a detailed knowledge, attitudes, and practices survey in 25 households in each community associated with schools receiving the Base and Sanitation Packages. In addition, enumerators completed a series of observations on household sanitation facilities, handwashing facilities, and household possessions. Similar methods were used in communities associated with schools receiving the Water Package with two exceptions: a second survey module was included in the data collection that gathered detailed information on water access and responses to water scarcity, and the number of households included in each survey was increased to 40.

Data were analyzed using SAS v. 9. For the purposes of the baseline study, the unit of the analysis was the school. For pupil-level data, first individual school averages were calculated, and then school averages were combined according to the intervention group, the district, and geographic cluster. Similar approaches were used for household-level data. Using the individual student or the individual respondent as the unit of analysis requires weighting the data to account for the research cluster design and changes in selection probability within each school and within each community. Because the unit of the analysis was the school, results presented in the baseline report cannot be used as population-level estimates. Such analytical adjustments will be done for subsequent analyses.

RESULTS

School and Pupil Results

A total of 185 schools and associated communities are included in the SWASH+ baseline assessment. Summary information for the 185 schools and their associated communities is presented in **Table 1**. Of the 185 schools included in the survey, 60 are in the Kisumu/Nyando cluster, 69 in Rachuonyo and 56 in Suba. A total of 135 schools are included in the Base and Sanitation Package assessment and 50 are included in the Water Package assessment.

	Total	Kisumu/ Nyando	Rachuonyo	Suba
Schools/Communities	185	60	69	56
Base/Sanitation Package	135	48	48	39
Water Package	50	12	21	17
School characteristics				
Average enrollment	373	400	337	380
Average student:teacher ratio	37.0	35.9	36.4	38.8
Average female:male enrollment	0.950	0.963	0.965	0.922
Community characteristics				
Median household size	5.0	5.0	5.0	6.0
Median number of school aged children per household	2.0	2.0	2.0	2.0
Median number of children under the age of five per household	1.0	1.0	1.0	1.0

Among schools included in the baseline survey, average enrollment is 373 pupils per school. Schools are largest in the Kisumu/Nyando District cluster (400), and smallest in Rachuonyo District (337). There is an average of 37 teachers per pupil among schools included in the baseline assessment, which is consistent across the three clusters. The enrollment ratio, defined as the number of female pupils compared to the number of male pupils, averages 0.950 across all program schools. Ratios are similar in Kisumu/Nyando and Rachuonyo, but slightly lower in Suba..

In the communities associated with program schools, the median household size is five persons. Median household size was higher in Suba District than in other program areas. All districts have a median number of 2 school aged children living in each household, and a median of 1 child under the age of five living in each household.

School Water Supply, Water Storage, and Water Treatment

Information on school water supply, water storage, and water treatment is provided in **Table 2**. Slightly over two-thirds of all schools report rainwater as the school's primary drinking water source during the rainy season. The percentage of schools relying on rain water is lowest in Suba District. Approximately 18% of all schools rely on an unprotected surface water source during the rainy season. This percentage is lowest in the Kisumu/Nyando cluster, and highest in Suba district, where almost

30% of households rely on an unprotected source. Improved sources were identified using standard definitions – water from an “improved” source is one that is more likely to provide “safe” drinking water located within one kilometer. Over 77% of schools use an improved source as the primary source of drinking water during the rainy season. This ranges from over 88% in Kisumu/Nyando to only 67% in Suba District.

Table 2: Summary School Water Source, Usage, and Treatment Indicators by Cluster

	Total	Kisumu/ Nyando	Rachuonyo	Suba
Primary water source (rainy season) (% of schools)				
Covered well, borehole or spring/ piped source	12.1	16.7	8.8	11.1
Unprotected surface source	17.6	10.0	14.7	29.6
Rainwater	68.1	71.7	72.1	59.3
None available	2.2	1.7	4.4	0.0
Improved source (total)*	77.5	88.3	76.5	66.7
Primary water source (dry season) (% of schools)				
Covered well, borehole or spring/ piped source	28.0	38.3	16.2	31.5
Unprotected surface source	61.5	45.0	76.5	61.1
Rainwater	2.7	6.7	1.5	0.0
None available	7.1	10.0	5.9	5.6
Improved source (total)*	17.6	31.7	7.4	14.8
Mean distance to primary source (meters)				
Rainy season	232.0	69.0	150.0	522.0
Dry season	1,223.0	381.0	1,834.0	1,400.0
Rainwater collection and storage (% of schools)				
Has rainwater storage tank	81.1	85.0	88.1	67.9
Rainwater storage tank and gutters connected and in working condition **	44.9	54.3	43.1	35.3
Schools that report treating water to make safe for drinking (% of schools)	30.2	5.3	35.7	50.0
Type of treatment reported† (% of schools)				
WaterGuard	68.4	100.0	50.0	87.5
Boiling	15.8	0.0	20.0	12.5
Chlorine powder/ other chlorine	15.8	0.0	30.0	0.0
PuR	0.0	0.0	0.0	0.0

* Access to an improved source defined as any covered and/or protected source, piped water, or rainwater within 1 kilometer of the school

** Among schools possessing appropriate equipment

† Among schools reporting treating drinking water

There are three notable differences in primary drinking water sources used in the dry season compared to sources used in the rainy season. First, only 2.7% of schools use rainwater as the primary drinking water source during the dry season. Second, the percent of schools relying on an unprotected surface water source in the dry season (61.5%) is more than triple that of the rainy season. The percentage of schools using an unprotected surface source during the dry season is highest in Rachunoyo District and lowest in Kisumu/Nyando. The percentage of schools using an improved source for drinking water during the dry season is only 17.6%, compared with almost three-quarters of all schools during the rainy season. While the percentage of schools using a covered well, borehole, protected spring, or piped source increases during the dry season, many of these do not qualify as improved sources because they are located more than one kilometer from the school.

The mean distance to primary source varies considerably across the three clusters for both the dry season and the rainy season. Mean distance to primary water source is 232 meters for all schools. This is lowest in Kisumu/Nyando, where the mean distance is less than 70 meters, and highest in Suba District, where mean distance is over one-half kilometer. The mean distance to the primary water source during the dry season is over 1.2 kilometers. This percentage is again lowest in Kisumu/Nyando (380 meters), but highest in Rachuonyo (1.8 kilometers).

Over 80% of schools have a rainwater storage tank. The lowest percentage of schools with a rainwater tank is found in Suba District (68%), and the highest in Rachuonyo. Among schools with a rainwater storage tank and gutters, only 45% have the storage tank and gutters in working condition.

Approximately 30% of all schools report treating water to make it safe for drinking. Only 5.3% of schools in Kisumu/Nyando report treating drinking water, compared with half of all schools in Suba District. Among schools reporting treating drinking water, 68% report using WaterGuard and 16% report another chlorine-based treatment. However, it should be noted that on the day of data collection, no schools tested positive for chlorine residual in school stored drinking water (data not shown), highlighting the marked differences between reported and actual behaviors.

School Sanitation Facilities and Pupil Sanitation Behaviors

Data on school sanitation facilities and pupil sanitation behaviors are presented in **Table 3**. The mean girl pupil-to-latrine ratio among schools included in the baseline assessment is 72.1 girl pupils per latrine. This is highest in Kisumu/Nyando (83.4 girl pupils per latrine) and lowest in Rachuonyo (57.1 girl pupils per latrine). The GoK recommends schools have one latrine for every 25 girl pupils. Over 97% of schools exceed the recommended girl pupil:latrine ratio. Almost 62% of schools exceed the ratio by a factor of two or more (50 or more girls per latrine) and 33% of schools exceed the recommended ratio by a factor of three or more (75 girl pupils per latrine or more). The mean number of boy pupils per latrine is 81.2 for all schools included in the baseline assessment. Almost 96% of schools exceed the government recommended ratio of thirty boy pupils per latrine, 61% exceed the recommended ratio by a factor of two or more (60 boy pupils per latrine or more), and 31.3% exceed the ratio by a factor of three or more (90 boy pupils per latrine or more).

Table 3: Summary School and Pupil Sanitation Indicators				
	Total	Kisumu/ Nyando	Rachuonyo	Suba
Girls' Latrines				
Mean girl pupils:latrine ratio	72.1	83.4	57.1	74.3
Adherence to government recommended girl pupils: latrine ratio of 25:1 (% of schools)				
Exceed government recommended ratio	97.6	100.0	92.7	100.0
Exceed government recommended ration by factor of two or more	61.9	63.3	50.9	71.7
Exceed government recommended ratio by a factor of three or more	32.7	38.3	21.8	37.7
Boys' Latrines				
Mean boy student:latrine ratio	81.2	82.1	61.6	89.7
Adherence to government recommended boy student: latrine ratio of 30:1 (% of schools)				
Exceed government recommended ratio	95.8	98.3	89.1	100.0
Exceed government recommended ratio by a factor of two or more	60.8	66.1	47.3	69.2
Exceed government recommended ratio by a factor of three or more	31.3	33.9	14.6	46.5
Median # of latrine doors				
% of doors that close completely	59.8	72.6	54.1	52.9
Median # of latrine banks				
	3.0	3.0	3.0	3.0
Observed conditions of latrine banks: (Average % of latrine banks)				
Odor problems	57.1	52.8	49.8	70.9
Lack of cleanliness / visible feces	46.3	41.8	34.7	65.8
Fly control problems	45.5	34.5	34.6	71.6
Pupil latrine use (% of students)				
Always use the latrine at school for defecation	72.2	65.7	79.2	70.0
Always use the latrine at school for urination	66.5	57.3	78.3	60.8
Always use the latrine at home for defecation	77.9	76.2	88.8	66.0
Always use the latrine at home for urination	41.8	36.4	46.2	41.6

Schools have a median of 7 individual latrines, organized into a median of 3 latrine banks. Median number of individual latrines per school is highest in Rachuonyo (8) and the same in Kisumu/Nyando and Suba District (6). On average, only 60% of latrine doors close completely.

School latrine quality was observed by enumerators during the primary facility survey. Data were collected at the level of the latrine bank. For all schools, an average of 57% of latrine banks have odor problems, defined as foul odors in all individual latrine stalls or foul odors outside of the latrine banks. On average, slightly less than half of each school's latrine banks are unclean (defined as dirty in all latrine doors and/or visible feces outside of the latrine), and slightly less than half have problems with flies (defined as flies in all latrine stalls or flies outside of the latrine bank).

Pupil sanitation practices were measured through the pupil survey. On average, 72% of pupils per school report always using the latrine at school for defecation, and 67% of pupils per school report always using the latrine at school for urination. Regarding sanitation practices at home, 78% of pupils report always using the latrine at home for defecation, while only an average of 42% of students per school report always using the latrine at home for urination.

School Handwashing Facilities and Student Handwashing Practices

Summary results for school handwashing facilities and student handwashing practices are presented in **Table 4**. During the pupil survey, an average of 94% of students per school report washing hands before eating, and an average of 80% of students per school report washing hands after visiting the latrine. It should be noted that these numbers may be a reflection of student hygiene knowledge and are not necessarily indicative of actual handwashing practices. Pupils were asked to demonstrate typical handwashing behaviors for school enumerators. Pupils were given one point for each of six steps completed during handwashing: wetting hands, lathering soap, rubbing between fingers, rubbing both hands for at least 10 seconds, cleaning under fingernails, and using the air or a clean cloth to dry. The average school handwashing score is 3.8. Handwashing scores are highest in Suba District (4.2) and lowest in Rachuonyo District (3.3). Approximately 35% of schools provided water for handwashing on the day of data collection. The percentage is highest in Kisumu/Nyando (61.5%) and lowest in Rachuonyo (20.8%).

Table 4: Summary School and Student Hygiene Indicators by Cluster				
	Total	Kisumu/ Nyando	Rachuonyo	Suba
Reported handwashing at key times (% of students)				
Before eating	94.1	94.3	93.6	94.6
After using a latrine	79.8	87.5	80.1	72.2
Mean handwashing score* (score 0 to 6)	3.8	3.9	3.3	4.2
School handwashing materials (% of schools)				
Provide water for handwashing the day of data collection	34.5	61.5	20.8	33.3

* One point was awarded for the demonstration of each of six steps for proper handwashing.

Community Results

Community Water Sources

Information regarding water sources used by household in the communities associated with SWASH+ schools is presented in **Table 5**. Rainwater is the most commonly identified primary drinking water source for households during the rainy season (average of 81.6% of households per community). The average percentage of households using an unprotected surface water source is 10.6%. This is lowest in Kisumu/Nyando (7.7%) and highest in Suba District (15.4%). Standard definitions were again used to identify households with access to an improved source. Average improved water source access is 88.4% of households per community, with the lowest average in Suba (82.8).

	Total	Kisumu/ Nyando	Rachuonyo	Suba
Primary water source (rainy season) (% households)				
Covered well or piped source	7.6	9.6	2.1	12.2
Unprotected well or surface source	10.6	7.7	9.3	15.4
Water vendor	0.0	0.0	0.0	0.0
Rainwater	81.6	82.2	88.6	72.3
None available	0.0	0.0	0.0	0.0
Improved source (total)*	88.4	91.1	90.5	82.8
Primary water source (dry season) (% households)				
Covered well or piped source	32.7	50.9	15.5	34.4
Unprotected well or surface source	64.9	47.5	80.9	63.8
Water vendor	0.8	0	1.7	0.5
Rainwater	1.4	1.1	1.8	1.2
None available	0.0	0.1	0.0	0.0
Improved source (total)*	27.7	44.7	13.2	27.2
Mean distance to primary source (meters)				
Rainy season	425.5	200.0	500.0	600.1
Dry season	650.0	200.0	875.0	900.0

* Access to an improved source defined as any covered and/or protected source, piped water, or rainwater within 1 kilometer of the school

In contrast with the rainy season, an average of only 1.4% of respondents report using rainwater as the primary source of drinking water during the dry season. The average percent of households using an unimproved surface water source increases during the dry season (65%). This percentage is highest in Rachuonyo (80.9%) and lowest in Kisumu/Nyando (47.5%). Average improved water source access during the dry season is 27.7%, with the lowest percentage of households with improved water source access found in Rachuonyo (13.2%).

Household Water Treatment and Household Water Storage

Summary information on household water treatment and household water storage practices is presented in **Table 6**. An average of 53% of respondents per community reports some action to make water safe for drinking. This is highest in Rachuonyo

(61%) and lowest in Suba (44%). Among respondents that report treating drinking water, approximately 42% identify WaterGuard as the primary method of water treatment, 53% report boiling water, and 18% report filtering water and/or allowing the water to settle. In addition, 13% of respondents report using an alternative chlorine-based treatment, such as chlorine power, Aquatabs² or Aquaguard³. Approximately 4% of respondents report using PUR⁴ to treat drinking water. PUR use is highest in Kisumu/Nyando.

	Total	Kisumu/ Nyando	Rachuonyo	Suba
Households that do something to make water safe for drinking (% households)	53.3	52.9	61.0	44.0
Type of treatment reported (% households) *				
WaterGuard	42.1	46.1	43.5	36.1
Boiling	52.7	52.8	53.4	51.9
Filter/ Sedimentation	18.2	14.9	19.0	20.8
Chlorine powder/ other chlorine	12.9	16.9	12.2	9.6
PuR	3.9	7.1	1.8	3.0
Treatment practices (% households)				
Have heard of WaterGuard	84.2	85.4	90.2	75.5
Have ever treated with WaterGuard	40.2	41.3	45.2	32.7
Have purchased WaterGuard	35.5	32.7	42.6	29.6
Currently have WaterGuard in home	15.9	17.5	15.2	15.0
Have detectable chlorine residual	4.1	5.9	3.4	3.2
WaterGuard treatment knowledge (% households)†				
Correct knowledge of clear water dosage	71.7	73.9	71.0	70.3
Correct knowledge of turbid water dosage	30.7	28.8	30.6	32.7
Correct knowledge of waiting time	64.4	72.7	60.8	60.0
Characteristics of drinking water storage container (% households)				
Traditional clay pot (wide mouth, no tap)	85.7	89.8	90.8	75.1
Lid or cover present	92.3	94.1	94.6	87.6
Narrow mouthed vessel	5.3	5.2	4.5	6.5
Tap present	1.2	1.2	1.7	0.8
Respondent dips hands into container (% households)‡	92.8	94.3	90.5	94.0

* Among households that report treating drinking water

† Among respondents who report proper WaterGuard treatment knowledge

‡ Respondent was observed to dip hands into container while retrieving a water sample

² Aquatabs are single-dose chlorine tablets.

³ AquaGuard is a liquid chlorine solution similar to WaterGuard.

⁴ PUR is a single-dose flocculent-disinfectant used to treat drinking water and reduce water turbidity.

An average of 84% of respondents have heard of WaterGuard, 40% report having treated water with WaterGuard before, and 36% report having purchased WaterGuard in the past. On the day of data collection, approximately 16% of households had a bottle of WaterGuard in the home. Only 4.1% of households had detectable chlorine residuals in household stored water. Chlorine residual, measured in the baseline as the presence of free chlorine ions, is assessed in order to determine the extent to which water is safe from recontamination. Chlorine residual was assessed for all households that reported treating drinking water with any chlorine-based solution.

Almost 72% of respondents know the correct WaterGuard dosage for clear water, but only 31% know the correct dosage for turbid water. Knowledge was similar across the three clusters. An average of 64.4% of respondents know the correct waiting time following application of a dose of WaterGuard before the water can be drunk, with a higher percentage of respondents in Kisumu/Nyando aware of the correct waiting time.

An average of 86% of households store drinking water in a traditional clay pot, with the highest percentage found in Rachuonyo (91%) and the lowest in Suba (75%). Over 92% of households have a lid or cover for the household drinking water storage container. On average, 5.3% of households per community have a drinking water storage container with a narrow mouth, 1.2% of households have a water storage container with a tap. Water handling practices were observed when respondents were asked to obtain a sample of stored water. An average of 93% of respondents per community dipped hands in the water storage container while retrieving a sample.

Household Sanitation Facilities and Behaviors

Information on household sanitation facilities and household sanitation practices is presented in **Table 7**. Approximately 42% of households included in the baseline assessment have a working latrine at home. Sanitation coverage is highest in Rachuonyo (51.7%) and lowest in Suba (24%). Among households with a latrine, approximately 81% of latrines are traditional pit latrines. An additional 12.5% of latrines are ventilated improved pit latrines. Only 1.2% of households have a flush toilet.

Among households with a latrine, an average of 40% of respondents per community report that children under the age of two do not use that latrine at home and an average of 69% of respondents per community report that children under the age of five do not use the latrine at home. On average, 4.0% of respondents per community report that school-aged children do not use the latrine at home. This number is markedly different than reported latrine use among pupils identified in the pupil survey, where an average of 21% of pupils per school with a latrine at home report using the latrine only sometimes or never.

Among households with a latrine, approximately 16% of latrines per community were observed to have a foul odor outside of the latrine. The average percent of latrines with a foul odor in Kisumu/Nyando is almost half of the percent in Rachuonyo and Suba. Visible feces and waste paper outside of the latrine were observed at an average of 8.1% of latrines, and visible holes between the latrine slab and the latrine pit were observed in an average of 8.6% of latrines per community. Almost half of all latrines

per community have no door. The average percent of latrines without a door is lower in Kisumu/Nyando than in other clusters.

Table 7: Summary Household Sanitation Indicators				
	Total	Kisumu/ Nyando	Rachuonyo	Suba
Households reporting a working latrine (% households)	42.3	48.7	51.7	24.0
Type of facility observed at compound				
Pit latrine	81.4	75.7	84.3	84.1
VIP latrine	12.5	10.6	11.9	15.5
Above ground vault	2.8	6.2	1.8	0.3
Flush toilet	1.2	3.8	0.0	0.0
Other latrine	1.6	3.5	1.0	0.2
Households reporting children who don't regularly use latrine* (% households)				
Children < 2 years old	39.9	59.9	30.6	29.0
Children < 5 years old	68.6	54.2	75.1	76.8
Children 5-15 years old	4.0	4.8	1.5	6.6
Poor observed latrine conditions* (% households)				
Odor outside of latrine	15.7	9.4	18.7	18.8
Visible feces and waste paper outside of pit	8.1	7.1	5.0	13.4
Visible holes between slab and ground (allowing water to enter)	8.6	7.9	11.3	5.9
No door	44.4	26.9	58.1	46.1

*Among households with a latrine

Household Hygiene Facilities and Practices

Information on household handwashing facilities and practices is presented in **Table 8**. An average of 66% of respondents per community report washing hands after visiting the latrine, 60% report washing hands after handling dirty things, and 51% report washing hands before cooking. Handwashing scores were calculated for respondents using the same methods employed for pupils. Average handwashing score for all communities included in the baseline report is 4.0 out of 6. Average handwashing score is lower in communities in Rachuonyo (3.6 out of 6) compared to the other two clusters. An average of 50% of households in all communities included in the baseline assessment has a location for handwashing in the home where both soap and water are present. The average percentage is highest in communities in Rachuonyo (70.7%) and lowest in Suba (24.6%).

Table 8: Summary Household Handwashing Facilities and Practices by Cluster				
	Total	Kisumu/ Nyando	Rachuonyo	Suba
Reported handwashing at key times (% household heads)				
After visiting the latrine	65.8	69.9	62.7	65.1
After handling dirty things	60.0	49.4	61.0	70.1
Before cooking	51.1	52.0	46.8	55.5
Mean handwashing score* (score 0 to 6)	4.0	4.2	3.6	4.3
Households with location for handwashing with soap and water (% households)†	49.8	49.3	70.7	24.6

* Handwashing score is calculated among respondents willing to demonstrate handwashing. One point was awarded for the demonstration of each of six steps for proper handwashing.

† Among households in which respondent was willing to demonstrate handwashing.

Health and Impact Indicators

The applied research and impact evaluation is designed to measure improvements in the health of children under five in communities associated with SWASH+ schools and to measure changes in the health and attendance of pupils in project schools. Summary baseline information related to the key health and educational impacts is presented in **Table 9**. An average of 19.7% of children under 5 years old in SWASH+ communities had diarrhea in the two weeks prior to data collection. An average of 39.3% of children had a cough in the two weeks prior to data collection, and 40.9% of children under the age of five per community had a fever. All health information for children under the age of five was reported by the household survey respondents. An average of 31.6% of children under the age of five per community visited a health facility in the two weeks prior to data collection. Among those children, an average of 35.4% of clinic visits was due to diarrhea or vomiting.

Student health and absenteeism have been combined for the purposes of the baseline report. An average of 22.9% of pupils per school were absent at least once in the two weeks prior to data collection. The primary causes of absenteeism among pupils that reported missing school were headache (43.3%), malaria (33.9%), cough (8.4%), diarrhea (8.1%), and fetching water for household use (2.1%). All of the respondents who reported school-aged children missing school to fetch water were found in Suba.

For schools selected for helminth and anemia assessments, an average of 13.1% of pupils tested positive for *Ascaris l.*, 8.2% tested positive for *Trichuris t.*, 27.7% tested positive for Hookworm, and 8.7% tested positive for *S. mansoni*. Prevalence of helminths was generally higher in Kisumu/Nyando than in Rachuonyo, with the exception of *S. mansoni*. The average percentage of pupils with at least one helminth infection was 42.2% among all schools included in the helminth assessment. Over half of pupils in Kisumu/Nyando tested positive for at least one helminth infection (53.0%). Helminth co-infection was identified in 10.7% of students.

Table 9: Summary Health and Impact Indicators by Cluster				
	Total	Kisumu/ Nyando	Rachuonyo	Suba
Illnesses reported by respondents for children < 5 years (% children < 5 per community)				
Diarrhea	19.7	22.1	15.1	22.7
Cough	39.3	39.7	38.3	39.9
Fever	40.9	40.2	34.1	50.1
Clinic visits (% children < 5 per community)				
Visited clinic in previous two weeks	31.6	36.4	29.6	29.0
Visited clinic due to diarrhea or vomiting*	35.4	36.1	33.1	37.6
Absenteeism (% students reporting each)				
School absence in past 2 weeks	22.9	20.8	19.1	29.6
Absence due to diarrhea†	8.1	3.4	10.3	9.9
Absence due to malaria†	33.9	29.7	39.4	31.6
Absence due to cough†	8.4	8.3	6.2	11.1
Absence due to headache†	43.3	43.6	37.5	49.4
Absence due to fetching water†	2.1	0.0	0.0	5.0
Helminth infections (% of students per school)				
<i>Ascaris l.</i>	13.1	17.7	7.7	NA
<i>Trichuris t.</i>	8.2	12.2	3.6	NA
Hookworm	27.7	37.8	16.1	NA
<i>S. mansoni</i>	8.7	7.6	9.9	NA
Any helminth infection	42.2	53.0	30.3	NA
Two helminth infections	10.7	13.3	6.5	NA
Average hemoglobin level (grams/decileter)				
	12.4	12.0	12.8	NA

* Among households reporting children < 5 years old visiting a health clinic in the previous two weeks

† Among students who reported absence. Reasons for absence are not mutually exclusive