DRINKING-WATER, SANITATION, AND HYGIENE BEYOND THE HOUSEHOLD: A GLOBAL REVIEW AND A SITUATIONAL ASSESSMENT OF GHANA

Ryan D. Cronk

A thesis submitted to the faculty of the University of North Carolina at Chapel Hill in partial fulfillment of the requirements for the degree of Masters of Science in the Department of Environmental Sciences and Engineering.

Chapel Hill
2013

Approved by:

Dr. Jamie Bartram

Dr. Jacqueline MacDonald-Gibson

Dr. Peter Kolsky

ABSTRACT

RYAN CRONK: Drinking-Water, Sanitation, and Hygiene Beyond the Household: A Global Review and Situational Assessment of Ghana
(Under the direction of Jamie Bartram)

Extra-household settings are in consideration for drinking-water, sanitation, and hygiene (WaSH) targets in the post-2015 development agenda but evidence gaps impair monitoring, policy, and practice. We systematically reviewed literature to develop a typology, evaluate standards, identify actors, assess evidence, and catalog monitoring initiatives. A situational assessment of Ghana identified specific national challenges. Schools and health facilities have the most support from actors, evidence for benefits, and standards defined. From available data in developing countries, we estimate that WaSH monitoring initiatives for schools exist in approximately 70 countries, 30 countries for health facilities, and fewer than 20 countries for all other settings combined. We found limited evidence describing benefits of WaSH or the impact of poor WaSH conditions in most settings. While not all countries conduct extra-household monitoring, examples are available on most continents suggesting that the establishment of a global monitoring system is achievable.

ACKNOWLEDGEMENTS

I would like to thank my advisor, Dr. Jamie Bartram who provided strategic vision, feedback, and guidance on the development of these papers and members of my committee, Dr. Jackie MacDonald-Gibson, and Dr. Pete Kolsky for their feedback and advice. Tom Slaymaker, chair of Joint Monitoring Program post-2015 Water Working Group, provided valuable feedback on the initial drafts of both papers.

I would like to thank Jonny Crocker of the Water Institute at UNC for collecting hard-to-find Ghanaian policy documentation and monitoring reports that helped shape the situational assessment. World Vision Ghana staff were instrumental in coordinating logistics and helping arrange interviews. Murat Sahin of UNICEF also helped to arrange interviews and provided feedback on an early draft.

This project was commissioned and partially funded by WaterAid on behalf of the WHO/UNICEF Joint Monitoring Programme post-2015 working groups. Additional funding was provided from a fellowship in Public Health Informatics supported by the Office of National Coordinators (ONC). World Vision Ghana and a Department of Environmental Sciences and Engineering travel award provided funding for field work.

TABLE OF CONTENTS

LIST OF TABLES

LIST OF ABBREVIATIONS

CSO	Country Status Overview
CWSA	Community Water and Sanitation Agency
DA	District Assembly
DESSAP	District Environmental Sanitation Strategy and Action Plan
DHS	Demographic and Health Survey
EHO	Environmental Health Officer
EHSD	Environmental Health and Sanitation Directorate
EMIS	Educational Management Information System
GSS	Ghana Statistical Service
HMIS	Health Management Information System
IRC	International Water and Sanitation Centre
JMP	Joint Monitoring Programme for water supply and sanitation of the World Health Organization and UNICEF
LSMS	Living Standards Measurement Survey
MICS	Multiple Indicator Cluster Surveys
MoE	Ministry of Education
MoH	Ministry of Health
NESSAP	National Environmental Sanitation Strategy and Action Plan (Ghana)
NGO	Non-Governmental Organization
SAM	Service Availability Mapping
SARA	Service Availability and Readiness Assessment
SDG	Sustainable Development Goals

SMS	Short Message Service
SPA	Service Provision Assessment
UN	United Nations
UNICEF	United Nations Children's Fund
USAID	US Agency for International Development
VCT	Voluntary Counseling and Testing
WaSH	Water, Sanitation, and Hygiene
WEDC	Water, Engineering and Development Centre of Loughborough University, Leicestershire, UK
WHO	World Health Organization
WSMIS	Water Sector Management Information System
WSMP	Water and Sanitation Monitoring Platform

CHAPTER I: INTRODUCTION

The Joint Monitoring Programme (JMP) of the World Health Organization (WHO) and the United Nations Children's Fund (UNICEF) has been the agency responsible for monitoring progress on drinking-water and sanitation coverage worldwide since 1990. Since the establishment of the Millennium Development Goals (MDGs), the JMP has a mandate for monitoring worldwide progress against the MDG target for drinking-water and sanitation. JMP monitoring has provided value to efforts towards capacity development, advocacy, and informing investments. The JMP recognizes that new, ambitious targets and indicators for monitoring could contribute to more rapid achievement of drinking-water and sanitation coverage worldwide (WHO/UNICEF JMP, 2012).

With the impending construction of the post-2015 development agenda and associated monitoring framework, the JMP assembled four expert working groups on drinking-water, sanitation, hygiene, and a cross-cutting group on equity and non-discrimination to develop a package of goals, targets, and indicators for WaSH beyond the MDGs. These working groups operated under the following assumptions and principles (WHO/UNICEF JMP, 2012):

1. "The targets should be formulated in the context of a simple, inspirational vision, articulated around universal use of water, sanitation and hygiene
2. "Targets should focus primarily on outcomes
3. "Targets should reflect the human rights to water and sanitation, and the concept of progressive realization of the rights
4. "The targets should reflect the aspiration of both an increase in the number of people using water, sanitation, and hygiene, and improvements in their level of service, and both are considered progressive realization
5. "Targets are global and must therefore be relevant to all countries

6. “Targets should look beyond the home to schools and health centres
7. “There must be a focus on the poor, disadvantaged and excluded
8. “There must be a focus on the elimination of inequalities and inequities” (WHO/UNICEF JMP, 2012, p. 2-3).

Point six, focused on WaSH in extra-household settings, is the genesis of this article compilation thesis. Prior to this review and situational assessment, little had been documented on WaSH in extra-household settings. Gaining a broader understanding of WaSH in the extra-household environment through a desk-based global review and a situational assessment of how these topics play out in practice in a specific country context has implications for the formation of international development policy and the post-2015 development agenda.

In section II, I review WaSH beyond the household through the development of a typology of settings, cataloging monitoring initiatives, and developing a set of indicators for monitoring. In section III, I report a situational assessment of the extra-household monitoring environment in Ghana to provide a contextual assessment of monitoring, policy, and practice. This research contributes to the broader understanding of these non-household environments by documenting gaps in evidence, monitoring, and practice to inform policy and the future research agenda for these settings.

CHAPTER II: A REVIEW OF DRINKING-WATER, SANITATION, AND HYGIENE BEYOND THE HOUSEHOLD: SETTINGS, MONITORING, AND POLICY IMPLICATIONS

INTRODUCTION

With the approaching expiration of the Millennium Development Goals (MDGs), attention is shifting to the assembly of the post-2015 development agenda. An aim of the agenda is to create a framework of Sustainable Development Goals (SDGs) that build on the MDGs. For drinking-water, sanitation, and hygiene (WaSH), settings beyond the household, such as schools, health facilities, and markets are being considered in addition to households, which were the only setting monitored for the drinking-water and sanitation target of the MDGs (WHO/UNICEF JMP, 2012).

In general, the lack of WaSH access in extra-household settings disproportionately affects certain household members in different ways. For example, inadequate sanitation facilities for menstrual hygiene management (MHM) have been associated with poor school attendance by adolescent girls (Abrahams, 2006). The elderly face substantial challenges if WaSH facilities are not suited to their needs (Harris, 2012). Disabled persons make up 15% of the global population and include individuals living with physical, intellectual, sensory (e.g. blindness, deafness) or mental health impairments (WHO, 2011). They face technical and social barriers related to WaSH preventing them from attending school, seeking jobs, and gaining access to other public settings. When disabled persons are unable to attend school or

take jobs, it places an additional economic burden on their families and compounds inequality (Groce, 2011).

Monitoring access to extra-household WaSH is important for purposes of informing investment in resources, supporting benchmarking and reporting, and measuring progress. A component of effective monitoring is a framework for data collection using a set of indicators. Examples of WaSH monitoring frameworks include the Human Right to Water (HRTW), the United Nations (UN) Water Global Analysis and Assessment of Sanitation and Drinking-Water (GLAAS), and the World Health Organization (WHO)/United Nations Children's Fund (UNICEF) Joint Monitoring Programme (JMP) which collects data used to track progress for the MDG target on drinking-water and sanitation. Despite the availability of multiple frameworks, none of them provide globally harmonized indicators or guidance for extra-household WaSH monitoring. Therefore, a new framework is required to monitor these settings.

This review summarizes the current state of WaSH in extra-household settings. We develop a typology to categorize extra-household settings. We catalog international standards, actors, and the current status of evidence about WaSH in these settings to identify literature gaps. We describe available monitoring initiatives that collect extra-household data and review other monitoring initiatives that could incorporate extra-household indicators in the future. Finally, we present a framework of extra-household indicators for monitoring in developing countries.

METHODS

Literature search strategy

We systematically reviewed PubMed, Web of Science, and Google Scholar, using each of the terms "drinking-water," "sanitation," and 'hygiene" in combination with terms associated with extra-household settings as described in Table 1 and terms related to monitoring, evaluation, policy, guidelines, and standards. The list of search terms in Table 1 was generated iteratively through web searches, literature searches, and consultation with the post-2015 WaSH working groups. Using the same set of terms, we searched for and reviewed gray literature publications from United Nations (UN) agencies, bilateral and multilateral organizations, non-governmental organizations (NGOs), national governments, and research institutions.

Table 1. Search terms used to review extra-household literature

Setting	PubMed MeSH term	Associated search terms
Schools	School	primary OR secondary OR boarding OR day AND school, nursery, daycare, university, kindergarten
Health facilities	Health facilities	Hospital, health center, clinic, asylum, dental surgery, general practitioner facility, maternities, nursing home, psychiatric hospital, voluntary counseling and testing (VCT) facility
Workplaces	Workplace	Farm, military base, municipal building, office, office park, factory, agriculture
Service settings	Food services, Restaurants	Accommodation, accommodation types, hotel, inn, motel, cafeteria, canteen, fast food, restaurant, bakery
Transit hubs	None available	Rail, bus, train, ship port, station, lorry park, bus stop, railway
Markets	None available	Food market, grocery
Places of worship	None available	Church, mosque, synagogue, temple, chapel, masjid, musjid, shrine, tabernacle
Public WaSH facilities	None available	Public toilet, pay-and-use toilet, community toilet, drinking-water fountain
Mass gatherings	None available	Mobile food vendors, Hajj, Olympic (Athens, London, Beijing), World Cup, soccer, football, State events (e.g. funeral, inauguration), festival, temporary event
Internally displaced persons camps	None available	IDP, emergency, disaster, disaster-response
Refugee camps	Refugees	Refugee, shelter, refugee community
Prisons	Prisons	Detention, penal, reformatory, penitentiary, incarceration, jail
Orphanages	Orphanages	Orphan asylum, group homes, children homes, refuges, rehabilitation centers, night shelters, youth treatment center

Document screening and categorization

We describe settings using the available evidence and definitions listed in Table 2. We describe monitoring initiatives using the available evidence and definitions listed in Table 3.

Table 2. Descriptive evidence for evaluating extra-household settings

Descriptive evidence	Definition
Setting	Describes the highest level "type" that is collectively exhaustive of sub-settings
Sub-setting (examples)	For example, for "schools" type, sub-settings include kindergartens, primary schools, secondary schools, etc.
Population multiplier	The sum of the individuals using each individual facility
Definition of the setting	Definitions of the setting as informed by internationally used terminology in the context of a setting being enumerated by a monitoring initiative; in the absence of a definition we developed one
Principal international actor(s)	Generally, actors that provide capacity support for policy, guidelines, standards, monitoring, evaluation, and practice
Principal national actor(s)	Generally, the actors at the national level that provide capacity support for policy, guidelines, standards, monitoring, evaluation, and practice
International WaSH standards and/or guidelines	We examine whether or not "sufficient" standards and/or guidelines are available for each setting type and define "sufficient" to be standards/guidelines that specifically reference quantities of drinking-water, ratios of toilets per persons, drinking-water quality, and other similar factors for a specific setting
Systematic review	We identify whether or not a formal systematic review has been undertaken in each setting that examines evidence for benefits or for poor conditions as a result of WaSH in each setting

Table 3. Descriptive evidence for evaluating monitoring initiatives for extra-household settings

Descriptive evidence	Definition
Monitoring initiative	Description of the initiative by which monitoring data on extra-household settings are collected
Examples in practice	Examples of monitoring initiative(s) in practice in countries
Applicable settings	For which settings is the monitoring initiative applicable
Institutional data coordinator	Actor responsible for managing, coordinating, and aggregating the monitoring data
Typical area of indicators included	Input, output, outcome, and impact indicators
Sampling approach	E.g. random sample, complete enumeration
Estimated number of data sets	Number of publicly available data sets that were identified through the course of this review
Frequency of reporting	E.g. monthly, annually, every five years
Data provider/ collector	The individual who is providing the status of the facility or setting of interest (e.g. school principal, health care worker)

Typology Development

Based on attributes of settings identified through the literature search, we develop a typology to describe, classify, and evaluate extra-household settings in a consistent manner.

The typology was constructed using methods described in Bailey (1994). Bailey describes typologies to be collectively exhaustive, where all settings are assigned a type. Types are also mutually exclusive, where each setting is only part of one type. The settings are conceptually grouped based on multidimensional attributes and characteristics described by the descriptions in Tables 2 and 3.

RESULTS

Settings

Findings on settings are described in Tables 4 and 5. By type, Table 4 describes the settings (e.g. transit hub), examples of associated sub-settings (e.g. rail station, bus station), the population multiplier, and definitions. Table 5 describes, for each setting, the principal international actor(s), principal national actor(s), available international standards and/or guidelines, and any systematic reviews that have been conducted for the setting.

Table 4. Results of review of extra-household settings (part 1 of 2)

Type	Settings	Sub-settings (examples)	Population Multiplier	Definitions
Schools	Schools	Daycare, nurseries, kindergarten, primary/ secondary schools, universities	school children and teachers	"Includes primary and secondary schools, boarding and day schools, rural and urban schools, and public and private schools" (Adams et al, 2009, p.1).
Health care facilities	Health care facilities	Hospital, health center, clinic, dental surgery, general practitioner facility	patients and staff	"Health-care settings include hospitals, health centers, clinics, dental surgeries and general practitioner facilities" (Adams et al, 2008, p. 3) and are generally places where people receive health care from a trained professional and include public, private, and faith-based facilities
Workplaces	Workplaces	Farm, agriculture, military base, municipal building, office, factory	Workers and patrons (if applicable)	Formal workplaces include "corporations (including quasi-corporate enterprises), non-profit institutions, unincorporated enterprises owned by government units, and those private unincorporated enterprises producing goods or services for sale or barter which are not part of the informal sector" (Hussmanns, 2004, p. 5). Informal workplaces are those where "(1) workers employed with no social contributions paid; (2) people employed in a private unregistered firm; and (3) the employed who work at home, from door-to-door, in the flea market and in other places" (Sanfey, 2010, p. 3).
Temporary use settings	Service settings	Hotel, inn, motel, cafeteria, canteen, fast food, restaurant, bakery	Patrons and workers	Setting where patrons pay to be provided with a service and are provided with food and/or beverage and/or lodging. Accommodations are defined as "the provision of at least sleeping and sanitary facilities" (Beaver, n.d.). Restaurants are defined as "a place that sells meals prepared and served on the premise" (A Dictionary of Public Health, 2007).
	Transit hubs	Rail station, bus station, ship port, truck stations (lorry parks), airports	travelers	We define transit hubs to include the places listed in the sub-settings
	Transit vessels	Train, bus, ship, truck (lorry), airplane	passengers	We define transit vessels to include those listed in the sub-settings
	Markets	Food market, grocery, etc.	patrons and workers	"A defined place where people periodically gather at predetermined times for the purchase and sale of goods, livestock, services, or commodities of various kinds within the structure of a market economy" (Darvill, 2008).
	Places of worship	Church, Mosque, synagogue, temple, etc.	Number of worshipers	We define places of worships as setting where individuals gather in a specially designed structure for religious activities
	Public WaSH facilities	Public toilet, public drinking-water fountain	Estimated number of patrons	We define public WaSH facilities to be those that are not attached or affiliated with one of the other settings described in this typology and include places such as standalone facilities in parks, slums, and other publicly accessible spaces.
Mass Gatherings	Religious events, sporting events, etc.	Hajj, World Cup, Olympics, State events (e.g. funeral), fairs, festivals	Estimated number of visitors	"A gathering of persons at a specific location for a specific purpose (a social function, large public event or sports competition) for a defined period of time. An organized or unplanned event can be classified as a mass gathering if the number of people attending is sufficient to strain the planning and response resources of the community, state or nation hosting the event (WHO, 2008)."
Dislocated populations	Internally Displaced Person camps	IDP camps	Individuals in the camp	"A temporary place of sanctuary for people who have been displaced from their usual home and habitat by natural or manmade disaster, typically violent armed conflict…those who do not leave [their country] are described as internally displaced persons" (A Dictionary of Public Health, 2007).
	Refugee camps	Refugee camps	Individuals in the camp	"A temporary place of sanctuary for people who have been displaced from their usual home and habitat by natural or manmade disaster, typically violent armed conflict…for those who leave their country" (A Dictionary of Public Health, 2007).
	Prisons	Prisons, detentions, places of internment	Detainees	"The term prison is intended to denote, as a minimum, the institutions that hold people who have been sentenced to a period of imprisonment by the courts for offences against the law" (WHO, 2007, p. xvi).
	Orphanages	Orphan asylum, group homes, children's homes, refuges, rehabilitation centers, night shelters, youth treatment center	Number of children and staff	"An institution for children who have no parents because their parent(s) have died or abandoned them and no other close relations are able to care for them" (Dictionary of Public Health, 2007).

Table 5. Results of review of extra-household settings (part 2 of 2)

Type	Settings	Principal International Actor(s)	Principle National Actor(s)	International standards and/or guidelines	Systematic review?
Schools	Schools	United Nations Educational, Scientific and Cultural Organization (UNESCO), UNICEF, WHO	Ministry of Education	UNICEF, WHO, The Sphere Project - Humanitarian Charter and Minimum Standards in Humanitarian Response (Sphere)	Yes; Jasper et al 2012
Health care facilities	Health care facilities	WHO, MEASURE Evaluation, International Health Facility Assessment Network (IHFAN)	Ministry of Health	WHO, Sphere	No
Workplaces	Workplaces	International Labor Organization (ILO)	Ministry of Labor	None sufficient; general guidance by Work Improvement in Small Enterprises (WISE+) (ILO, 2009)	No
Temporary use settings	Service settings	None identified	Ministry of Health and/or Environmental Health	None identified	No
	Transit hubs	Local Governments for Sustainability (ICLEI)	Municipal authorities, private companies, mayor associations	None sufficient; General guidance on environmental health in bus and rail stations (WHO, n.d.)	No
	Transit vessels	None identified	Municipal authorities; private companies	WHO guide to ship sanitation (WHO, 2011); none sufficient for other vessels	Rooney et al, 2004 (ships only)
	Markets	WHO (though limited)	Municipal authorities	None sufficient though some guidance in Healthy Food Marketplaces (WHO, 2006)	No
	Places of worship	Global governing body of the religious institution	National governing body of the religious institution	None identified	No
	Public WaSH facilities	None; generally managed locally	Ministry of Works; Water and Sanitation	None identified	No
Mass Gatherings	Religious events, sporting events, etc.	WHO	Context specific; often Ministry of Health	None identified	No
Dislocated populations	IDP camps	The Office of the United Nations High Commissioner for Refugees (UNHCR)	None identified	Sphere	No
	Refugee camps	UNHCR	None identified	Sphere	Yes; Cronin, 2011
	Prisons	International Committee of the Red Cross (ICRC)	National prison agency	ICRC, WHO	No
	Orphanages	Non-governmental organizations (NGOs)	None identified	None identified	No

Typology for settings

For settings, seven types are identified based on the literature review and denoted in Table 6: schools, health care facilities, workplaces, temporary use settings, mass gatherings, and dislocated populations. The typology was constructed based on common characteristics of the populations who use the settings (e.g. children, sick people, working adults), length of exposure to inadequate WaSH while in the setting (e.g. temporary use throughout a lifetime), and additional factors that are unique to each setting (e.g. large temporary gathering, involuntarily relocated to the setting). Schools, workplaces, and health facilities include settings described in the definitions informed by literature. Temporary use settings, which include service settings (e.g. hotel, restaurant), transit hubs (e.g. bus station), means of transit (e.g. bus), markets, and public WaSH facilities (e.g. public toilet) are settings where individuals are temporary users. Mass gatherings include religious events, sporting events, and large state events, among others, where large groups of people gather temporarily and place a strain on local resources (WHO, 2008). Dislocated populations include internally displaced persons (IDP) camps, refugee camps, prisons, and orphanages and are settings where individuals are involuntarily relocated, are dependent on third parties for sustenance, and maintain dislocated social structures.

Table 6. Extra-household settings typology

Type	Settings	Sub-settings (examples)
Schools	Schools	Daycare, nurseries, kindergarten, Primary/secondary schools, universities
Health care facilities	Health care facilities	Hospital, health center, clinic, dental surgery, general practitioner facility
Workplaces	Workplaces	Farm, military base, municipal building, office, factory
Temporary use settings	Service setting	Hotel, inn, cafeteria, canteen, fast food, restaurant
	Transit hubs	Rail station, bus station, ship port, truck stations (lorry parks)
	Transit vessels	Train, bus, ship, truck (lorry)
	Markets	Food market, grocery, etc.
	Places of worship	Church, mosque, synagogue, temple, etc.
	Public WaSH facilities	Public toilet, public drinking-water fountain
Mass Gatherings	Religious events, sporting events, etc.	Hajj, World Cup, Olympics, State events (e.g. funeral), fairs, festivals
Dislocated populations	Internally displaced persons camps	IDP camps
	Refugee camps	Refugee camps
	Prisons	Prisons, detentions, places of internment
	Orphanages	Orphan asylum, group homes, children homes, refuges, rehabilitation centers, night shelters, youth treatment center

Monitoring Initiatives

Findings on established monitoring initiatives are described in Table 7 and grouped at three levels: global, national, and local. Local initiatives include district monitoring in addition to program and project monitoring. Initiatives that currently do not contain extra-household indicators but could in the future are described.

Table 7. Extra-household monitoring initiatives at the global, national, and local levels

Monitoring level	Monitoring Initiative	Examples in practice	Applicable settings	Institutional data coordinator	Sampling approach	Estimated data sets available	Frequency of reporting	Data provider/ collector
Global	GLAAS	GLAAS as conducted biennially	Schools, health facilities	WHO	Survey to country ministers	Two	Two years	Mixed
National	Educational Management Information System (EMIS)	Ghana EMIS, India District Information System for Education (DISE), Bolivia EMIS	Schools	Ministry of Education	Complete enumeration in country	30	Annually	School teachers or headmaster
	Health Management Information System (HMIS)	Ethiopia, Myanmar, Timor-Leste	Health facilities	Ministry of Health	Complete enumeration in country	10+	Quarterly, annually	Health facility employee
	Water Sector Management Information System (WSMIS)	Directorate of Water Development Management Information System (Uganda)	All settings (most focus on schools and health facilities)	National government ministry (e.g. water, environment)	Complete enumeration in country	Unknown	Annually	Water sector professional
	Service Provision Assessment (SPA)	Bangladesh, Egypt, Guyana, Kenya	Health facilities	MEASURE Evaluation	Cluster random sample	14 countries, 19 data sets	Every three to five years	Trained enumerator
	Service Availability and Readiness Assessment (SARA)	Sierra Leone, Tanzania, Zambia	Health facilities	WHO	Cluster random sample	Four	Every three to five years	Trained enumerator
	Facility surveys	Iraq schools, Tajikistan health facilities	All settings (most are schools and health facilities)	UNICEF, WHO, USAID	Generally, a random sample	30 schools, 5+ health facilities	One-off studies; often baseline surveys	Trained enumerator
Local	Program/ Project	USAID Ghana, NGO reports, impact assessments, journal publications	All settings (most are schools and health facilities)	Context specific	Random sample or complete enumeration	Many, though not many are publicly available	Generally one-off studies, length of project	Trained enumerator
	District	Ghana EHSD	All settings	District agency	Generally complete enumeration	Many, though not many are publicly available	annually	District employee

Globally Conducted Monitoring Initiatives

The only global monitoring initiative that contains information on extra-household settings is the Global Analysis and Assessment of Sanitation and Drinking-Water (GLAAS). GLAAS is a UN-Water initiative implemented by the WHO. Information for GLAAS are compiled from surveys completed by national ministers. This report provides policy makers with global information for decision making. Amongst the responses are data on drinking-water and sanitation in schools and health facilities. Survey respondents indicate that the school and health facility data are compiled from national monitoring sources (GLAAS, 2012).

Nationally Conducted Monitoring Initiatives

For school monitoring, national Ministries of Education frequently use the open source Educational Management Information System (EMIS). UNESCO, which is a UN agency that contributes resource capacity for education and other initiatives, designed these generic systems. EMIS are customizable and operated at the national level by the Ministry of Education. To collect information for the EMIS, a national Ministry of Education distributes a census annually to all schools, generally both public and private, primary through secondary, and in some instances, tertiary facilities such as universities. A principal, head teacher, or district official completes the census for each school and these data are aggregated nationally in a database for evaluation by the Ministry of Education (UNESCO, 2009).

The primary focus of the EMIS is not WaSH and national survey instruments generally contains few WaSH indicators. The survey typically includes indicators on the ratio of toilets per student, existence of separate sanitation facilities for boys and girls, and an improved drinking-water source on or near the school campus. EMIS data results are most

often reported annually and it is estimated that there are at least 30 publicly available data sets from developing countries. Because the survey instrument and indicators are designed nationally, the data from these systems are not necessarily comparable between countries (UNICEF, 2011).

For national health facility monitoring, Health Management Information Systems (HMISs), are routine health facility reporting systems that generate service data at the facility level for all facility types and often allow for aggregation at the national level. HMISs collect a range of health related indicators (e.g. malaria prevalence, number of beds available per hospital) and some of these systems include indicators on infrastructure such as drinking-water and sanitation (WHO, 2010).

Other health facility monitoring initiatives include Service Provision Assessments (SPAs) and Service Availability and Readiness Assessments (SARAs) which examine the status of health service delivery in a country. These initiatives replace several precursor tools including Service Availability Mapping (SAM) and the Facility Audit of Service Quality (FASQ). Infrastructure status is collected in this survey process including drinking-water and sanitation. SPAs were designed by USAID and SARAs by the WHO to be used globally but they are conducted in country by national ministries (usually the ministry of health and national statistical office). They sample from all facilities and facility types using government and NGO coordination lists including facilities managed by the government (public sector) and by NGOs, faith-based organizations, and private for-profit groups. They do not include a population multiplier (e.g. number of patients and staff). Both SPA and SARA include indicators for WaSH. They are conducted similarly to survey approaches such as the Demographic and Health Survey (DHS) which is a large, nationally representative

household survey that is conducted in individual countries and is comparable between countries. For SPA and SARA, enumerators sample facilities from a stratified cluster and collect interview and observational response data. Because of the global coordination of the survey instruments by WHO and USAID, the survey indicator data on WaSH are comparable between countries (Alva et al, 2009; WHO, 2013; MEASURE DHS, 2013).

There are other facility surveys that can be used to capture data on any facility type. These initiatives are most frequently conducted by multilateral agencies, such as UNICEF and WHO, at the national level. Only surveys for schools and health facilities were found through the course of the review but the general methodology could be applied to any other setting. An example facility survey includes the 2009 Djibouti School Hygiene and Sanitation Survey (SHSS) which was a simple random sample of schools in the country in which enumerators collected data from students and teachers (El-Zanty & Associates, 2009). UNICEF have conducted national baseline assessments of WaSH in schools in Malawi, the Philippines, Timor-Leste, and Uganda among others (Freeman et al, 2013). India conducts annual health facility surveys that are released annually online (NUEPA, 2012). A WHO survey from 2009 indicated that more than 50% of health facilities in Tajikistan do not have access to safe drinking-water in sufficient quantity or quality (WHO-Europe, 2010).

Locally conducted monitoring initiatives

Local monitoring initiatives include district, project, and program monitoring. Extra-household WaSH monitoring are often collected by local governments but are infrequently aggregated at a higher level and are often not publicly or digitally available. For example, the Ghana DESSAP includes data on sanitation facilitates in many extra-household settings such as hotels, restaurants, schools, and markets, but the DESSAP documents are hand written,

stored in hard copy, and not available outside district offices (Ministry of Local Government, 2007).

Other sources of monitoring data from settings such as markets and workplaces were identified in literature but the primary sources could not be found, such as those in a World Bank report on the economic impacts of sanitation in Southeast Asia (Hutton et al, 2008) and case study examples from the GLAAS report (GLAAS, 2012).

Some facility surveys are used to fulfill a specific purpose such as targeting vulnerable populations or specific districts or regions. For example, a survey in Kyrgyzstan examined WaSH access in schools and health facilities in targeted regions of the country (UNICEF, 2011). In Ghana, a USAID project conducted health facilities surveys in targeted regions of the country where maternal and child health was a focus (Quality Health Partners, 2009).

Possible future options for extra-household monitoring

In addition to established methods for monitoring extra-household settings, there are other initiatives and emerging tools that could include extra-household monitoring indicators. Nationally representative household surveys include the Demographic and Health Survey (DHS), Multiple Indicator Cluster Survey (MICS), Living Standards Measurement Study (LSMS), World Health Survey (WHS), Core Welfare Indicator Questionnaire (CWIQ) national censuses, and other similar national household surveys that provide data for a wide range of indicators. These surveys are conducted by national statistics offices often with technical assistance from an outside agency or development partner. These cross-sectional surveys are generally conducted every few years and the data are made publicly available through a variety of sources directly through development partner agencies and national

reports. Censuses conducted by national governments are generally a complete enumeration while the other survey types are frequently a two stage probability sample which provide nationally representative statistical data on a given country. The surveys collect data on a variety of demographic, health, and economic indicators and include harmonized household drinking-water and sanitation indicators which allow for global comparison across time (K4Health, 2013).

Extra-household modules have been incorporated in household surveys. LSMS surveys have included community modules to show both the supply side and demand side of services within countries. A review of the World Bank survey database indicates that no community modules have been applied to the LSMS since 1997. Two LSMSs, in the Côte d'Ivoire and Jamaica, surveyed both schools and health facilities. These facility assessments were linked with household survey response data and did not provide statistical representation of the population of facilities nor populations in each country (World Bank, 2013). Similar methods have been conducted to link the DHS with SPA surveys with an example being Egypt in 2004 (Ministry of Health and Population et al, 2005).

MEASURE Evaluation, an organization that provides support for global population and health monitoring and evaluation, produced a guideline on how to conduct nationally representative health facility assessments within a household survey design scheme. Statistically, once the clusters have been selected for the household surveys, a “ring” of surrounding clusters are added and all the facilities within the new larger cluster are surveyed. Depending on the country and the amount of stratification desired a complete enumeration of larger facilities and certain types of facilities might need to be completed (MEASURE Evaluation, 2001).

Other future monitoring options include mapping tools and information and communication technologies (ICTs). Examples include tools developed by the non-governmental organizations (NGOs) Akvo and WaterAid. Both of these tools monitor community drinking-water sources (e.g. water taps and boreholes). Akvo FLOW is a smartphone application that uses open-source Android technology. FLOW has even been adopted at a national level by Liberia as their primary drinking-water monitoring tool (Akvo, 2013). The WaterAid Water Point mapper monitors drinking-water sources in rural and urban areas. WaterAid claims that this tool can help service sustainability issues, equity and transparency, access levels, financing needs, planning needs, water quality, and monitoring and evaluation trends (WaterAid, 2010).

The Waterpoint Data Transmitter developed at Oxford University in the UK is capable of measuring and transmitting handpump data via mobile phone networks. This tool is capable of modeling the frequency of handpump usage (e.g. number of pumps per day) and provides immediate feedback when a system becomes non-functioning (Thomson et al, 2012).

Indicators for monitoring extra-household settings

Indicators for schools and health facilities are presented in Tables 8 through 11. These are the two settings with the most global institutional support, existing monitoring systems in place, and represent an example on how indicators for other settings may look. Indicators are organized using a service level approach. Service levels are a mechanism by which to describe and differentiate between qualities of service or "ladders." (Kayser et al, in draft). Indicators organized by basic, intermediate, and high levels of service are described for three normative criteria for drinking-water as described by the Human Right to Water and

Sanitation: quality, availability and accessibility (Roaf et al, 2005). Indicators in Tables 8 through 11 were derived from several sources including WHO guidelines (Adams et al, 2008; Adams et al, 2009) and expert elicitation from experts on the post-2015 WaSH working groups (WHO/UNICEF JMP, 2012).

Table 8. Proposed aggregate WaSH indicators for schools and health facilities (WHO/UNICEF JMP, 2012)

Aggregate Indicators		
Setting	**Schools**	**Health Facilities**
Drinking-water	Percent of school children and teachers with access to a drinking-water source at school that is accessible to all	Percent of patients and staff at health facilities with access to a drinking-water source that is accessible to all
Sanitation	Percent of school children and teachers with access to gender-segregated sanitation facilities and adequate facilities for women and girls for menstrual hygiene that are accessible to all	Percent of patients and staff at health facilities with access gender-segregated to sanitation facilities and adequate facilities for women and girls for menstrual hygiene that are accessible to all
Hygiene	Percent of school children and teachers with access to handwashing stations with soap near the sanitation facility that are accessible to all	Percent of patients and staff at health facilities with access to handwashing stations with soap near the sanitation facility that are accessible to all

Table 9. Proposed indicators for basic levels of service for schools and health facilities (WHO/UNICEF JMP, 2012)

Basic Level Outcome Indicators		
Setting	**Schools**	**Health Facilities**
Drinking-water quality	Drinking-water source meets the criteria for an "improved" source with differentiated technology classifications for urban and rural settings	
Drinking-water availability	Drinking-water source is capable of delivering 5 liters per capita per day (lpcpd) (the proxy indicator being an improved source)	Drinking-water source is capable of delivering 30 lpcpd (the proxy indicator being an improved source)
Drinking-water accessibility	• Drinking-water source is located *within 500 meters* of the facility • Drinking-water source is accessible to all users, including adults and children, the elderly, and those with physical disabilities	
Sanitation accessibility	• Sanitation facility is accessible to all users, including adults and children, the elderly, and those with physical disabilities • Separate sanitation facilities are available for males and females	
Sanitation: Menstrual Hygiene Management (MHM)	Sanitation facility provides adequate MHM facilities that are used by women and by girls of menstruating age	
Sanitation toilet ratios (adapted from Adams et al, 2008, p. 22; Adams et al, 2009, p. 32)	• At least one toilet is available per 25 girls and at least one toilet for females school staff • At least one toilet plus one urinal (or 50 cm of urinal wall) are available per 50 boys, and at least one toilet for school staff	• At in-patient health centers, includes at least one toilet is available per 20 users • At out-patient health centers, includes at least four toilets – one for staff, female patients, male patients, and child patients are available
Hygiene	• Extra-household facility is equipped with handwashing stations that include soap and water and are inside or immediately outside the sanitation facility • Handwashing facilities are accessible to all users, including adults and children, the elderly, and those with physical disabilities	

Table 10. Proposed indicators for intermediate levels of service for schools and health facilities (WHO/UNICEF JMP, 2012)

Intermediate Level extra-household WaSH Indicators		
Setting	**Schools**	**Health facilities**
Drinking-water quality	Drinking-water source has <1 *E. coli* colony forming units (CFU) per 100 ml sample	
Drinking-water availability	Drinking-water service discontinuity is less than 2 days in 2 weeks	
Drinking-water access	• Drinking-water source is *on the facility premises* • Drinking-water source is capable of delivering a minimum of 50 lpcpd (proxy indicator being drinking-water source is on the facility premises and service discontinuity is less than 2 days in 2 weeks) • Drinking-water source is accessible to all users including adults and children, the elderly, and those with physical disabilities	
Sanitation accessibility	• "Safe management of excreta" (containment, extraction, and transport to a designated disposal or treatment site, safe reuse at the facility level) (WHO/UNICEF JMP, 2012) • Sanitation is accessible to all users, including adults and children, the elderly, and those with physical disabilities • Separate sanitation facilities are available for males and females	
Sanitation: MHM	Same indicators as basic level	
Hygiene	Same indicators as basic level	

Table 11. Proposed indicators for high levels of service for schools and health facilities (WHO/UNICEF JMP, 2012)

High Level extra-household WaSH Indicators		
Setting	**Schools**	**Health Facilities**
Drinking-water quality (Adams et al, 2008 and Adams et al, 2009)	Water meets WHO facility standards for a drinking-water source: 1. "*E. coli* or thermotolerant coliform are not detectable in any 100-ml sample 2. "Drinking-water from unprotected sources is treated to ensure microbiological safety 3. "Water meets WHO Guidelines for drinking-water quality or national standards concerning chemical and radiological parameters 4. "There are no tastes, odors or colors that would discourage consumption or use of the drinking-water. 5. "Water that is below drinking-water quality is used only for cleaning, laundry and sanitation and is labeled as such at every outlet" (Adams et al, 2009 p. 16-17)	
Drinking-water availability (Adams et al, 2008 and Adams et al, 2009)	"Sufficient water is available *at all times* for drinking, food preparation, personal hygiene, medical activities, cleaning and laundry" (Adams et al, 2009, p. 18).	
Drinking-water access	• Piped water is available *throughout the facility premises* • Piped water is accessible to all users including adults and children, the elderly, and those with physical disabilities	
Sanitation accessibility	Same indicators as intermediate level	
Sanitation: MHM	Same indicators as basic level	
Hygiene	Same indicators as basic level	

DISCUSSION

A typology for extra-household settings and monitoring initiatives was developed to categorize settings. A typology is useful because it helps systematically group setting types that have similar characteristics or common traits which helps to organize the state of knowledge. This is important from a monitoring perspective because it can contribute to the reduction of data costs, identifies duplications in monitoring efforts, and ensures all relevant settings are considered and enumerated. No other settings-based typology was discovered through the process of conducting this review.

Within the typology, however, there are caveats and challenges. For example, boarding schools may be considered long-term residences while agriculture is a very different workplace than an office building. Workplaces may benefit from further sub-categorization that group sub-settings into types with common risk factors such factories (sanitary conditions from production, heat, and intensive labor) and agricultural work settings (outdoors, changing environmental conditions, often spread out over large spaces). Regardless, each type provides commonalities where efficiencies can be gained. For example, while each mass gathering event is often quite different (e.g. a sporting event compared to a religious event), there may often be indirect transferability between settings (e.g. standards on portable toilet provision, deployment of handwashing stations, and strategic positioning of drinking-water stations).

For the purposes of enumerating facilities for monitoring, some settings are better defined than others. Schools, for example, are relatively straightforward and include settings for early age children (daycares and kindergartens) to primary and secondary schools, and universities for young adults. Others are more challenging to define, such as workplaces, due

to the diverse nature of the sub-setting types which range from agriculture to office buildings. Further challenges arise from informal workplaces. The ILO has attempted to define and identify informal work settings for the purposes of measuring economic impact yet characterizing, identifying, and enumerating all these settings is a persistent challenge (Hussmanns, 2004).

Health, economic, environmental, and educational benefits from WaSH in most extra-household settings are also limited. Three settings, schools, refugee camps, and ships, have had systematic reviews conducted that catalog WaSH evidence. These reviews include studies that show benefits from WaSH interventions in these settings and also include studies that identify the impact of poor conditions (Jasper et al, 2012; Cronin, 2011; Rooney et al, 2004). For the settings without systematic reviews, studies that examined extra-household evidence tend to focus on drinking-water quality issues and there were few studies identified that examined health impacts from WaSH provision. The lack of studies suggests that extra-household settings have not been prioritized within the WaSH sector research agenda.

There is no current international actor responsible for aggregating extra-household data to form global data sets. No consolidated global extra-household monitoring database was identified through this review. Schools and health facilities garner the most international attention and more data sets are publicly available for these settings from individual countries. These data sets are not necessarily comparable between countries due to differences in the indicators used to measure WaSH coverage and differences in methodological approaches. Table 12 describes tools, indicators and data sets available to each setting type.

At present, there is no systematic way to collect extra-household monitoring data sets. Not all reports and data sets are publicly available from national governments. Other data sets may exist but the institutional owners of the data may not recognize the value of the data they have or collect it in a representative manner. Two sources of data that likely exist but are frequently not publicly available are local monitoring initiatives and drinking-water quality regulator data. Unlocking these data could provide an enormous amount of WaSH access statistics for settings for which little publicly available data exists such as workplaces and markets. Because of these limitations, a systematic process could not be applied through this review to identify the number of existing global data sets for extra-household settings.

With mobile phone coverage and wireless broadband access expanding rapidly, including 79% penetration in the developing world and 5.9 billion subscriptions worldwide, it is important to consider data collected through mobile technology, smart phone applications ('apps'), and other "bottom up" collection methods as potential sources of monitoring data in the future (ICT, 2011). As these devices have become more ubiquitous, they become cost-effective tools for data collection if harnessed properly.

User reported data could be a source of data to build the evidence base on WaSH coverage in extra-household settings. For example, if a country uses a random sample facility survey, it is difficult to determine which facilities in any given region or district do not have access to WaSH facilities. User reported data can provide additional texture to these baseline facility surveys by identifying which systems are functional and document aspects of drinking-water quality over time.

Table 12. WaSH monitoring initiatives available for extra-household settings

Setting Type	Settings	Monitoring Initiatives including WaSH indicators	Level	Estimated number of publicly available country data sets
Schools	Schools	GLAAS, EMIS, facility surveys, project/program monitoring	Global, National, Local	60+
Health care facilities	Health care facilities	GLAAS, HMIS, SPA, SARA, facility surveys, project/program, district	Global, National, Local	30+
Workplaces	Workplaces	District	Local	< 5
Temporary use settings	Service settings	Sometimes local monitoring	Local	< 5
	Transit hubs	Sometimes local monitoring	Local	< 5
	Transit vessels	Sometimes local monitoring	Local	< 5
	Markets	Sometimes local monitoring	Local	< 5
	Places of worship	Sometimes local monitoring	Local	< 5
	Public WaSH facilities	Sometimes local monitoring	Local	< 5
Mass gatherings	Religious events, sporting events, etc.	None identified	None identified	None publicly available
Dislocated populations	Internally Displaced Persons Camps	UNHCR monitoring	Global	None publicly available
	Refugees	UNHCR monitoring	Global	None publicly available
	Prisons	None identified	None identified	None publicly available
	Orphanages	None identified	None identified	None publicly available

The importance of user reported data, such as "crowdsourced" SMS from cell phones, should not be discounted despite their current inability to collate nationally representative extra-household data. While the data quality and coverage is currently not viable for use by a global monitoring actor such as the Joint Monitoring Programme, these sources serve as a critical supplementary data layer. A protocol could be developed to set data quality standards to allow these data streams to feed into a global monitoring system which would provide a richer picture of WaSH coverage in certain sub-regions. As quality of these data streams continue to improve over time heading to 2030, these tools should be reexamined on how they can contribute to global monitoring.

Nationally representative household surveys are another initiative that could be leveraged to provide extra-household data. Extra-household facilities could be sampled within cluster randomized household survey designs. After clusters are selected, enumerators create a household listing by developing a complete numbered list of every household or dwelling within the cluster. Enumerators could map extra-household facilities during this process. In fact, many extra-household facilities are already documented as landmarks on household listing maps. Oversampling of settings would likely need to be conducted to capture a statistically valid national sample of facilities. The challenge with this approach, however, is that it results in a facility-based estimate rather than population-based estimate. A facility based approach heavily weights small facilities while a population based estimate reflects a more conventional human development outlook (MEASURE Evaluation, 2001).

CONCLUSION

Examples of successful monitoring systems exist in different world regions but not all countries are monitoring. At the global level, more capacity support from international actors, such as UNESCO, UNICEF, and WHO, are necessary to help ensure that monitoring initiatives are effective. National initiatives will benefit from clearly defined and robust indicators, the adoption or adaptation of internationally vetted standards and guidelines, and technical assistance for management and implementation of information systems and nationally representative surveys.

Much like existing JMP household data aggregation, a global extra-household monitoring system should interface and harmonize with national monitoring information systems, survey data, and other data streams. Collecting WaSH monitoring data from different sources poses challenges in terms of coordination and reconciling multiple data sources to generate globally comparable data. A global system will require that these data sources are representative, collected regularly, and validated.

International monitoring systems for extra-household settings require fewer but simple and robust indicators many of which are already included within existing data collection mechanisms. These mechanisms should include core, harmonized indicators proposed in this review for aggregation to international monitoring systems. Prioritizing monitoring and investing resources into capacity building for initiatives will help to improve data collection and allow for more efficient targeting of resources.

CHAPTER III: DRINKING WATER, SANITATION, AND HYGIENE BEYOND THE HOUSEHOLD: A SITUATIONAL ASSESSMENT OF GHANA ON MONITORING, POLICY, AND PRACTICE

INTRODUCTION

Extra-household settings (e.g. schools, health facilities, refugee camps) are being considered for drinking-water, sanitation, and hygiene (WaSH) targets in the post-2015 development agenda. The proposal by the High Level Panel of eminent persons on the post-2015 agenda have recommended that three of the four targets for WaSH include monitoring access in schools, health facilities, workplaces, and refugee camps (UN, 2013).

Cronk (2013) conducted a global review of extra-household settings and generated a typology, evaluated guidelines and standards, identified actors, assessed available evidence by setting, and generated a catalog of monitoring initiatives. Less is known about monitoring, policy, and practice at the national, regional, and district level within a country. This paper is a situational assessment of Ghana that examines how the concepts described in the global review occur in practice.

The burden of disease due to diarrhea in Ghana is estimated to be 20,300 deaths per year or 18 disability adjusted life years (DALYs) per 1000 capita per year (WHO, 2009). The World Bank estimates that Ghana loses 420 million cedis (US$290 million) annually due to poor sanitation which is equivalent to US$12 per person in Ghana per year or 1.6% of the national gross domestic product (World Bank, 2012). Improving WaSH in both household

and extra-household settings will contribute to improving health, educational, environmental, and economic outcomes in Ghana.

This situational assessment identifies WaSH monitoring actors, describes their roles and responsibilities, and describes how the actors conduct extra-household monitoring. For each setting, policies, standards, and monitoring systems are described. Finally, the proposed post-2015 extra-household indicators are compared to those existing in Ghana and recommendations for future improvements to Ghanaian monitoring systems are described.

METHODS

Literature search strategy

This situational assessment used a mixed methods approach to evaluate extra-household settings and monitoring in Ghana through a desk based literature review and field interviews with relevant monitoring staff. We reviewed PubMed, Web of Science, and Google Scholar, using the terms "Ghana," "drinking-water," "sanitation," and 'hygiene" in combination with terms associated with extra-household settings as described in Table 13 from Cronk (2013), terms related to monitoring and evaluation, and names of cities and towns in Ghana. We used the same set of terms on gray literature websites including the International Water and Sanitation Centre (IRC) knowledge base, the Water, Engineering and Development Centre (WEDC) knowledge base, and other online WaSH knowledge repositories. National ministry websites were searched for relevant policy documents. Through interviews, we solicited additional documents that were relevant to this study.

Table 13. Typology of Extra-household settings (from Cronk, 2013)

Type	Settings	Sub-settings (examples)
Schools	Schools	Daycare, nurseries, kindergarten, Primary/secondary schools, universities
Health care facilities	Health care facilities	Hospital, health center, clinic, dental surgery, general practitioner facility
Workplaces	Workplaces	Farm, military base, municipal building, office, factory
Temporary use settings	Service setting	Hotel, inn, cafeteria, canteen, fast food, restaurant
	Transit hubs	Rail station, bus station, ship port, truck stations (lorry parks)
	Transit vessels	Train, bus, ship, truck (lorry)
	Markets	Food market, grocery, etc.
	Places of worship	Church, mosque, synagogue, temple, etc.
	Public WaSH facilities	Public toilet, public drinking-water fountain
Mass Gatherings	Religious events, sporting events, etc.	Hajj, World Cup, Olympics, State events (e.g. funeral), fairs, festivals
Dislocated populations	Internally Displaced Persons camps	IDP camps
	Refugee camps	Refugee camps
	Prisons	Prisons, detentions, places of internment
	Orphanages	Orphan asylum, group homes, children's homes, refuges, rehabilitation centers, night shelters, youth treatment center

Interviews

Interviews were conducted with WaSH monitoring experts and staff at the district, regional, and national level in Ghana. Approval was provided by the University of North Carolina at Chapel Hill Institutional Review Board (#110226). Snowball sampling, which is a sampling procedure where interviewees recruit additional interviewees from among their colleagues, was employed to help validate the desk based literature review. The interview questions asked respondents to highlight the challenges faced in reality versus what is written in policy and guidelines, and also provide a snapshot of the current status of extra-household monitoring.

RESULTS

Actors Involved in WaSH Monitoring

Organizations and institutions that conduct WaSH monitoring were examined for their ability to provide data on WaSH in extra-household settings. Table 14 describes agencies that conduct extra-household monitoring.

Table 14. Extra-Household WaSH data availability from WaSH monitoring actors

Actor	Setting data collected	Levels of aggregation	Frequency of collection/ reporting	Reporting format	Publicly Available?
Ghana Statistical Services (GSS)	Health facilities	National coordination	Baseline in 2002	Service Provision Assessment (SPA)	Yes
Environmental Health and Sanitation Directorate (EHSD)	All extra-household sanitation	National coordination	Annual	NESSAP	No
Ministry of Education, Sports, and Science (MoESS)	School water & sanitation	National coordination	Annual	EMIS, Education sector performance reports	No
Environmental Health Officers (EHOs)	All extra-household sanitation	District collection and coordination	Annual	DESSAP	No

The Ghana Statistical Service (GSS) is responsible for administering most nationally conducted surveys such as the Demographic and Health Survey (DHS), Service Provision Assessment (SPA), and the national census. Interviewees confirmed that the GSS has no involvement in validating the quality of any extra-household WaSH data sources (e.g. such as the Educational Management Information System) with the exception being the Service Provision Assessment (SPA) which collects data on health facilities (GSS, 2003).

The Environmental Health and Sanitation Directorate (EHSD) is responsible for national coordination of the activities involved in the sanitation sector. National policy, established through the National Environmental Sanitation Strategy and Action Plan (NESSAP), states that sanitation monitoring should occur at the district level through

guidance from the District Environmental Sanitation and Action Plan (DESSAP) (Ministry of Local Government, 2010). District level sanitation data is generated annually in Ghana including many extra-household settings as described in Table 13 (Ministry of Local Government 2007).

The Ministry of Education, Science, and Sports (MoESS) is responsible for monitoring schools through the annual Educational Management Information System (EMIS). Environmental Health Officers (EHOs) educate communities on sanitation and hygiene and enforce regulations regarding the construction, use, and management of public, institutional, and household facilities. The EHOs are responsible for collecting and compiling data for the DESSAPs (Ministry of Local Government 2007).

Extra-household settings in Ghana

The Education Strategic Plan (2010-2020) includes WaSH under policy objective QE12 which is to expand and improve school health, sanitation, and safety systems. The policy goal is to have 100% of basic education schools with adequate WaSH by 2015. Additionally, the plan states that all schools shall be rehabilitated in terms of safety, sanitation, and health by the end of 2015 (MoESS, 2010).

There are currently no standards for drinking-water and hygiene in schools in Ghana. The CWSA provides the standard of 50 students per drop hole for sanitation at schools (CWSA, 2008). Interviewees indicated that a set of standards based on the WHO guidelines for schools in low-cost settings are in development.

The Ghana EMIS collects data on drinking-water and sanitation in schools. USAID sponsored a review that evaluated the system. The EMIS collects data through an annual census distributed to schools. The Ministry of Education, Science, and Sports (MoESS)

conducts the census annually. Data are collected from all Ghanaian districts and all school types and grade levels including public and private sector crèches (daycare), kindergartens, primary schools, junior high schools, basic schools, and senior high schools (USAID, 2011).

The head of the school fill out the census forms and the data are compiled in the respective districts. These data are then aggregated nationally for statistical analysis. The response rate nationwide is 95%. The EMIS survey collects data for each individual school facility on the number of school children at the building which provides a population multiplier. Quality checks are supposed to occur at the district level but the USAID report indicated that statistically valid checks rarely occur. Data quality checks occur infrequently because monitoring occurs at the end of the budget cycle and funds for quality control are rarely available (USAID, 2011).

In addition to the EMIS, sanitation data in schools is also generated at the district level through the EHOs and compiled in the DESSAP. The data collected in the DESSAP only contains the number of schools with toilets in the district and the type of toilet facility (e.g. ventilated improved pit latrine or flush toilet). The DESSAP does not indicate which specific schools or school types (e.g. primary, secondary) have toilets (Ministry of Local Government 2007).

A review of Ghanaian health care policy revealed no mention of WaSH for health facilities. No WaSH standards for health facilities in Ghana were identified. Data on health facilities are provided by the Health Management Information System (HMIS) which collects information on health facilities and health including both public and private facilities. This system, however, does not collect WaSH data. WaSH in health care settings in Ghana was

monitored once through a Service Provision Assessment (SPA) which is a health facility assessment survey (GSS et al, 2003).

In the 2002 SPA, 75.2% of facilities assessed had basic amenities including a clean environment and a functioning toilet. Most facilities had electricity connectivity (85.4%) and 71.3% had an onsite source of water year-round. Hygiene had lower coverage. All facilities had some infection-prevention measures but only 4.1% had all infection prevention items which included water for handwashing, soap, single use towels, puncture proof boxes, chlorine solution for decontamination and clean latex gloves. Waste disposal systems were also lacking with only 13.5% having adequate systems. Similarly, all regional hospitals had water available routinely, while 97.4% of district/mission hospitals and 60.7% of health centers reported a constant water source, for an overall availability of 71.3% of facilities surveyed. The Ashanti region had the lowest water coverage with only 50.3% of facilities meeting coverage criteria. Overall, 50.3% of facilities surveyed met the criteria for all basic amenities (toilet, shelter, cleanliness, electricity, and drinking-water) (GSS et al, 2003).

The Environmental Health and Sanitation Directorate (EHSD) conducts sanitation monitoring through the District Environmental Sanitation Strategy and Action Plan (DESSAP). The guidance for the DESSAP comes from the National Environmental Sanitation Strategy and Action Plan (NESSAP). The NESSAP guidance recognizes that the quality of information will differ due to the decentralized nature of monitoring but suggests that as annual reporting is conducted, the quality will improve (Ministry of Local Government, 2010).

DESSAPs were developed by all 170 Districts. Two completed DESSAPS acquired from Abura Sebu Kwamankese and Hohoe district assemblies confirm that extra-household

sanitation data are in fact collected. Other figures in the NESSAP appear to be aggregated from the DESSAP suggesting that sanitation data is likely aggregated nationally in some form but are not publicly released (Ministry of Local Government, 2010).

The DESSAP indicates that sanitation in many extra-household settings is monitored including: "communal or neighborhood toilets, markets, lorry stations, hotels, restaurants, chop bars, slaughter slabs, schools, police/army/prison barracks, prison complexes, health facilities (specifically hospitals, clinics, and maternities), offices, and industrial premises" (Ministry of Local Government, Rural Development and Environment, 2007, p. 17). Additional data collected include the number of toilets, the estimated number of users, and the type of sanitation facility.

Comparing Ghana to Proposed indicators in the Post-2015 agenda

Indicators used in existing Ghanaian extra-household monitoring initiatives were compared to those proposed by Cronk (2013) for the post-2015 agenda. Table 15 (schools) and Table 19 (health facilities) describe the unit of evaluation, the data collection method, sampling approach, and the population multiplier. The unit of evaluation is the individual unit by which the access statistics are calculated (e.g. one primary school). The population multiplier is the sum of the individuals using the facility (e.g. number of students and staff at the primary school). Table 16 (schools) and Table 20 (health facilities) describe inputs which are the costs, budgets, and financing of WaSH services. Table 17 (schools) and Table 21 (health facilities) describe enabling environments which are the capacity of the WaSH sector to deliver services. Table 18 (schools) and Table 22 (health facilities) describe the indicators available for monitoring in Ghana as compared to those proposed for the post-2015 agenda.

Table 15. School evaluation units used in Ghana (WHO/UNICEF JMP, 2012)

Setting	Proposed school units for measurement	Units of measurement available for Ghana schools
Unit of Evaluation	Individual school facility (single location facility/campus, not multi-locations under single management, both public and private) disaggregated by number of students	School Status (public, private registered, private not registered) Select which levels are found in the school (Nursery/Crèche, Kindergarten, Primary, Jr. High) Urban or Rural
Data collection method and sampling approach	EMIS census (complete enumeration), facility survey (random sample)	EMIS Census
Population Multiplier	Number of children attending/enrolled and number of staff	Summary pupil count: Pupils/teachers in each Nursery/Crèche, Kindergarten, Primary, Jr. High and senior high

Table 16. Input indicators for schools in Ghana (adapted for extra-household settings from Roaf, 2005)

Input Indicators	Ghana
What percentage of the national water and sanitation budget and of local authority water and sanitation budgets are allocated for the provision of extra-household WaSH facilities? (%) (Roaf, 2005, p. 26)	**Unknown (likely exists, but no publicly available data)**

Table 17. Enabling environment indicators for schools in Ghana (adapted for extra-household settings from Roaf, 2005)

Enabling Environment Indicators
Is extra-household WaSH included in national policies for each setting category? **Yes**
Does the policy include consideration for disadvantaged and marginalized populations? **Yes**
Are national WaSH-related standards defined in each extra-household setting? **No**
Are goals defined in national policy for the achievement of universal coverage of extra-household WaSH facilities? **Yes**
Is there an entity undertaking monitoring of each extra-household setting type? **Yes, Ministry of Education**

Table 18. Basic level indicators for schools in Ghana (WHO/UNICEF JMP, 2012)

Basic Level Outcome Indicators		
Setting	**Schools**	**Ghana**
Drinking-water quality	Drinking-water source meets the criteria for an "improved" source with differentiated technology classifications for urban and rural settings	1. "Does your school own a safe water facility (Yes/No) 2. "What type of safe water facility is available (Pipe borne water, borehole, well, other)" (MoESS, 2012)
Drinking-water availability	Drinking-water source is capable of delivering 5 liters per capita per day (lpcpd) (the proxy indicator for availability being an improved source)	• Same as quality • No data collected on functionality
Drinking-water accessibility	• Drinking-water source is located *within 500 meters* of the facility • Drinking-water source is accessible to all users, including adults and children, the elderly, and those with physical disabilities	No specific question, see question in Quality
Sanitation accessibility	• Accessible to all users, including adults and children, and those with physical disabilities • Separate facilities for males and females	"How many individual toilet seats are available? (Boys: #, Girls: #)" (MoESS, 2012)
Sanitation MHM	Sanitation facility provides adequate MHM facilities that are used by women and by girls of menstruating age	No indicators included
Sanitation toilet ratios (adapted from Adams et al, 2008, p. 22; Adams et al, 2009, p. 32)	• At least one toilet is available per 25 girls and at least one toilet for females school staff • At least one toilet plus one urinal (or 50 cm of urinal wall) are available per 50 boys, and at least one toilet for school staff	• See indicator for accessibility • "How many individual toilet seats are functional? (Boys: #, Girls: #) • "Are urinals available and functional? (Yes/No)" (MoESS, 2012)
Hygiene	• Extra-household facility is equipped with handwashing stations that include soap and water and are inside or immediately outside the sanitation facility • Handwashing facilities are accessible to all users, including adults and children, the elderly, and those with physical disabilities	No indicators included

Table 19. Health facility evaluation units used in Ghana (WHO/UNICEF JMP, 2012)

Setting	Health facilities	Ghana Health facilities
Unit of Evaluation	Individual health facility (single facility, both public and private)	Same as proposed
Data collection method and sampling approach	SARA/SPA, random sample; HMIS census, complete enumeration	SPA
Multiplier	Number of patients attending, people waiting, and staff	Facility

Table 20. Input indicators for health facilities in Ghana (adapted for extra-household settings from Roaf, 2005)

Input Indicators	Ghana
What percentage of the national water and sanitation budget and of local authority water and sanitation budgets are allocated for the provision of extra-household WaSH facilities? (%) (Roaf, 2005, p. 26)	**Unknown**

Table 21. Enabling environment indicators for health facilities in Ghana (adapted for extra-household settings from Roaf, 2005)

Enabling Environment Indicators
Is extra-household WaSH included in national policies for each setting category? **No**
Does the policy include consideration for disadvantaged and marginalized populations? **Yes (but not monitored)**
Are national WaSH-related standards defined in each extra-household setting? **No**
Are goals defined in national policy for the achievement of universal coverage of extra-household WaSH facilities? **No**
Is there an entity undertaking monitoring of each extra-household setting category? **GSS and Ministry of Health through SPA (but only once)**

Table 22. Basic level indicators for health facilities in Ghana (WHO/UNICEF JMP, 2012)

Basic Level Outcome Indicators		
Setting	**Health facilities**	**Ghana SPA**
Drinking-water quality	Drinking-water source meets the criteria for an "improved" source with differentiated technology classifications for urban and rural settings	"What is the commonly used source of water for the facility at this time of year? (list)" (GSS et al, 2003, p. 285)
Drinking-water availability	Drinking-water source is capable of delivering 30 lpcpd (the proxy indicator for availability being an improved source)	Same as for drinking-water quality
Drinking-water accessibility	• Drinking-water source is located *within 500 meters* of the facility • Drinking-water source is accessible to all users, including adults and children, the elderly, and those with physical disabilities	"Is this water source available on-site?" (GSS et al, 2003, p. 285)
Sanitation accessibility	• An improved sanitation facility is accessible to all users, including adults and children, the elderly, and those with physical disabilities • Separate sanitation facilities are available for males and females	"Is there a toilet (latrine) in functioning condition which is available for clients use? (Yes, verified; Yes, not verified; No)" (GSS et al, 2003, p. 285)
Sanitation MHM	The improved sanitation facility provides adequate MHM facilities that are used by women and by girls of menstruating age	No indicator included
Sanitation toilet ratios (adapted from Adams et al, 2008, p. 22; Adams et al, 2009, p. 32)	• At in-patient health centers, includes at least one toilet is available per 20 users • At out-patient health centers, includes at least four toilets – one for staff, female patients, male patients, and child patients are available	No indicator included
Hygiene	• Extra-household facility is equipped with handwashing stations that include soap and water and are inside or immediately outside the sanitation facility • Handwashing facilities are accessible to all users, including adults and children, the elderly, and those with physical disabilities	"Water for hand-washing" (GSS et al, 2003, p. 323)

DISCUSSION

Challenges to Monitoring Schools

For schools, monitoring concerns revolve around the consistency, reliability, and accessibility of the EMIS data. Annual collection often takes longer than expected, delays

occur in reporting, and stakeholders who use the data find it less useful when it is late. Because the school surveys occur late in the budget cycle, there is often limited funding remaining for quality control which results in considerable impact on data quality. Cost and time saving measures frequently include some censuses filled out by secondary reviewers such as someone from a district or regional office. Verification of the data through small random samples rarely occur, so data accuracy is unknown (USAID, 2011).

Another challenge is the lack of a master national list of schools. The national MoESS staff rely on the districts to distribute the surveys to all the schools within their area. The districts maintain school lists but these are not organized in a database or kept current. Some schools are not included within the census and literature indicated that these are frequently private schools that are attempting to avoid paying taxes. The census coverage, however, is estimated to be 95% which is robust (USAID, 2011).

In terms of collecting data, another challenge is that the data are generated through a census filled out by school teachers. Any higher level post-2015 indicators that incorporate drinking-water quality or other more complicated measures will require trained personnel to collect information or test the drinking-water. Through interviews, it did not appear that water sector actors at the district and region level are aware that school drinking-water and sanitation data is being collected through the EMIS. Interviewees indicated that information sharing is often a challenge and occurs infrequently.

Challenges to monitoring health facilities

The only health facility monitoring in Ghana has occurred through a SPA conducted in 2002 which is not sufficient to measure progress. For the HMIS, a draft report on health information management in Ghana produced by the Health Metrics Network of the World

Health Organization evaluated the Ghana HMIS. While there is a well-established and clearly defined core set of indicators on health, it does not incorporate WaSH indicators. The HMIS could be a mechanism by which to collect WaSH health facility data if these indicators were included (WHO, 2007).

Challenges to Monitoring Other Settings

Data on sanitation for most extra-household settings defined by the typology are collected through the Environmental Health and Sanitation Division and the DESSAP reports. Settings in the DESSAP report are not clearly defined. The only indicator on sanitation that is collected is whether or not the facility has a toilet and drinking-water and hygiene are not considered. There is no disaggregation for number of sanitation facilities, gender, or functionality of the sanitation facility.

Trends in coverage

Attempts were made to show trends in drinking-water and sanitation coverage in schools. The only full EMIS data set was obtained from UNICEF for the 2011/2012 school year (MoESS, 2012). Data from 2002, 2004/2005, and 2007/2008 were extracted from various MoESS policy documents (Government of Ghana, 2003; MoESS, 2008). Within these documents, coverage figures were reported only for public primary schools and these reports did not show national aggregation figures for all schools (e.g. secondary, university). As indicated by Table 23, drinking-water coverage appears to have improved while sanitation coverage appears to have remained constant since 2002.

Table 23. School water and sanitation coverage in Ghana

Public Primary Schools	**2002/2003** (Government of Ghana, 2003)	**2004/2005** (MoESS, 2008)	**2007/2008** (MoESS, 2008)	**2011/2012** (MoESS, 2012)
Drinking-water	38%	42.8%	63%	59.8%
Sanitation	68%	55%	48%	64.5%

The 2008 Preliminary Education Sector Performance Report identified substantial sub-national inequality with drinking-water coverage ranging from 13% to 98% between districts. Sanitation ranged from 9% to 93%. The Northern regions tended to have the lowest coverage rates among all regions which suggest an uneven investment in resources throughout the country (Ministry of Education, Science and Sports. 2008).

Using existing data sets, we attempted to compare the data between the DESSAP and EMIS. The only available district level EMIS data was from the 2011/2012 EMIS raw results (MoESS, 2012). Two 2009 DESSAPs were acquired from the Hohoe Municipal Assembly (MA) and the Abura Asebu Kwamankese District Assembly (DA) and sanitation coverage rates were compared in Table 24 (Hohoe Municipal Assembly, 2010; Abura Asebu Kwamankese District Assembly, 2010). While it would certainly be desirable to compare data from the same year, the coverage rates appear to be somewhat compatible with increasing trends in coverage between 2009 and 2011.

Table 24. School sanitation coverage in Ghana

Sanitation Coverage (Number of Toilets)	**2009 DESSAP** (Hohoe Municipal Assembly, 2010; Abura Asebu Kwamankese District Assembly, 2010)	**2011/2012 EMIS** (MoESS, 2012)
Hohoe MA	225	248
Abura Asebu Kwamankese DA	164	223

Existing EMIS Census versus Proposed WaSH Indicators for Schools

The existing EMIS census asks questions that allow for data disaggregation for public versus private, multi-campus sites, number of school children within each grade level, and urban versus rural. This matches the requirement necessary for the proposed unit of evaluation and population multiplier.

The current indicators for drinking-water in the Ghana EMIS should be harmonized to match the proposed post-2015 indicators in Cronk (2013). In terms of quality and

availability, the drinking-water question in the EMIS survey does not provide enough options to select from the entire list of "improved" technologies. The definition of "safe water facility" is also not provided and may introduce confusion and lack of consistency among census responders, school teachers or headmasters who are not necessarily WaSH experts. There are neither questions about availability of the supply nor questions about the accessibility of the drinking-water source in terms of distance from the school or accessibility by all students. There are questions, however, in the EMIS census that ask about the number of disabled children at the school but not whether they are able to use drinking-water or sanitation facilities (MoESS, 2012).

For sanitation, the indicators for sanitation mostly align with those proposed with the exception of indicators on menstrual hygiene management. There are no hygiene indicators in the EMIS census. In terms of inputs and enabling environment indicators, WaSH in schools is included in national education policy and also includes consideration of marginalized and disadvantaged populations despite the lack of appropriate indicators in the census. Budget figures for WaSH in schools investment could not be identified through publicly available documents.

Existing Health Facility SPA versus Proposed WaSH Indicators for Health Care Settings

The existing SPA survey asks questions that allow for data disaggregation for public and private, multi-facility sites, and urban and rural. This matches the requirement for unit of evaluation. The SPA does not collect data on patient numbers so a population multiplier cannot be calculated. The current indicators for drinking-water are sufficient for measuring basic level service. Sanitation and hygiene indicators are in line with the proposed post-2015 indicators with the exception of menstrual hygiene management.

In terms of input and enabling environment indicators, consideration for WaSH was not found in any national policy documents. There was no mention of standards or goals for reaching a certain national level of coverage. The budget figures for investment in WaSH in health care facility settings could not be identified through publically available documents. The Ghana Statistical Service has been responsible for conducting the SPA in collaboration with the Ministry of Health. These surveys are not conducted with enough frequency to be useful for national and global monitoring.

Study limitations

Readily available public information is difficult to find on WaSH in extra-household settings in Ghana. Many of the reporting data are poorly defined (e.g. reports indicating "school drinking water coverage" data point were often unclear as to whether or not this included public/private and primary/secondary schools). Best efforts were made to present information as accurately as possible and all attempts were made to validate and cross-reference information in interviews with relevant extra-household monitoring stakeholders and triangulation of data sources.

CONCLUSIONS AND RECOMMENDATIONS

Ghana has several initiatives in place that could be used to monitor WaSH in extra-household settings for the post-2015 development agenda. Schools are monitored through the EMIS. Health facilities have baseline data from a SPA. Most other extra-household sanitation is monitored through the NESSAP. While these initiatives provide a mechanism by which to collect data, improvements are necessary to generate more up-to-date and accurate information for reporting.

The government could make existing monitoring more useful to the WaSH sector and development partners by making more of it publicly available. While the data is certainly not perfect and may lack quality control, basic coverage figures and transparency in the reporting process will help inform decision-makers and policy-makers. The Ghana Statistical Service should be integrated within monitoring processes to ensure quality and validity of data.

EHSD collects sanitation data in schools in addition to the MoESS. These data should be compared as a quality control mechanism and/or combined in some manner to reduce duplication of efforts. The MoESS should work with WaSH sector partners who have the capacity to conduct drinking-water quality testing to begin to work to achieve intermediate service levels in schools and gain a better understanding of drinking-water safety in schools.

The following are specific recommendations for each setting and the actors who are affiliated with each setting. For schools, external support agencies such as UNICEF should provide capacity building support to the EMIS system, help to establish uniform standards, and ensure that WaSH indicators are harmonized with international monitoring efforts. The reporting should be clearer, allow for disaggregation, and also add indicators that are useful for Ghanaian stakeholders. The national government and the MoESS should ensure that the data is aggregated and released in a timely manner so that the data will be useful and relevant to planners at the district and regional level. These data should also be released publicly in locations such as the MoESS website. Adequate funding should be provided to the districts to ensure that all schools complete a census rather than a district official completing the form without physical observation of the WaSH facilities at schools. Districts should ensure that the data are collected in a timely manner.

For health facilities, in the continued absence of WaSH indicators in the HMIS, dedicated facility surveys coordinated by the GSS can provided updated status on conditions. There are currently no national standards for WaSH in health facility settings. The Ministry of Health should adopt or adapt the WHO essential environmental health standards in health care (Adams et al, 2009). External support agencies should provide capacity support to conduct health facility assessments on a regular basis. The national government and the Ghana Statistical Service (GSS) should be responsible for conducting the surveys. The Ministry of Health should incorporate WaSH indicators into the HMIS.

Other extra-household settings as described by the typology currently have no clear monitoring framework. It is also unclear from publicly available literature whether or not the data are aggregated to the national level. While almost all extra-household sanitation is monitored through the EHSD, it is unclear if quality control occurs. Extra-household drinking-water sources other than schools and health facilities do not appear to be monitored.

IV. CONCLUSION

The global review demonstrates that extra-household settings can be cataloged in a typology that provides efficiencies toward the development of indicators and determining analogous factors between setting types. Settings such as mass gatherings, markets, and health facilities frequently lack evidence of health, economic, and environmental impacts. Settings frequently lack appropriate internationally recommended standards and guidelines for adequate WaSH service provision (e.g. transit settings, markets, workplaces, mass gatherings). In terms of monitoring and indicators, there are challenges for indicator comparability between systems, data providers (e.g. are school teachers able to provide accurate data about water and sanitation systems?), and quality control.

The situational assessment helped to validate the global review by demonstrating that extra-household monitoring initiatives are in place but need improvements. Ghana has a strong system for schools, has previously monitored health facilities, and has environmental officers who monitor sanitation in many other extra-household settings. However, standards are inadequate, policies to foster the enabling environment for extra-household settings are deficient, and limited collaboration occurs between ministries and implementing partners.

Despite these challenges globally and in Ghana, there are many monitoring initiatives worldwide that currently collect data on WaSH in extra-household settings. Harmonizing indicators between existing national initiatives and those proposed for the post-2015 agenda will allow for data comparability between countries. Prioritizing resources for monitoring

will improve data collection, help countries more efficiently allocate resources, and invest in WaSH to improve health, environmental, and economic outcomes.

Future research areas include cataloging and evaluating existing standards, guidelines, baseline data sets, and indicators for WaSH in schools as adopted by different national governments. A review on this topic would provide further insight into the current state of WaSH in schools globally and provide the first baseline estimate of global coverage from disparate data sets. Additional country situational assessments on extra-household monitoring will help gain further insight into how these systems function, what policies countries have in place, and understanding the barriers to sustainably and scalability. Research to develop tools such as a WaSH in schools index would provide policy makers with a mechanism by which to examine the enabling environment in countries and hold them accountable to internationally recognized WaSH goals and targets.

REFERENCES

Abrahams, N., S. Mathews, et al. (2006). "Intersections of 'sanitation, sexual coercion and girls' safety in schools'." Tropical Medicine and International Health 11(5): 751-756.

Abura Asebu Kwamankese District Assembly. (2010). District Environmental Sanitation Strategy and Action Plan.

Adams, J., Bartram, J., & Chartier, Y. (2008). Essential environmental health standards in health care. World Health Organization, Geneva. Retrieved 15 July 2013 from http://whqlibdoc.who.int/publications/2008/9789241547239_eng.pdf

Adams, J., Bartram, J., Chartier, Y., & Sims, J. (2009). Water, Sanitation and Hygiene Standards for Schools in Low-cost Settings. World Health Organization, Geneva. Retrieved 15 July 2013 from http://www.who.int/water_sanitation_health/publications/wash_standards_school.pdf

Akvo. (2013). Introducing Akvo FLOW. Retrieved 15 July 2013 from http://www.akvo.org/web/introducing-akvo-flow

Alva, S., Kleinau, E., Pomeroy, A., Rowan, K. (2009). Measuring the Impact of Health Systems Strengthening: A Review of the Literature. US Agency for International Development, Washington, DC. Retrieved 17 July 2013 from http://transition.usaid.gov/our_work/global_health/hs/publications/impact_hss.pdf.

Bailey, K. D. (Ed.). (1994). Typologies and taxonomies: an introduction to classification techniques (Vol. 102). Sage.

Bartram, J (2008) Improving on haves and have nots. Commentary, Nature Vol 452\20 March 2008.

Bartram J, Cairncross S (2010) Hygiene, Sanitation and Water: Forgotten Foundations of Health. PloS Med e367: doi:10.1371/ journal.pmed.1000367.

Beaver, A. (n.d.) accommodation types. In *A Dictionary of Travel and Tourism*. Oxford University Press. Retrieved 11 July 2013 from http://www.oxfordreference.com/view/10.1093/acref/9780191733987.001.0001/acref-9780191733987-e-112

Cairncross, S., Bartram, J., Cumming, O., & Brocklehurst, C. (2010). Hygiene, sanitation, and water: what needs to be done? PLoS medicine, 7(11), e1000365. doi:10.1371/journal.pmed.1000365

Cronin, A., and Shrestha, D. (2008). A review of water and sanitation provision in refugee camps in association with selected health and nutrition indicators-the need for

integrated service provision. Journal of water and health, 1–13. doi:10.2166/wh.2007.019

Cronk, Ryan. (2013). A Review of Drinking Water, Sanitation, and Hygiene Beyond the Household: Settings, Monitoring, and Policy Implications.

Darvill, T. (2008). market. In *The Concise Oxford Dictionary of Archaeology*. Oxford University Press. Retrieved 11 Jul. 2013 from http://www.oxfordreference.com/view/10.1093/acref/9780199534043.001.0001/acref-9780199534043-e-2415

DISE. (2013). District Information System for Education. Retrieved 16 July 2013 from http://www.dise.in/

El-Zanty & Associates. (2009). Djibouti School Hygiene and Sanitation Survey. Retrieved 16 July 2013 from http://www.WaSHinschoolsmapping.com/projects/Djibouti.html

Freeman et al. (2013). Equity of Access to WASH in Schools. A Comparative Study of Policy and Service Delivery in Kyrgyzstan, Malawi, the Philippines, Timor-Leste, Uganda and Uzbekistan. UNICEF, New York, NY. Retrieved 15 July 2013 from http://www.unicef.org/wash/schools/files/Equity_of_Access_to_WASH_in_Schools(1).pdf

Ghana Statistical Service (GSS), Health Research Unit, Ministry of Health, and ORC Macro. (2003). Ghana Service Provision Assessment Survey 2002. Calverton, Maryland: Ghana Statistical Service and ORC Macro. Retrieved 11 July 2013 from http://www.measuredhs.com/pubs/pdf/SPA6/SPA6.pdf

Government of Ghana (2003). National Action Plan Education for All: Ghana 2003-2015. Ministry of Education, Youth and Sports. Retrieved 11 July 2013 from http://planipolis.iiep.unesco.org/upload/Ghana/Ghana%20EFA%20NAP%20Finalised%20Version.pdf

Groce, N., Bailey, N., Lang, R., Trani, J. F., and Kett, M. (2011). Water and sanitation issues for persons with disabilities in low- and middle-income countries: a literature review and discussion of implications for global health and international development. Journal of water and health, 9(4), 617-27. doi:10.2166/wh.2011.198

Harris & Emmertt. HelpAge. (2012). Rio + 20 : The emerging challenge of an ageing world. Retrieved 26 June 2012 from http://www.helpage.org/download/4fd5db3ccbb7d

Hohoe Municipal Assembly. (2010). District Level Environmental Sanitation Strategy and Action Plan.

Hussmanns, Ralf. (2004). Statistical definition of informal employment: Guidelines endorsed by the Seventeenth International conference of Labour Statisticians (2003). International Labour Office. Geneva, Switzerland.

Hutton G, Rodriguez UE, Napitupulu L, Thang P, Kov P. (2008). World Bank, Water and Sanitation Program, Economic impacts of sanitation in Southeast Asia. Retrieved 18 July 2013 from http://www.wsp.org/sites/wsp.org/files/publications/Sanitation_Impact_Synthesis_2.pdf

International Committee of the Red Cross (ICRC). (2005). Water, Sanitation, Hygiene and Habitat in Prisons. Retrieved 25 June 2012 from http://www.icrc.org/eng/assets/files/other/icrc_002_0823.pdf

ILO. (2009). Work improvement in small enterprises (WISE) Action Manual. International Labor Office, Geneva.

International Telecommunication Union (ITU). 2011. The World in 2011. ICT Facts and Figures 2011. Retrieved 9 April 2012 from http://www.itu.int/ITU-D/ict/facts/2011/material/ICTFactsFigures2011.pdf

Jasper, C., Le, T., and Bartram, J. (2012). Water and Sanitation in Schools: A Systematic Review of the Health and Educational Outcomes. International Journal of Environmental research and Public Health.

K4Health. (2013). Demographic and Health Surveys Toolkit. Retrieved 15 July 2013 from http://www.k4health.org/toolkits/dhs

Kayser, G., Moriarty, P., Fonseca, C., Bartram, J. (In Draft). Drinking Water Service Delivery Indicators and Frameworks for Monitoring, Evaluation, Policy and Planning: A Review.

Last, J. (Ed.). (2007). orphanage. In *A Dictionary of Public Health*. Oxford University Press. Retrieved 11 July 2013 from http://www.oxfordreference.com/view/10.1093/acref/9780195160901.001.0001/acref-9780195160901-e-3256

Last, J. (Ed.). (2007). Refugee camp. In *A Dictionary of Public Health*. Oxford University Press. Retrieved 11 July 2013 from http://www.oxfordreference.com/view/10.1093/acref/9780195160901.001.0001/acref-9780195160901-e-3849

Last, J. (Ed.). (2007). restaurant. In *A Dictionary of Public Health*. Oxford University Press. Retrieved 11 July 2013 from http://www.oxfordreference.com/view/10.1093/acref/9780195160901.001.0001/acref-9780195160901-e-3906

Measure DHS. (2013). SPA Overview. Retrieved 11 July 2013 from http://www.who.int/healthinfo/systems/sara_introduction/en/index.html

Measure Evaluation. (2001). Sampling Manual for Facility Surveys for Population, Maternal Health, Child Health and STD Programs in Developing Countries. MEASURE Evaluation Manual Series, No. 3**.** Carolina Population Center, University of North Carolina at Chapel Hill.

MEASURE Evaluation. (2005). Profiles of Health Facility Assessment Methods. US Agency for International Development, Washington, DC.

Ministry of Education, Science and Sports. 2008. Preliminary Education Sector Performance Report 2008. Retrieved 11 July 2013 from http://www.idpfoundation.org/Ghana%20MoE%20Ed%20Performance%20Report%202010.pdf

Ministry of Health and Population, El-Zanaty Associates, and ORC Macro. (2005). Egypt Service Provision Assessment Survey 2004. Calverton, Maryland, USA: Ministry of Health and Population and ORC Macro. Retrieved 11 July 2013 from http://www.measuredhs.com/pubs/pdf/SPA7/SPA7.pdf

Ministry of Local Government, Rural Development and Environment. 2007. Draft Handbook for Preparation of District Environmental Sanitation Strategy and Action Plan (DESSAPs). Republic of Ghana. Retrieved 11 July 2013 from http://wcghana.com/reports/district_environmental_sanitation_strategy_and_action_plan_handbook.pdf

Ministry of Local Government, Rural Development and Environment. 2010. National environmental sanitation strategy and action plan: materials in transition. Environmental Health and Sanitation Directorate, Republic of Ghana.

MoESS. (2012). 2011/2012 Education Profiles. Accra, Ghana.

National University of Educational Planning and Administration (NUEPA). (2012). District Education Systems for Education (DISE). Retrieved 11 July 2013 from http://www.dise.in

Rooney RM et al. (2004). A review of outbreaks of waterborne disease associated with ships: evidence for risk management. Public Health Reports, 119:435–442.

Roaf, V., Khalfan, A., & Langford, M. (2005). Monitoring implementation of the right to water: a framework for developing indicators. Berlin: Heinrich Böll Stiftung.

Sanfey, P. (2010). Earnings inequality and the informal economy: evidence from Serbia. ILO Working Papers. Retrieved from http://ideas.repec.org/p/ebd/wpaper/114.html

Sphere Project. (2011). Humanitarian Charter and Minimum Standards in Humanitarian Response. Retrieved 26 June 2012 from http://www.sphereproject.org/resources/download-publications/?search=1&keywords=&language=English&category=22

Spratt, J., Cummiskey, C., Mulcahy-Dunn, A. (2011). Information for Education Policy, Planning, Management, and Accountability in Ghana: Report of Findings of the Data Capacity Assessment of Ghana's Education Sector. Prepared for the United States Agency for International Development. RTI International, Research Triangle Park, North Carolina, USA.

Thomson, P., Hope, R., & Foster, T. (2012). GSM-enabled remote monitoring of rural handpumps : a proof-of-concept study, 1-11. doi:10.2166/hydro.2012.183

UNHCR and CARE International. 2005. Framework for Assessing, Monitoring and Evaluating the Environment in Refugee-related Operation. Accessed 16 July 2013 from http://www.unhcr.org/4a97d1039.html

United Nations. (2013). A New Global Partnership: Eradicate Poverty and Transform Economies Through Sustainable Development. UN, New York, NY.

UNICEF (2011). WASH in schools monitoring package. United Nations Children's Fund, Unite for Children. Retrieved 15 June 2013 from http://www.unicef.org/WaSH/schools/WaSHinschools_53115.html

Wanjek, C. (2005). Food at work: Workplace solutions for malnutrition, obesity and chronic diseases. International Labour Office, Geneva.

WaterAid. (2010). Water Point Mapper: A free, simple and powerful mapping tool. Retrieved 18 July 2013 from http://www.waterpointmapper.org/Home.aspx

WHO/UNICEF Joint Monitoring Programme (JMP). (2012). Report of the Second Consultation on Post-2015 Monitoring of Drinking-Water, Sanitation and Hygiene The Hague, 3-5 December 2012. Retrieved 18 July 2013 from http://www.wssinfo.org/fileadmin/user_upload/resources/WHO_UNICEF_JMP_Hague_Consultation_Dec2013.pdf

WHO and UN Water, (2012) GLAAS 2012 Report: The Challenge of Extending and Sustaining Services. World Health Organization, Geneva. Retrieved 15 July 2013 from http://whqlibdoc.who.int/publications/2012/9789241503365_eng.pdf

World Bank. (2010). An AMCOW Country Status Overview: Water Supply and Sanitation in Ghana. World Bank, Washington, DC.

World Bank. (2013). LSMS Data set finder. Retrieved 15 July 2013 from http://iresearch.worldbank.org/lsms/lsmssurveyFinder.htm

World Health Organization. (n.d.). Sanitation in public places fact sheet. Retrieved 18 July 2013 from http://www.who.int/water_sanitation_health/hygiene/emergencies/fs3_14.pdf

World Health Organization. (2006). A guide to healthy food markets. World Health Organization, Geneva. Retrieved 11 July 2013 from http://www.who.int/foodsafety/publications/capacity/healthymarket_guide.pdf

World Health Organization (2007). Health information management strategic plan 2007 to 2011. World Health Organization, Geneva. Retrieved 11 July 2013 from http://www.who.int/healthmetrics/library/countries/HMN_GHA_StrPlan_Draft_2007_en.pdf

World Health Organization. (2008). Communicable disease alert and response for mass gatherings. Technical workshop. Geneva, Switzerland; April 29–30, 2008. Retrieved 15 July 2013 from http://www.who.int/csr/Mass_gatherings2.pdf

World Health Organization. (2009). Country profile of environmental burden of disease. World Health Organization, Geneva. Retrieved 15 July 2013 from http://www.who.int/quantifying_ehimpacts/national/countryprofile/ghana.pdf

World Health Organization. (2011). Guide to ship sanitation. World Health Organization, Geneva. Retrieved 11 July 2013 from http://whqlibdoc.who.int/publications/2011/9789241546690_eng.pdf

World Health Organization. (2007). Health in Prisons: A WHO guide to the essentials in prison health. WHO Regional Office for Europe, Copenhagen. Retrieved 11 July 2013 from http://www.euro.who.int/__data/assets/pdf_file/0009/99018/E90174.pdf

World Health Organization. (2010). Monitoring the building blocks of health systems: a handbook of indicators and their measurement strategies. World Health Organization, Geneva.

World Health Organization (2011). Measuring Service Availability and Readiness: A health facility assessment for monitoring health system strengthening. World Health Organization, Geneva.

World Health Organization. (2011). World Report on Disability. Retrieved 16 July 2013 from http://www.who.int/disabilities/world_report/2011/en/index.html

World Health Organization. (2013). Service Availability and Readiness Assessment. Retrieved 16 July 2013 from http://www.who.int/healthinfo/systems/sara_introduction/en/index.html

World Health Organization – Regional Office for Europe. (2010). Health Assessment for Tajikistan. WHO Regional Office for Europe, Copenhagen.

World Health Organization/United Nations Children's Fund Joint Monitoring Programme. (2012). Report of the Second Consultation on Post-2015 Monitoring of Drinking-Water, Sanitation, and Hygiene. Retrieved 10 July 2013 from <http://www.wssinfo.org/fileadmin/user_upload/resources/WHO_UNICEF_JMP_Hague_Consultation_Dec2013.pdf>

WHO/UNICEF JMP. 2012. Proposal for consolidated drinking water, sanitation, and hygiene targets, indicators and definitions. Retrieved 15 July 2013 from http://www.wssinfo.org/fileadmin/user_upload/resources/A-proposal-for-consolidated-WASH-goal-targets-definitions-and-indicators_version7_Nov22_final.pdf