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Monitoring drinking water, sanitation, and hygiene in non-household settings: Priorities for policy and practice

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ABSTRACT

Inadequate drinking water, sanitation, and hygiene (WaSH) in non-household settings, such as schools, health care facilities, and workplaces impacts the health, education, welfare, and productivity of populations, particularly in low and middle-income countries. There is limited knowledge on the status of WaSH in such settings. To address this gap, we reviewed international standards, international and national actors, and monitoring initiatives; developed the first typology of non-household settings; and assessed the viability of monitoring. Based on setting characteristics, non-household settings include six types: schools, health care facilities, workplaces, temporary use settings, mass gatherings, and dislocated populations. To-date national governments and international actors have focused monitoring of non-household settings on schools and health care facilities with comparatively little attention given to other settings such as workplaces and markets. Nationally representative facility surveys and national management information systems are the primary monitoring mechanisms. Data suggest that WaSH coverage is generally poor and often lower than in corresponding household settings. Definitions, indicators, and data sources are underdeveloped and not always comparable between countries. While not all countries monitor non-household settings, examples are available from countries on most continents suggesting that systematic monitoring is achievable. Monitoring WaSH in schools and health care facilities is most viable. Monitoring WaSH in other non-household settings would be viable with: technical support from local and national actors in addition to international organizations such as WHO and UNICEF; national prioritization through policy and financing; and including WaSH indicators into monitoring initiatives to improve cost-effectiveness. International consultations on targets and indicators for global monitoring of WaSH post-2015 identified non-household settings as a priority. National and international monitoring systems will be important to better understand status, trends, to identify priorities and target resources accordingly, and to improve accountability for progressive improvements in WaSH in non-household settings.

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Abbreviations: EMIS, Educational Management Information System; DESSAP, District Level Environmental Strategies and Action Plan; GLAAS, UN-WaterGlobal Analysis and Assessment of Sanitation and Drinking-Water; HCF, health care facility; HMIS, Health Management Information System; JMP, WHO/UNICEF Joint Monitoring Programme; MDG, Millennium Development Goals; NGO, non-governmental organization; SARA, Service Availability and Readiness Assessment; SDI, Service Delivery Indicators; SPA, Service Provision Assessment; UN, United Nations; UNESCO, United Nations Education, Scientific and Cultural Organization; UNICEF, United Nations Children's Fund; WaSH, water, sanitation, and hygiene; WHO, World Health Organization.

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Introduction

Inadequate drinking water, sanitation, and hygiene (WaSH) in non-household settings, such as schools, health care facilities, and workplaces impacts the health, education, welfare, and productivity of populations, particularly in low- and middle-income countries. These impacts disproportionately affect certain types of people. For example, a lack of gender separated toilets at schools impacts attendance of girls (Adukia, 2013). Disabled persons make up 15% of the global population (WHO, 2011a) and face physical and social barriers related to accessing WaSH, potentially preventing them from attending school, gaining employment, and using public services and amenities (Groce et al., 2011). Vulnerable populations such as immuno-compromised persons, expectant mothers, and infants frequent health care facilities (HCF) where they are

often exposed to inadequate WaSH and environmental conditions (Allegranzi et al., 2011). Improper management of human excreta from sick patients in HCF poses a potential public health hazard to people in the HCF and nearby communities. Transmission of infectious disease in non-household settings may have the potential to cause larger epidemics as compared to household settings (Cairncross et al., 1996).

Despite their importance, non-household settings have not been included in international WaSH monitoring to-date (Bartram, 2008). Millennium Development Goal (MDG) Target 7c, which aims to “halve the proportion of people without access to water and sanitation” between 1990 and 2015, is only applied to household settings. The 2014 UN-Water GLAAS report, a biannual survey, identified less than one third of 94 countries have policies, plans, and coverage targets in place for schools and health care facilities (WHO, 2014). However, WaSH in non-household settings has gained increased attention from the international development and public health communities (Bradley and Bartram, 2013). The UN Special Rapporteur on the human right to safe drinking water and sanitation has identified the provision of drinking water, sanitation, and hygiene (WaSH) in non-household settings as an important means for advancing human rights (UN Special Rapporteur on the Human Right to Safe Drinking Water and Sanitation, 2012). Other stakeholders have identified the provision of WaSH in schools and health care facilities as priorities (UNICEF, 2012; WHO, 2015). Expanding coverage to unserved non-household settings and monitoring the services provided are important development objectives post-2015.

National and international monitoring of WaSH in non-household settings is important to inform policy and investment strategies, to benchmark service quality, and to measure, compare and report progress among countries (Bradley and Bartram, 2013). However, there is limited knowledge on the status of WaSH in non-household settings and the evidence for monitoring. To address this gap, we conducted a review of WaSH in non-household settings, developed a typology of settings and assessed the viability of monitoring by examining evidence, international standards, national and international actors, and available monitoring initiatives.

Methods

A list of search terms associated with non-household settings were developed through literature searches and consultation with experts on the WHO/UNICEF Joint Monitoring Programme (JMP) post-2015 working groups for water, sanitation, hygiene and equity and non-discrimination. We reviewed PubMed and Google Scholar, using the terms “drinking water,” “sanitation,” and “hygiene” in combination with search terms associated with non-household settings (Table 1) and terms related to monitoring, evaluation, policy, guidelines, best practice, and standards. Using the same terms, we searched for and reviewed gray literature publications and associated data sets from United Nations (UN) specialized agencies, bilateral and multilateral donors, non-governmental organizations (NGOs), national governments, networks such as the International Household Survey Network and the International Health Facility Assessment Network, and research institutions such as the Institute for Health Metrics and Evaluation.

Based on attributes of settings identified through the literature search, we developed a typology to organize and evaluate non-household settings. A typology is collectively exhaustive, where all settings are assigned a type, and mutually exclusive, where each setting is only part of one type (Bailey, 1994). The attributes used to develop the typology include 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), total population affected (e.g. sum of people using each facility) and additional risk factors that are specific to each setting (e.g. large temporary gathering, involuntarily relocated to the setting, absence of alternative facilities).

Results

Typology for settings and monitoring initiatives

No other non-household settings-based typology was discovered through the course of conducting this review. Six setting types are identified: schools, health care facilities, workplaces, temporary use settings, mass gatherings, and dislocated populations. Table 2a lists non-household settings organized by the typology with examples, the population multiplier, and definitions of settings from literature. The population multiplier is the sum of people using an individual facility (e.g. the number of students and teachers at a primary school). Collecting a population multiplier for individual facilities in addition to WaSH indicators allows for the creation of a population-based estimate of coverage (e.g. national coverage statistics) rather than a facility-based estimate. Table 2b lists, for each setting, the principal international actor(s) (those with a formal mandate), principal national actor(s), available international standards and/or guidelines, and any systematic reviews conducted for the setting that describe the evidence related to health and/or non-health related outcomes from WaSH. National and international actors are those that provide support for policy, guidelines, standards, monitoring, evaluation, and practice.

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. Shared facilities, such as household or community shared sanitation facilities, are not considered public since their use is restricted to certain households.

Characteristics of non-household monitoring initiatives that collect WaSH data are grouped by national and sub-national initiatives in Table 3. Sub-national initiatives include local government monitoring, surveys that cover regions of a country, and program/project monitoring.

Nationally representative monitoring initiatives

For school monitoring, national Ministries of Education frequently use Educational Management Information Systems (EMIS) designed by the United Nations Education, Scientific and Cultural Organization (UNESCO) for use by developing countries (Table 3) (Carrizo et al., 2003). To collect data for EMIS, a census is distributed by the Ministry of Education annually to schools, generally all schools, including public and private and both primary and secondary. A principal, head teacher, or district official completes the census for each school and the resulting data are aggregated nationally in a database by the Ministry of Education (UNICEF, 2011). UNESCO provides recommended questions for the questionnaires but they are customizable to reflect national conditions (Carrizo et al., 2003).

EMIS censuses generally contain few WaSH indicators. The census instrument typically includes questions on the number of students per toilet, the availability of separate sanitation facilities for boys and girls, and access to an improved drinking water source on or near the school campus (UNICEF, 2011). Because the

Table 1
List of search terms associated with non-household settings.

Setting	Associated search terms
Schools	Nursery, daycare, kindergarten, primary/secondary/boarding/day school, university
Health care facilities	Hospital, health center, clinic, asylum, dental surgery, general practitioner facility, maternities, nursing home, psychiatric hospital, voluntary counseling and testing (VCT) facility
Workplaces	Farm, military base, municipal building, office, office park, factory, agriculture
Restaurants	Cafeteria, canteen, fast food, restaurant, bakery
Hotels	Accommodation, accommodation types, hotel, inn, motel
Transit hubs	Rail, bus, train, ship port, station, lorry park, bus stop, railway
Markets	Food market, grocery
Places of worship	Church, mosque, synagogue, temple, chapel, masjid, musjid, shrine, tabernacle
Public WaSH facilities	Public toilet, pay-and-use toilet, community toilet, drinking-water fountain
Mass gatherings	Mobile food vendors, Hajj, Olympics (Athens, London, Beijing), World Cup, soccer, football, State events (e.g. funeral, inauguration), festival, temporary event
Internally displaced persons camps	IDP, emergency, disaster, disaster-response
Refugee camps	Refugee, shelter, refugee community
Prisons	Detention, penal, reformatory, penitentiary, incarceration, jail
Orphanages	Orphan asylum, group homes, children homes, refuges, rehabilitation centers, night shelters, youth treatment center

census questions are often customized nationally, the data are not necessarily comparable between countries.

Health Management Information Systems (HMISs) are health care facility monitoring systems that generate facility level data and often allow for sub-national and national level data aggregation. HMISs collect a range of health related indicators such as malaria prevalence and number of beds available per hospital. Some of these systems collect health care facility infrastructure indicators such as drinking water and sanitation (WHO, 2010).

Other health care facility monitoring initiatives include Service Provision Assessments (SPAs), Service Availability and Readiness Assessments (SARAs), and Service Delivery Indicators (SDIs) all of which examine the status of health service delivery. Indicators of infrastructure status including drinking water and sanitation are collected in addition to information on availability of handwashing stations and availability of infection prevention items. These initiatives are designed to be used in countries worldwide and are conducted by national ministries (usually the ministry of health and the national statistical office), often in collaboration with external support agencies. Indicators are comparable between SPA, SARA, and SDI as a result of coordination between institutional survey providers (WHO, 2011c; O'Neill et al., 2013). SDI surveys collect nationally representative WaSH indicators for both health and education facilities.

Other non-household monitoring initiatives that do not include WaSH indicators are Enterprise Surveys. The World Bank conducts Enterprise Surveys which examine formal and informal work settings. They gather data at the firm-level on topics such as sales, infrastructure, technology, and performance measures (World Bank, 2014).

Sub-nationally representative monitoring initiatives

There are several types of sub-national monitoring initiatives including local government monitoring, multi-district targeting surveys, and program/project monitoring. Tools such as the Integrated Management for Emergency and Essential Surgical Care assessment have been used by WHO and others to examine health care facility status including data on drinking water access in HCF (Spiegel et al., 2011). Local governments often monitor the status of non-household WaSH but these data are infrequently publicly available. For example, the Ghana District Level Environmental Strategies and Action Plan (DESSAP) includes data on sanitation facilities in many non-household settings such as hotels, restaurants, schools, and markets, but the DESSAP documents are hand written, stored in hard copy, and typically not available outside district offices (Ministry of Local Government, 2007).

Coverage data for WaSH in non-household settings

Coverage of WaSH in non-household settings is often low. UNICEF reports an unweighted water coverage average in primary schools of 69% from 134 reporting UNICEF program countries and 47% in 54 least developed and low income program countries. Sanitation coverage averages are 67% for all program countries and 46% for least developed and other low income program countries (UNICEF, 2014). WHO reports weighted average coverage for WaSH in health care facility coverage to be 62% for an improved water source (e.g. a technology classification for sources that protect water from outside contamination) within 500 meters based on data from 54 countries, 81% for sanitation on-site (based on 36 countries), and 65% for soap for hand washing (based on 35 countries) (World Health Organization, 2015). Table 4 lists the status of WaSH in non-household settings from select countries.

Conditions in non-household settings may be worse than indicators suggest. For example, the improved source indicator does not consider quality. Estimates suggest more than a quarter of improved sources contain fecal contamination (Bain et al., 2014). Further, evidence suggests water quality may be worse in the wet season and may be of significantly worse quality when comparing the source to storage at the point of use (Kostyla et al., 2015; Shields et al., 2015). Many of the global coverage figures do not consider year-round reliability of water supplies. In health care facilities, estimates suggest coverage decreases by half when year-round reliability is considered. Toilet facilities are often locked rendering them unavailable to patients and staff (World Health Organization, 2015). Challenges in schools include insufficient student-to-toilet ratios and a lack of gender segregated facilities (UNICEF, 2014).

Discussion

We developed a typology to categorize non-household settings and assessed the viability of monitoring by examining the evidence base, international guidelines and standards, national and international actors, and available monitoring initiatives. The typology distinguishes characteristics of setting types and reveals the wide array of available evidence, actors, standards, and data collection initiatives as well as gaps that need to be addressed in order to improve the situation.

Few initiatives monitor WaSH in non-household settings other than schools and health care facilities. While sometimes incomplete and not always comparable, data indicate WaSH coverage is often low in these settings. The 2014 GLAAS report suggests WaSH in HCF is largely neglected in terms of national target setting and planning (World Health Organization, 2014). However, countries

Table 2a
Characteristics of non-household settings relevant for WaSH monitoring.

Settings	Examples of settings	Population multiplier	Definition of the setting
Schools	Daycare, nurseries, kindergarten, primary and secondary schools, universities	School children and staff	"Includes primary and secondary schools, boarding and day schools, rural and urban schools, and public and private schools" (World Health Organization, 2009 , p. 1)
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" (World Health Organization, 2008a , p. 3) and are generally places where people receive health care from a trained professional and include public, private, and faith-based facilities
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" (Husmanns, 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	Restaurants	Cafeteria, canteen, fast food, restaurant	Patrons and workers
	Accommodations	Hotel, inn, motel, hostel, campsite	Patrons and workers
	Transportation hubs	Rail station, bus station, ship port, truck stations, lorry parks, airports	Travelers and workers
	Transportation vehicles	Train, bus, ship, truck (lorry), airplane	Passengers
	Markets	Food market, grocery	Patrons and workers
	Places of worship	Church, Mosque, synagogue, temple, shrine chapel	Worshippers
	Public WaSH facilities	Public toilet, public drinking water fountain	Estimated number of patrons
	Mass gatherings	Hajj, World Cup, Olympics, State events (e.g. funeral, inauguration), fairs, festivals	Estimated number of visitors
Dislocated populations	Internally displaced person (IDP) camps	IDP camps	People in the camp and staff (if applicable)
	Refugee camps	Refugee camps	People in the camp and staff (if applicable)
	Prisons	Prisons, detentions, places of internment	Detainees and staff (if applicable)
	Orphanages	Orphan asylum, group homes, children's homes, refuges, rehabilitation centers, night shelters, youth treatment center	Children and staff

Table 2b

Description of characteristics of non-household settings relevant for WaSH monitoring.

Settings	Principal international actor(s)	Principal national actor(s)	International standards and/or guidelines	Systematic review(s) on health and/or non-health related outcomes from WaSH	
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 Project, 2011)	Jasper et al. (2012) on health and educational outcomes of WaSH in schools; Dickson et al. (2011) on provision of toilets for girls at school	
Health care facilities	UNICEF, WHO	Ministry of Health	WHO, Sphere	Anaissie et al. (2002) on hospital water supply as a source of nosocomial infections; Erasmus et al. (2010) describes role of hand hygiene None identified	
Workplaces	International Labor Organization (ILO)	Ministry of Labor	None sufficient; general guidance by Work Improvement in Small Enterprises (WISE+) (ILO, 2009) None identified	None identified	
Temporary use settings	Restaurants	None identified	Ministry of Health and/or Environmental Health	None identified	
	Accommodations	None identified	Ministry of Health and/or Environmental Health	None identified	
	Transport hubs	Local Governments for Sustainability (ICLEI)	Municipal authorities, private companies, mayor associations	None identified	None identified
	Transport vessels	None identified	Municipal authorities; private companies	WHO guide to ship sanitation (WHO, 2011b); none sufficient for other vessels	Rooney et al. (2004) on ship sanitation
	Markets	WHO (though limited involvement)	Municipal authorities	None sufficient though some guidance in Healthy Food Marketplaces (WHO, 2006) None identified	None identified
	Places of worship	Global governing body of the religious institution	National governing body of the religious institution	None identified	None identified
	Public WaSH facilities	None identified	Ministry of Works; Water and Sanitation	None identified	None identified
Mass gatherings	WHO (though limited involvement)	Context specific; often Ministry of Health	None identified	None identified	
Dislocated populations	Internally displaced person camps	The Office of the United Nations High Commissioner for Refugees (UNHCR)	All countries are required to make provision and allocate responsibility under international law	UNHCR, Guiding Principles on Internal Displacement (Deng, 1998), Sphere	Cronin et al. (2008) on provision of water and sanitation in refugee camps and impact on health indicators
	Refugee camps	UNHCR	None identified, though states have an obligation for refugees	Sphere	Cronin et al., 2008
	Prisons	International Committee of the Red Cross (ICRC)	National prison agency	ICRC, WHO	None identified
	Orphanages	None identified	Non-governmental organizations (NGOs)	None identified	None identified

Table 3
Select national and sub-national non-household monitoring initiatives that include WaSH.

Monitoring level	Monitoring initiative	Examples in practice	Applicable settings	Institutional data coordinator	Sampling design	Population multiplier	Estimated data sets available	Frequency of reporting	Data provider/collector
National	Educational Management Information System (EMIS)	Ghana EMIS, India District Information System for Education (DISE)	Education facilities	Ministry of Education	National or sub-national enumeration	Students and teachers	30+	Annually	School teachers or headmaster via survey
	Health Management Information System (HMIS)	Kenya, Uganda, Zambia	Health care facilities	Ministry of Health	National or sub-national enumeration	Facility	10+	Quarterly, annually	Health care facility employee
	Water Sector Management Information System (WSMIS)	Directorate of Water Development Management Information System (Uganda)	All settings (most focus on education and health care facilities)	National Government Ministry (e.g. water, environment)	National or sub-national enumeration	Facility	Unknown	Annually	Water sector professional
	Service Provision Assessment (SPA)	Egypt, Guyana, Haiti, Kenya	Health care facilities	DHS Program	Stratified random sample	Facility	15+ countries	Every three to five years	Trained enumerator
	Service Availability and Readiness Assessment (SARA)	Burkina Faso, Benin, Sierra Leone, Tanzania, Zambia	Health care facilities	WHO	Stratified random sample	Facility	8+	Every three to five years	Trained enumerator
Sub-national	Service Delivery Indicators (SDI)	Kenya, Senegal, Tanzania, Uganda	Education and health care facilities	World Bank and collaborators	Stratified random sample	Facility	5+	Every two years	Trained enumerator
	Facility surveys, inventories, and censuses	Bangladesh schools, health care facilities, and restaurants, Ethiopia census of schools and health care facilities	All settings	UNICEF, WHO, USAID, and others	Random sample or complete enumeration	Facility	30+ schools, 10+ health care facilities	One-time studies; often baseline surveys	Trained enumerator
	Program/project initiatives	NGO reports, impact assessments, journal publications	All settings (most focus on education and health care facilities)	Context specific; often NGOs and researchers	Random sample or complete enumeration	Varies; typically facility	Many, though not all are publicly available	Generally one-off studies, length of project	Trained enumerator
	Local/district initiatives	Ghana District Level Environmental Strategies and Action Plans (DESSAPs)	All settings	District agency	Generally complete enumeration	Facility	Many, though not many are publicly available	Annually	Government employee

Table 4
WaSH in non-household settings coverage in low- and middle-income countries.

WHO region	Country	Year	Monitoring initiative	Survey coverage	Setting	Improved water source coverage	Improved sanitation coverage	Soap for hand washing coverage
Africa	Ethiopia (MoWE, 2012)	2012	National WASH Inventory	National census	HCF Schools	32% 31%	85% 33%	Not available Not available
Africa	Tanzania (AERC, 2013)	2010	Service Delivery Indicators	Nationally representative	HCF Schools	81% 70%	90% 96%	Not available Not available
Africa	Zambia (MoH, 2010)	2010	Service Availability and Readiness Assessment	Sub-national	HCF	88%	95%	97%
Americas	Haiti (IHE and ICF, 2014)	2014	Service Provision Assessment	National census	HCF	65%	46%	50%
Eastern Mediterranean	Egypt (Ministry of Health and Population et al., 2005)	2002	Service Provision Assessment	Nationally representative	HCF	88%	78%	71%
Eastern Mediterranean	Iraq (UNICEF and EE, 2012)	2012	UNICEF Baseline Assessment Report	98 of 111 districts	Schools	95% (with access), 46% (with sufficient quantities)	95% (with access), 53% (with sufficient quality)	Not available
Europe	Tajikistan (WHO-EURO, 2010)	2008	WHO Rapid Health Facility Assessment	Sub-national	HCF	38%	43%	Not available
South East Asia	Bangladesh (ICCD, b and WaterAid, 2014)	2014	Survey	Nationally representative	Restaurants Schools	94% 80%	12% 84% (functional, improved toilets); only 45% of toilets were accessible	91% 27% (hand washing location with water and soap available)
South East Asia	India (NUEPA, 2012)	2011	District Information System for Education (DISE)	Complete enumeration	HCF Schools	97% 93%	53% 80%	79% Not available
Western Pacific	Mongolia (Spiegel et al., 2011)	2011	Situational analysis for the WHO Global Initiative for Emergency and Essential Surgical Care	Sub-national assessment of hospitals	HCF	45%	Not available	Not available

Table 5
Indicators for WaSH in non-household settings recommended by the WHO/UNICEF Joint Monitoring Programme (from WHO/UNICEF, 2014).

Indicators	Schools	Health care facilities (HCF)
Water	<ul style="list-style-type: none"> Percentage of primary and secondary schools with an improved source on or near premises and water points accessible to all users during school hours 	<ul style="list-style-type: none"> Percentage of health facilities with an improved source on premises and water points accessible to all users at all times
Sanitation	<ul style="list-style-type: none"> Percentage of primary and secondary schools with basic separated sanitation facilities for males and females on or near premises (at least one toilet for every 25 girls, at least one toilet for female school staff, a minimum of one toilet and one urinal for every 50 boys and at least one toilet for male school staff) Percentage of primary and secondary schools with basic separated sanitation facilities for females that provide privacy; soap, water and space for washing hands, private parts and clothes; and places for changing and disposing of materials used for managing menstruation 	<ul style="list-style-type: none"> Percentage of health facilities with basic separated sanitation facilities for males and females on or near premises (at least one toilet for every 20 users at inpatient centers, at least four toilets – one each for staff, female, male and child patients – at outpatient centers) Percentage of health facilities with basic separated sanitation facilities for females that provide privacy; soap, water and space for washing hands, private parts and clothes; and places for changing and disposing of materials used for managing menstruation
Hygiene	<ul style="list-style-type: none"> Percentage of primary and secondary schools with a handwashing facility with soap and water in or near sanitation facilities 	<ul style="list-style-type: none"> Percentage of health facilities with a handwashing facility with soap and water in or near sanitation facilities, food preparation areas and patient care areas

with targets and national plans have far greater WaSH coverage in HCF suggesting targets and plans may be drivers for increased coverage (World Health Organization, 2015).

Experience suggests non-household WaSH monitoring is viable. To achieve robust national and international monitoring of WaSH in non-household settings, we suggest several steps are necessary. They include the development of a monitoring framework for improving and expanding monitoring over time, developing setting-specific standards and guidelines, increasing the capacity of national level actors to monitor non-household settings, establishing clear roles and responsibilities for actors involved in monitoring, and translating monitoring data into actionable evidence for use by policy makers and service delivery providers.

A framework that links monitoring at different levels (e.g. local, national, international) allows for efficient data collection that is useful to multiple stakeholders (Bradley and Bartram, 2013). Within such a framework, there is a need for robust indicators and definitions, such as those proposed by the JMP for the post-2015 development agenda (Table 5) to understand status and trends in coverage which enables effective and efficient targeting of financial resources (WHO/UNICEF, 2014).

Opportunities are available to include WaSH indicators within existing non-household monitoring initiatives which would reduce the need for additional data collection instruments, monitoring costs, and human resources. For example, World Bank Enterprise surveys could assess the status of WaSH conditions in workplaces. Local government monitoring could also play an expanded role in gathering non-household WaSH data, as demonstrated by the DESSAP in Ghana (Ministry of Local Government, 2007).

WaSH standards and guidelines provide benchmarks against which to monitor settings. Few are available and further work is necessary to define adequate WaSH standards and guidelines for settings such as markets and orphanages. Standards and guidelines need to be further differentiated within each type; for example, standards for health clinics need to be different than those for hospitals since each performs different health care functions, provides services for different types of vulnerable patients, and has different WaSH requirements. These standards should be designed using a 'laddered' approach such that basic, intermediate, and high levels of service are defined and countries have a mechanism by which to measure progress beyond basic levels of service. These standards and guidelines need to be evaluated and adjusted over time as countries increase coverage of WaSH services.

To enable implementation of WaSH monitoring in non-household settings, organizations such as WHO and UNICEF should lead consultations with a broad set of stakeholders including central and local governments, civil society, and academia.

These organizations can lead the development of evidence-based standards, guidelines, and indicators for non-household settings beyond schools and health care facilities. Organizations such as the International Labor Organization, the World Bank, and the United Nations Educational, Scientific and Cultural Organization (UNESCO) should be included. Outputs of these consultations can be used in partnerships such as Sanitation and Water for All to encourage national governments to prioritize WaSH in non-household settings.

WHO and UNICEF have already taken leadership on schools and health care facilities which provide examples for how other settings might be addressed. Indicators in Table 5 were developed through a series of technical consultations that assessed available evidence on water, health, and development and setting specific evidence for schools and health care facilities. A further example includes WHO and UNICEF consultations to improve existing WaSH in schools guidelines and engaged stakeholders in middle and high income countries in the WHO European region (WHO-EURO, 2014). WHO and UNICEF, in addition to a broad array of WaSH actors, have generated awareness and political prioritization for WaSH in health care facilities (World Health Organization, 2015). The UN-Water GLAAS report has identified gaps in policies, plans, and resources and raised awareness for prioritization of these settings (World Health Organization, 2014). Policy survey instruments like GLAAS might be used to rapidly assess status of monitoring WaSH in other non-household settings.

Our review reveals a wide array of actors who conduct and support monitoring of WaSH in non-household settings. Coordination of non-household monitoring efforts may be a challenge due to lack of leadership and accountability regarding which ministry or organization is responsible for ensuring service provision and monitoring of those services (World Health Organization, 2015). Therefore, establishing clear roles and responsibilities of local and national level actors is an important step. The ministries or organizations responsible for building, constructing, and maintaining non-household settings should also lead the provision of WaSH with the support of other agencies such as the Ministry of Water and Ministry of Local Government. Improving monitoring systems requires an increase in human resources capacity and technical capacity to operate and maintain systems and validate data quality.

At present, cluster randomized sample facility surveys provide the bulk of the data but national information systems are a more sustainable option for future data provision. National information systems can provide more up-to date information (measured multiple times per year rather than once every several years through a survey-based initiative). Conducting facility surveys, such as SARA, SDI, or SPA, in coordination with national information system data

collection will help to validate those systems and assess data quality as they are enhanced and improved.

Data from these systems can be used to analyze relationships between WaSH service provision and educational, environmental, and health outcomes, as demonstrated by a study from India (Adukia, 2013). Such analysis can be used to show the impacts of WaSH provision in these settings to inform policy makers who make decisions on where to invest scarce resources.

Conclusion

WaSH in non-household settings is important for health, development, and human rights. Monitoring enables service providers to identify where services are lacking to make improvements. Through this review, we show that examples of successful non-household WaSH monitoring systems exist in different world regions but not all countries are monitoring. Monitoring initiatives are limited to a small number of setting types. Advancing monitoring and investing resources into capacity building for initiatives will help to improve data collection and allow for more efficient targeting of resources to improve WaSH. Leadership provided by national level actors who manage monitoring systems and by international agencies such as the JMP can help to advance the development of guidelines, standards and indicators for adoption at the country level. Evidence gathered through this review suggests that harmonization of indicators and instruments for global monitoring is rapidly achievable in the post-2015 development period.

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