Title: A Survey of Water, Sanitation, and Hygiene in Schools in the Caribbean Coast of Nicaragua: Findings, Lessons Learned, and Recommendations for Future Studies

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Background: Improving water, sanitation and hygiene (WaSH) in Nicaragua can have a large impact on the disease burden in disability-adjusted life years (DALYs) and deaths. According to the most recent WHO study, inadequate WaSH contributes to 8.1% of DALYs and 7.5% of deaths in Nicaragua (Prüss-Üstün et al. 2008). Children are the most vulnerable, with more than 20% of deaths and DALYs in children up to 14 years of age attributable to unsafe WaSH conditions (Prüss-Üstün et al. 2008). Exposure to poor WaSH conditions can increase the risk of diarrheal disease, and subsequently leads to malnutrition which renders children even more susceptible to other diseases. For example, as much as 26% of childhood pneumonia episodes can be attributed to diarrhea (Schmidt et al., 2009).

One way to target this burden of disease is by improving WaSH in schools. Since schools are places with intense levels of person-to-person contact, lack of proper WaSH facilities only acts to exacerbate infectious health risks. Additionally, diarrhea, malnutrition and dehydration can also result in diminished school performance and attendance. Chatterley and Thomas (2012) state that an estimated 272 million school days can be gained globally if the Millenium Development Goal (MDG) for sanitation is achieved. Beyond school attendance, WaSH in schools also helps achieve MDGs related to universal primary education, promoting gender equality, reducing child mortality and combating major diseases (Adams et al., 2009).

Moreover, instilling healthy hygiene behaviors is easier in children, as opposed to changing long-held behaviors of adults (Pinfold and Horan, 1996, and Grimason et al. 2013).

Jasper et al. (2012) conducted a systematic literature review of scientific studies regarding WaSH in schools. The studies they examined tended to provided evidence that provision of water for handwashing and materials such as soap decreased absenteeism and reported illnesses at schools. Studies also reported that increased access to adequate sanitation facilities in schools led to a decrease in diarrheal and gastrointestinal diseases. There were also many studies which supported the claim that a lack of water and sanitation facilities to manage menstruation in schools leads to discomfort and decreased school attendance by female students during menstruation (See: Birdthistle et. al (2011), Maimaiti and Siebert, (2009), Sommer (2010), and Oster and Thornton (2011)).Finally, some studies, such as Blanton et al. (2010), have shown that there can be a broader community impact of providing WaSH in schools. Additionally, O’Reilly et al. (2008) found that 14% of parents reported currently treating their water, compared with 6% at baseline after a school-based WaSH intervention, providing evidence that children can transfer hygiene behaviors learned at schools to their
households and can serve as role models to other members of their family and community. [Also see Patel et al. (2012), Ayi et al. (2010), and Onyango-Ouma et al. (2005)].

Beyond the health and educational benefits, WaSH in schools supports children’s rights. The United Nations Convention on the Rights of the Child states that every child deserves to be in a school that offers safe water, healthful sanitation and hygiene education. In 2010, UNICEF published the global Joint Call to Action for WASH in Schools, “Raising Clean Hands,” to increase action to improve school-based water, sanitation and hygiene. UNICEF’s global target is to ensure that all schools have adequate child-friendly water and sanitation facilities and hygiene education programs by 2015. Additionally, “targets promoted by Vision 21 include 80% of primary schoolchildren educated about hygiene and all schools equipped with facilities for sanitation and handwashing by 2015 (WSSCC, 2000).” However, progress to meeting these goals has been slow; “globally, it is estimated that 49% of schools lack access to an adequate water source and 55% lack adequate sanitation facilities (UNICEF, 2012a)” (Chatterley and Thomas, 2012).

Nicaragua has already taken steps to improve WaSH in schools through collaboration with international organizations such as UNICEF. In 1994, the Ministry of Education, Culture and Sports and Ministry of Health signed an agreement to promote health and health education in primary schools. In 1998 “the Nicaraguan Water and Sewage Company (ENACAL), with the support from UNICEF and the Swedish International Development Agency, launched the Nicaraguan Hygiene and Environmental Sanitation Initiative to promote changes in attitudes and the adoption of good hygiene and sanitation practices among primary school students.” In 2001, Nicaragua joined the global Child-Friendly and Healthy Schools (CFHS) Initiative. That year, the Ministries of Health (MINSA) and Education (MINED), the Ministry of Natural Resources and the Environment (MARENA), and ENACAL began to implement the school hygiene and environmental sanitation component in 17 schools in strategically selected municipalities. In 2009, the program had expanded to over 350 schools. The CFHS Initiative was and continues to be compatible with the National Education Plan 2001-2015. (Lumpkin, 2009). Currently, UNICEF is partnering with UNILEVER to focus on WaSH in schools over five years, as it is seen as a central component impacting educational quality and inclusiveness.

By incorporating the Child Friendly Schools program into national policy, Nicaragua has developed a WaSH in schools policy, but there are is still a need to allocate funding to not only support the policy, but also to monitor schools for adherence to standards. As Chatterley and Thomas (2012) identify, many governments focus on building a small number of facilities each year, rather than investing in resources needed for a large scaling up of the program to reach all schools. Furthermore, the authors found that “current data are often inconsistent and unreliable, questions used and data collection methods need improving”. Recommendations on how Nicaragua can improve in this aspect are given in the discussion section of this report.

Despite these encouraging policy actions, there is still a lack of basic information on WaSH in schools in Nicaragua, especially disaggregated data at the local level. This lack of information “hampers planning and resource allocation decisions, and makes it difficult to ensure
accountability and evaluate progress,” (UNICEF, 2011). The main data on WaSH that does exist is at the national level and for households. According to this data from the Joint Monitoring Program (JMP), 2% of urban and 15% of rural households did not have an improved water source and 28% of urban and 57% of rural households did not have improved sanitation in Nicaragua in 2011 (WHO/UNICEF JMP, 2013). The JMP data is required in order assess whether Nicaragua meets the MDGs for household water and sanitation coverage. However, it is important to consider that in many communities, schools are a part of the core water and sanitation structures. If schools lack the access to WaSH or hygiene education, it would also negatively affect the overall access to WaSH in communities.

**Purpose/Objective:** In 2012, UNICEF Nicaragua collaborated with the Ministry of Education (MINED), regional and municipal Secretariats of Education, and Water Directors from local governments to conduct a survey of WaSH in schools in 12 municipalities of the North and South Atlantic Autonomous Regions (RAAN and RAAS respectively). The objectives were to: (1) assess WaSH conditions in schools to identify areas of greatest need and (2) analyze associations between variables to determine possible interventions and future studies. It was hoped that this data would also serve as the baseline data for UNICEF Nicaragua country program 2013-2017. The findings and recommendations are detailed within this report.

**Methodology:** UNICEF Nicaragua, with technical assistance from a consultant, set out to conduct a cross-sectional study of WaSH conditions in schools in the RAAN and RAAS regions. Instead of testing a specific hypothesis, the aim of the study was to describe the level of coverage of water and sanitation infrastructure and hygiene education at schools, for the purpose of future intervention and investment planning.

The team developed a 102-question draft questionnaire to be distributed and answered by school directors. The questions were based on UNICEF criteria as defined in WASH in schools, package of tools for monitoring (UNICEF, 2011) and also incorporated lessons learned from other Latin American countries which had conducted similar surveys. Questions were further refined to account for specific regional context based on input from MINED and the Regional Secretariats of Education. The survey tool was validated in monthly education evaluation meetings with regional and municipal government representatives. A pilot test of the questionnaire was conducted in one school in the city of Bluefields, RAAS, to identify areas of difficulty in answering questions and understanding of terminology. This testing identified that the survey took about 45 to 60 minutes to complete.

Trained municipal delegates of MINED delivered the questionnaires to school directors in each municipality. There was considerably less participation from the RAAN, where delegates from two out of five municipalities surveyed did not attend training meetings. In these cases, consultants from UNICEF had to make visits to the municipalities to ensure surveys were properly distributed. Delegates were given 30 days to collect and bring back the completed questionnaires to the next monthly education meetings. Completed surveys were coded by the consultants and entered into an SPSS database for analysis. Where there were inconsistencies
and doubts of the quality of the data, answers were confirmed with the municipal delegates via telephone.

Compared to the nation as a whole, the Caribbean region of Nicaragua shows a disparity in socio-economic indicators. The RAAN and RAAS are home to the largest portion of indigenous and afro-descendent populations. National health, education, and economic data show that RAAN and RAAS have some of the most deplorable social and economic indicators in the country (Lumpkin, 2009). Thus, targeting WaSH in schools in these two regions could have a substantial impact on children’s lives.

Initially, 10 priority municipalities (five in each region), were selected for the survey, based on their participation in the UNICEF/Nicaragua Cooperation Program 2013-2017. Prioritization was based on a variety of health, education, and economic indicators. However, representatives from RAAS requested two extra municipalities in their region, which were not prioritized, be included. Thus, the final survey was administered in seven municipalities in RAAS and 12 municipalities overall. During study design, the number of schools in each municipality was based on 2009 national data, which indicated a total of 631 schools (165 preschool, 407 primary, and 59 secondary schools) in the 12 survey municipalities. The national data did not include informal schools, often taught by volunteer teachers and organized through churches or community collectives. Communications with local MINED representatives revealed that in actuality 1,229 schools were located in these municipalities. Surveys were delivered to all 1,229 schools rather than a random sample, as the survey was intended to gather population-level data.

Study design and questionnaire testing occurred in October 2012, with data collection occurring between November and December 2012. Surveys were completed and returned by 524 schools representing a 42.6% response rate (10 preschool, 162 preschool and primary, 255 primary only, 35 secondary only, 41 with all levels, and the rest were unspecified). There was variability in the completeness of the surveys returned, with certain municipalities and questions having lower response rates.

Findings and Conclusions:

Water

Less than fifty percent of schools (43%) had water infrastructure at the school, including piped connections, boreholes, and wells (n=454). Of the 195 schools with water infrastructure, 51 (26%) stated that the water system was damaged or not functioning properly. The highest percentage of damaged water systems was in the rural villages (35%), while dispersed rural areas had 23% of systems damaged and urban areas had the lowest percentage of damaged systems with 18%. Thus, out of 454 schools, only 32% had functioning water systems, while 30% had to bring water to school from an outside source, and 38% had no water at all at the school. Carrying water to the school was most common in dispersed rural areas.
Water treatment followed a similar urban-rural pattern as water infrastructure, increasing from 50% in dispersed rural areas to 83% in urban areas. However, 27% of respondents stated that they were not sure or did not know if the water at their school was treated. Additionally, only 133 school directors answered the question as to whether the school used a water filter or other purification system. Excluding schools with city water system connections leaves 91 schools. Of these schools, only 22 (24%) stated that a filter was used.

Health inspections of school water quality also follow an urban-rural trend, with easier to access schools and schools with water infrastructure being inspected more frequently than schools in harder to reach remote rural areas. Water quality has been tested at 27% of urban schools, 21% of rural village schools, and only 9% of dispersed rural schools.

Additionally, 33 schools with wells did not have a functioning hand pump and 48 out of 94 schools (51%) with water storage tanks stated that they were in bad condition. It was unclear from the survey whether all of the wells were adequately protected from outside contaminants, but 20 out of 43 wells with inspection openings did not have the opening covered or sealed properly. While 73% of 101 schools had a concrete slab around the well, only 49% of 93 schools had the area tiled and with drains and only 30% of 91 schools had a secure fence.

Sanitation

As a whole, there is higher sanitation than water coverage in the study area, with 63% of schools having some sort of sanitation facilities at the school (n=410). However, 28% of schools with sanitation facilities reported that toilets are not used due to poor conditions or habits (n=260). Of schools with toilets, only 22%, 26% and 39% had lids in dispersed rural, rural village, and urban areas respectively and just 5% of all schools had toilet paper (n= 327). The majority of sanitation infrastructure at the schools was in the form of water-less latrines (70%), another 17% of schools had a latrine system which used water, 8% were on a septic-system, only 2% were connected to a community sewer system, and 3% reporting “other” (n=307).

Similar to water infrastructure, the percentage of schools with sanitation infrastructure showed urban-rural discrepancies; with coverage of 56% in dispersed rural, 72% in rural villages and 79% in urban schools. Additionally, the percentage of schools with toilets separated by gender was much lower in dispersed rural schools (24%) than in rural village schools (44%) and in urban schools (49%).

Urban areas had significantly higher student per toilet ratios than rural areas. The median student to toilet ratio is 55, 33, and 24 for urban, rural village, and dispersed rural respectively. The Nicaraguan standard is a maximum of 30 students per toilet. Thus, schools in both urban and rural village areas exceed this standard. Of note is that only 170 out of 500 schools (34%) provided enough information to calculate this ratio, with only 23% of urban schools, 33% of rural village schools, and 39% of dispersed rural schools answering these two quantitative questions.
Urban schools have a higher proportion of daily cleaning of sanitation facilities, while rural schools have a higher proportion of weekly or less frequent cleaning. Toilet facilities were cleaned daily in 54% of urban schools, but only 24% and 25% of rural village and dispersed rural schools, respectively. Irrespective of urban-rural location, increased frequency of sanitation facility cleaning was significantly associated with personal hygiene training within the past three years at the school.

Hygiene

The survey asked three different questions about hygiene training programs. For all three, there was a strong and significant association with urban and rural location. The largest disparity was in whether a school has had environmental health training in the past three years; only 19% of dispersed rural and 21% of rural village schools had such a program, as compared to 64% of urban schools. Personal hygiene training at the school within the past three years followed a similar pattern, with such a program being present in 22%, 29% and 54% of dispersed rural, rural village, and urban schools, respectively. Lastly, 35% of dispersed rural, 52% of rural village and 65% of urban schools implemented a personal hygiene awareness program for students and teachers at the school during the 2012 school year. However, of the 195 schools with hygiene programs, only 36 (18%) are using the Healthy Families, Schools, and Communities (FECSA) methodology as advised by the Nicaragua Ministry of Health. There was no urban-rural discrepancy between which schools used the FECSA methodology. Overall, 41% of schools did not implement any of the three hygiene programs that were inventoried by the survey (n= 412). Again, this follows an urban-rural pattern. Fifty-four percent of dispersed rural schools were without any hygiene program, as opposed to 32% of rural village and 18% of urban schools without any program.

While 91% of urban schools had a school action plan, this decreased to 69% in rural villages, and only 60% in dispersed rural. Of the 253 schools with action plans, 77% of urban and 78% of rural village schools included a component on hygiene training in the action plan.

Hand washing practices are constrained at the surveyed schools, since 81% of schools don’t have stations for hand washing (n= 462) and 71% of schools wash hands only with water (n= 376). 42% of urban schools had a budget or community support to provide soap, while only 22% of rural village and 25% of dispersed rural schools did (n=350). There is also a practice of children drinking form a shared cup in rural areas. The percentage of schools where students drink from a shared cup decreases from 48% in dispersed rural areas to 34% in urban areas.

Recommendations:

This section includes recommendations for advocacy and policy actions based on survey results as well as a discussion of possible future studies to provide more in-depth understanding of WaSH in schools in the RAAN and RAAS regions of Nicaragua.
In a review of WaSH interventions, Fewtrell et al. (2005) found that hygiene interventions had the greatest impact on diarrheal disease, though multiple interventions, sanitation interventions, and water quality interventions all had similar level of impact, with 33%, 32%, and 31% reductions in diarrhea, respectively. However, it is important to note that “the impact of each may vary widely according to local circumstances. Prioritizing should therefore be based on local conditions and evidence from implementation rather than from pooled data” (Prüss-Üstün et al. 2008). Considering the many discrepancies we found between rural and urban schools in the RAAN and RAAS, it is important to consider that interventions that work in rural areas may be very different from those in urban areas. Thus future study is needed to identify the best strategies for improving WaSH at different types of schools.

ADVOCACY AND POLICY ACTIONS

While there are limitations in the survey data, the preliminary results can be used to better target implementation resources from the government and international aid organizations for the poorest schools to maximize health, educational, and environmental outcomes.

PRIORITIZE ASSISTANCE TO HELP SCHOOLS MEET MINIMUM NATIONAL WASH STANDARDS

The national government of Nicaragua has incorporated the CFHS Initiative into the National Education Plan 2001-2015 and has set a new national goal to “promote WASH in schools to increase healthy hygiene habits in 80 per cent of children and guarantee the installation and adequate use of water and sanitation services in 50 per cent of schools in prioritized municipalities,” (Lumpkin, 2009). Our study shows that currently, in the prioritized municipalities of the RAAN and the RAAS, these goals are still far from being met. For example, the national standard for student to toilet ratio in Nicaragua is 30:1. Of the schools which had sanitation facilities and provided a number of toilets at the school, only 48% (83/174) met that standard.

Clearly, more action and financial assistance is needed by national and regional governments to meet the established WaSH in schools goal by 2015. While a goal of 50% of coverage is a good start, the government should actively strive to bring near 100% coverage of WaSH in schools as quickly as possible. In the most underserved schools, a focus should be made to provide low-cost short-term options to meet minimum standards, before more potentially costlier long-term solutions are put into place. For example, rain water collection tank with filter is a simpler and lower cost solution for bringing water to a school than digging a well or connecting to a municipal water system. Additionally, Cairncross et al. 2010 state that national governments must ensure that no new schools are constructed without WaSH facilities. MINSA should also “include WaSH as an essential component of all health and child health policies and plans with an adequate and costed strategy” and “include WaSH as a key performance indicator of management in the health sector” (Cairncross et al. 2010).

ADDRESS URBAN VS. RURAL INEQUALITIES IN WASH THROUGH CONCENTRATED FOCUS ON PROJECTS FOR RURAL AREAS
As our analysis has shown, there are major discrepancies of WaSH in schools coverage between urban and rural areas, as is the case in many countries. It is imperative that national and regional governments focus assistance to areas with the greatest need. Our survey has identified hundreds of schools which would qualify for such prioritized assistance, though it also may have missed many schools due to the low response rates in some areas.

Issues involving the provision and maintenance of water and sanitation facilities are different for rural and urban areas, as are problems related to hygiene behavior. Thus, governments cannot take a blanket approach, but must provide tailored assistance and materials which are appropriate for urban and rural areas. (UNICEF, 1998)

WaSH assistance is often provided to schools which are easier to reach or which have less severe problems and require less investment. This can lead to the exclusion of schools which are in greatest need of assistance and already serve the poorest and most disadvantaged populations. Thus, it is important that governments “develop criteria for more equitable allocation of resources to ensure better focus on serving the unserved,” (Cairncross et al. 2010).

INCREASE FINANCIAL INVESTMENT AND/OR COMMUNITY INVOLVEMENT IN MAINTENANCE AND CLEANLINESS OF NEW AND EXISTING FACILITIES (INCLUDING PURCHASING SOAP)

Our survey found that a sizable proportion of schools had broken or poorly functioning water systems and sanitation facilities not in use due to poor maintenance. Additionally, nearly three quarters of schools stated that they did not have a budget or community support to purchase soap and over 100 schools reported pools of stagnant water and/or trash piles on the schools premises.

Reduced water supply due to broken infrastructure hinders the cleaning of sanitation facilities and handwashing, which can create a health risk. Furthermore, stagnant water and trash piles in the school environment can attract disease vectors such as rodents and mosquitoes. To make school sanitation programs sustainable all maintenance costs should be covered by schools and communities. It is best to create a budget, assign responsibility, and identify a source for spare parts and equipment for operations and maintenance of WaSH in schools before construction starts. Responsibility of WaSH maintenance can be assigned through a cleaning committee, by a class or students on a rotational basis, or by hiring external cleaning personnel (UNICEF, 1998). MINED should provide information to schools on ways that they can fundraise for operations and maintenance of WaSH facilities within their community, as well as which government departments, NGOs or international organizations to approach for financial support and how to write effective proposals (UNICEF, 1998). Schools in case studies from around the world have funded maintenance through income-generating activities such as selling produce from a school garden, or creating products to sell at local markets. What will be most successful will depend on the specific context of the community and resources where each school is located. Additional funding options include: contributions from parents and/or teachers, other outside donations, using the general school maintenance budget, or using fines for misuse of WaSH facilities in the community. Issues of security and vandalism must also be addressed.
REQUIRE HYGIENE TRAINING FOR TEACHERS AND MOBILIZE THEM TO LEAD WASH IMPROVEMENT PROJECTS

Statistical analysis showed that schools with personal hygiene training within the past three years had higher rates of teacher involvement in water system planning and maintenance and more frequent cleaning of sanitation facilities in rural areas, than schools which did not have a personal hygiene program. These results suggest that it is important for the national government to require regular hygiene training at schools and provide resources to teachers to incorporate hygiene concepts into the regular curriculum. It is interesting to note that often in developing countries “there are more than five times as many school teachers as health workers,” (UNICEF 1998) and thus focusing on disseminating hygiene information through teachers can have a major impact.

To mobilize teachers to be active in school WaSH, MINED can develop and distribute teaching aids such as: lesson plans, posters, special textbooks or pamphlets, and school kits on hygiene education. This has already been done for schools participating in the CFHS Initiative, and thus could be scale up to cover all schools. Additionally, teacher knowledge on hygiene can be a required part of the teacher exam. Municipal delegations of MINED can be responsible for providing interdisciplinary workshops to update teacher knowledge, provide examples and demonstrations of effective teaching strategies, and provide advice on how to mobilize the community (UNICEF 1998).

Furthermore, Nicaragua has adopted a new teacher training and evaluation strategy that can incorporate WaSH components. Included in the new strategy is a “monthly component of educational evaluation, planning and training workshops (TEPCE), and regional teacher preparation schools (Escuelas normales) (Lumpkin, 2009). Under this new strategy, schools use a clustering system with ‘base’ (mentor) schools known as Núcleos educativas. This system will increase more school-to-school cooperation (Lumpkin, 2009), where schools with successful WaSH programs can share knowledge with other lower-performing schools. Local innovations can be shared between peers, as opposed to teachers feeling that they are being told what to do by outsiders.

It is crucial that teacher training is not carried out in isolation. Many studies have shown that providing improved facilities in themselves is not sufficient in improving health outcomes of students; instead, behavioral changes are also needed to reduce sanitation and hygiene-related diseases (UNICEF 1998). However, teachers may not be able to put their knowledge and commitment to hygiene education to effective use if there isn’t an adequate provision water and sanitation facilities.

ENGAGE TEACHERS, PARENTS, STUDENTS, AND COMMUNITY MEMBERS IN RURAL AREAS TO FORM WASH IN SCHOOLS COMMITTEES AND DEVELOP A SCHOOL ACTION PLAN
When national and regional governments have constrained financial and human resources, developing countries rely more and more on students, teachers, parents and communities for the improvement of the environmental situation at schools, including the construction and management of school facilities (UNICEF, 1998). The majority of our statistical analyses found that teacher, student, parent and community involvement in general were associated with better WaSH conditions. For example, schools with teachers associations had greater teacher involvement in water system planning and maintenance in rural areas. Additionally, parent involvement in water system planning and maintenance was associated with water transport to school in rural areas. Parents were most involved at schools where water had to be carried to the school. In such situations, parents can be leveraged to help fundraise, apply for assistance from outside organizations, and ultimately oversee the construction of water and sanitation facilities at the school, thus removing the need for water to be brought manually.

Our data analysis also pointed to an association between the inclusion of hygiene program in school action plan and whether the school had any type of hygiene program. The majority of schools with action plans were located in urban areas. This may be likely that there are more informal and non-governmental schools in rural areas. MINED should encourage more schools, especially in rural areas, to develop annual school action plans with specific focus on WaSH. Guidance should be given as to the necessary components of a successful action plan, including: a budget, timetable of actions, and assigned responsibilities and accountability. When the management of funds, materials, design and construction of water and sanitation facilities is in the hands of school committees, they are better managed, with more transparency, responsibility, and completed in a timely manner, than when funds are given directly to contractors (UNICEF, 1998). Additionally, substantial financial or manpower contribution from both school and community enhances the sense of ownership and responsibility for facilities.

IMPROVE MONITORING AND EVALUATION OF WASH IN SCHOOLS BY REQUIRING STANDARDIZED, CONSISTENT AND SYSTEMATIC REPORTING OF DATA ON KEY WASH INDICATORS AND INCREASING SCHOOL INSPECTIONS

While conducting our survey, it was discovered that schools do not regularly and systematically report student absence or WaSH-related data to municipal MINED offices. Moreover, only small fraction of schools had the quality of their water inspected by health authorities, and the majority of those were in easier to reach urban locations. These findings indicate that Nicaragua must step up its monitoring efforts in schools to ensure schools are meeting regulations and to identify problem areas which need to be addressed.

To establish a national WaSH in schools monitoring program, MINED must develop indicators and decide who collects the monitoring information and how it will be used. For example, teachers or school directors can be trained on how to answer short questionnaires to gather the most basic information, such as number of enrolled students, number of “improved” toilets, whether the schools has an “adequate” water supply, and whether hygiene promotion program is being taught at the school. This can be incorporated as part of an Education
Management Information System (EMIS), which was established in Nicaragua in 2007 (World Bank, 2011).

To address issues of reporting bias from headmasters, self-reported questionnaires should be validated with inspections by authorities at a random selection of schools each year, if it is not possible to inspect all of the schools. Chatterley and Thomas (2012) state that EMIS results in combination with visits to a smaller sample of schools from the municipal level can provide a more reliable picture of WaSH in schools coverage. It should be assured that the same standards are applied across the different municipalities. The collected data can be summarized in the form of a report card to give feedback to each school. The report card can include suggestions on how the schools can improve its score. These report cards can also alert municipal officials as to which schools need the greatest assistance in meeting national WaSH standards. This will help prioritize actions and funding.

A previous World Bank Education Project in Nicaragua showed that data collection and dissemination has many positive externalities, such as increasing community participation and spurring action. In 2009, MINED applied student testing and published the results in 2011 “to the regional and municipal education offices, participating schools, and the community. The new accountability mechanism also generated more voluntary involvement of parents in schools in the form of non-monetary work” (World Bank, 2011).

Successful data collection requires a budget for information and communication tools for regional and municipal education offices. The World Bank was able to train government staff in information technology and provide information and communication technology (ICT) equipment to regional and municipal government offices, including: computers, printers, motorcycles, cellular phones, fax machines, office furniture, and generators (World Bank, 2011). Thus, Nicaragua has a good foundation of tools and knowledge to expand data collection activities to include WaSH in Schools.

In addition to collecting data on basic WaSH infrastructure, Cairncross et al. (2010) recommend that health ministries improve their surveillance systems of other diseases linked to inadequate WaSH, including diarrhoeal disease in children. Annual health checks of pupils can be conducted with the support of the community and district health centers and reported to MINSA. Within this data can be included the school that the child attends.

Lessons Learned:
This section describes study design considerations, data collection methods and research questions for future studies to further assess WaSH in schools in Nicaragua.

Sampling and Study Design

UNICEF Nicaragua and government agencies can partner to conduct a follow-up survey in a subset of the schools which responded to this initial survey, or conduct new studies sampling from a complete list of schools. Since the initial survey was not based on a random sample, one
issue with selecting schools for study based on survey responses is that they may be biased. In other words, school directors which had the time, resources, motivation and knowledge to respond to the survey, might not be representative of all schools in the region. Thus, it may be of interest for the next study to select a random sample of schools from the entire school roster. However, there is little data on WaSH at the schools which did not respond to the survey, and thus they could not be assigned to groups based on specific criteria. A decision should also be made as to whether to only study government schools, only study non-government schools, or study both.

In any case, the schools selected for a new or follow-up study should be randomly selected, using a cluster or block sampling methodology to ensure that an adequate number of different types of schools are selected. For example, a study could group schools based on rural-urban location and select an equal quantity from each category. Alternatively, rural schools can be oversampled since the RAAN and RAAS regions tend to be mostly rural and there is the highest level of variation between school conditions in rural areas. Additionally, to accommodate financial constraints, a follow-up survey can be administered in just in one specific geographic area, if the results could be generalizable to the larger region. Ultimately, the selected sample will depend on the research question, resource constraints, and government and school cooperation.

Further school selection criteria will also depend on the specific research question in mind. For example, if we are concerned with investigating the reasons why certain rural schools have water infrastructure and others do not, half of the sampled schools should be selected from rural schools which do not have water infrastructure and half from those that do. If alternatively we are interested in studying maintenance and operation issues related to sanitation infrastructure, we can randomly sample schools from the group of schools which stated that they have latrines or toilets which are not in use due to poor conditions. If, on the other hand, we are interested in assessing community involvement in schools and its impact on WaSH in schools, we can randomly select to study 25 schools at which school directors stated that there was a high level of community involvement and 25 schools where school directors believed there was a low level of community involvement. Such a study should also validate whether the original opinions of the school directors were correct by interviewing various stakeholders.

With a smaller sample size, it is possible to gather data through observations and qualitative interview techniques in addition to quantitative methods. This is especially important for the study of subjective variables, such as community, teacher, and parent involvement in WaSH in schools or for variables that may be subject to responder bias such as whether students exhibit “good” handwashing practices and whether hygiene education programs are actually being taught properly.

Data Collection
One of the largest challenges in collecting data for this survey was reaching schools located in geographically remote schools which were far from road and other transportation
infrastructure or required travel by boat and airplane. One possible way to resolve this issue in the future is to use innovative data collection techniques, such as mobile phones, to collect data through voice, electronic, or SMS/text messaging. This is especially useful for regular monthly or annual monitoring of basic WaSH data. Many studies found that there were fewer inconsistencies and missing responses if the survey done electronically as opposed to paper (Barnabe-Ortiz et al. (2008), Palen et al. (2008), Yu et al. (2009), and Thriemer et al. (2012)). One study in Laos found that community health workers did not provide monthly reports to regional centers due to “no money to visit health center”, “no time to visit health center”, and the “health center is located too far”(Pongvongsaa et al. 2011). Mobile technology can address these issues if similar reasons for not reporting exist in RAAN and RAAS.

Collecting data using mobile phones might require a substantial capital investment in hardware; however it can also save costs in the long run (Seebregts et al., 2009). For example, electronic data capture removes the need to hire data entry personnel and also eliminates data entry error. Thriemer et al. (2012) found that PDA administered surveys were both faster and 25% cheaper than paper-based surveys. Another benefit of using mobile phones is that they can provide geographic coordinates. GPS data can provide more in-depth analysis, especially regarding geographic issues such as climate change or proximity to transportation infrastructure or city centers.

However, it is difficult to collect impartial qualitative data without supplemental observation and interviewing conducted by trained volunteers. Thus, some traveling to remote areas will still be needed to periodically train field interviewers and inspectors. Furthermore, the use of mobile technology requires adequate electricity, wireless coverage and knowledge on how to use this technology. Thus, this technology should be used where the context and conditions support it.

Possible Research Questions for Future Studies

Many interesting research questions emerged as a result of this first survey of WaSH in schools in the RAAN and RAAS. A summary of these questions are presented in a list below. A more detailed set of questions is attached in an appendix to this report. Discussion with national, regional, and municipal governments and partner organizations will help narrow down and select the most important questions for immediate study.

- How are the geographic and socioeconomic characteristics of the communities within which schools are located related to WaSH in schools (beyond just rural or urban)?
- Is there a difference in coverage of WaSH in schools between formal state-run schools as opposed to informal community schools or parochial schools?
- Is coverage of WaSH in schools related to government, NGO or private organization involvement? Which have greater impact, in which areas (water, sanitation, hygiene), and why?
- What is the impact of WaSH in schools on student wellbeing and/or learning? Use specific and accurate outcome variable measures such as pupil absence, rate of student diarrhea, or microbial water quality.
• Is there an association between no separation of toilets by sex or poor quality of toilets and decreased attendance by girls?
• Conduct more in-depth water and sanitation studies. For example:
  o Where is water carried from, how much water, how far or how much time did it take to carry? Who carries the water? Is the transport and storage of water safe?
  o What are the sustainability issues in WaSH: why is water infrastructure broken? Why are sanitation facilities not used?
  o Are maintenance tasks, such as toilet cleaning, being done well, safely, and equitably? What distinguishes schools with good maintenance from those with poor maintenance practices?
• How are hygiene programs and trainings implemented across different schools? What is the quality?
  o What is the difference between personal hygiene training, environmental health training, and other hygiene programs?
  o Why don’t many schools use the FECSA methodology?
  o Use observational techniques to validate/assess handwashing practices and knowledge.
• Is there willingness for parents to pay or contribute labor/materials to building and maintaining WaSH in schools? In which communities?
• Does higher community involvement in schools contribute to better WaSH in schools conditions?
• Do hygiene programs or presence of WaSH in schools influence the larger community?

The study methods outlined in this section are aimed to address limitations of the initial survey discussed in this report. The list of possible future studies are based on patterns revealed from the data analysis that need further examination. The focus of future studies should be on mixed methods data collection to attain a deeper understanding of the issues surrounding WaSH in schools. These studies will add to the baseline survey discussed in this report and continue to expand the knowledge on WaSH in schools in Nicaragua.

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