Journal of Environmental Science and Management 24-1: 1-14 (June 2021) ISSN 0119-1144

Water, Sanitation and Hygiene Practices in the Philippines: Meeting National and Global Targets at the Local Level

ABSTRACT

As national and global water, sanitation, and hygiene targets have been set and programs have been implemented, the study aimed to assess the attainment of these targets at the local level in selected areas in Davao region, the Philippines. Randomly selected households were assessed for water, sanitation, and hygiene indicators using a modified tool that combined national guidelines and global recommendations. Validated access to improved water source for drinking was below the targets in most barangays, while validated sanitary toilet coverages in all barangays did not meet the targets. Significant difference was observed between validated and reported access to improved water and sanitation services in some barangays. Approximately 87.5% of households had a handwashing facility, but only 51.2% of which had both water and soap available. Achieving the targets is challenged by the gap in monitoring due to a decentralized health system in the Philippines. There is a need to standardize indicators and optimize the tool to allow a comprehensive assessment of water, sanitation, and hygiene practices. This will help generate local data that are in line with national guidelines and global recommendations to enhance policy and to determine priority areas for improved water, sanitation, and hygiene service delivery.

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Keywords: *water, sanitation, hygiene, WASH interventions, WASH practices*

INTRODUCTION

Water, sanitation, and hygiene (WASH) services are essential to public health, welfare, and development. Water is considered as an essential commodity, fundamental to human health, while adequate sanitation and hygiene services are needed to maintain the quality of water as well as to prevent the transmission of water-related diseases (*UN Water 2015*). In 2016, an estimated 1.6 million deaths and 105 million disability-adjusted life years were attributed to inadequate WASH (*Prüss-Ustün et al. 2019*). Among the diseases that can be prevented through WASH are the neglected tropical diseases (NTDs) (*WHO 2012*), such as soil-transmitted helminthiasis (STH) and schistosomiasis. The transmission of these infections are facilitated through environmental pathways, wherein people may be repeatedly exposed and infected (*Garchitorena et al. 2017*).

"Ensuring availability and sustainable management of water and sanitation for all" by 2030 is included as the sixth Sustainable Development Goal (*UN 2015*). In the Philippines, the proportion of the population with access to safely managed drinking water, safely managed sanitary facilities, and basic handwashing facilities were 47%, 52%, and 78%, respectively, in 2017 (*WHO/UNICEF 2019*).

In support of global initiatives, the Department of Health (DOH) has developed programs which specify national WASH targets. The DOH targets to provide access to safely managed water to 62.5% of all households (HHs) by 2022 (*DOH 2018*). The National Sustainable Sanitation Promotion Plan (NSSPP) aims to achieve 100% sanitary toilet coverage by 2022 (*DOH 2010a, 2018*). The Local Sustainable Sanitation Promotion Program (LSSPP) and Zero Open Defecation Program (ZODP) are being implemented under the NSSPP. The LSSPP localizes the national plan and ensures that goals are achieved through effective planning and implementation at the local level (*DOH 2010b*). The ZODP aims to end open defecation by 2022 through the Community-

Led Total Sanitation approach which seeks to engender behavioral change and empower communities to collectively act to become Zero Open Defecation (ZOD) areas (*DOH 2010c, 2010d*). These programs, however, grant some degree of autonomy in the implementation at the local level under the decentralized health system. To assess the progress towards achieving the set targets, the DOH through local government units conducts regular monitoring of access to WASH practices.

Since national and global WASH targets have been set and WASH programs have been implemented, the study aimed to assess the attainment of WASH targets at the local level in selected areas in Davao region, the Philippines as part of a multidisciplinary study for the control and prevention of schistosomiasis.

MATERIALS AND METHODS

Study sites

The cross-sectional study was conducted in the provinces of Davao de Oro and Davao del Norte in Region 11, the Philippines. Two municipalities per province and four barangays (villages) from each municipality were included as study sites. These were selected based on known schistosomiasis endemicity, zero open defecation (ZOD) status, willingness to participate, accessibility of communities, and peace and order situation, and in consultation with the Department of Health (DOH)-Davao Center for Health Development, provincial health offices, and concerned rural health units (RHUs). For each province, one non-ZOD municipality and one near-ZOD municipality were included (**Figure 1 and Table 1**).

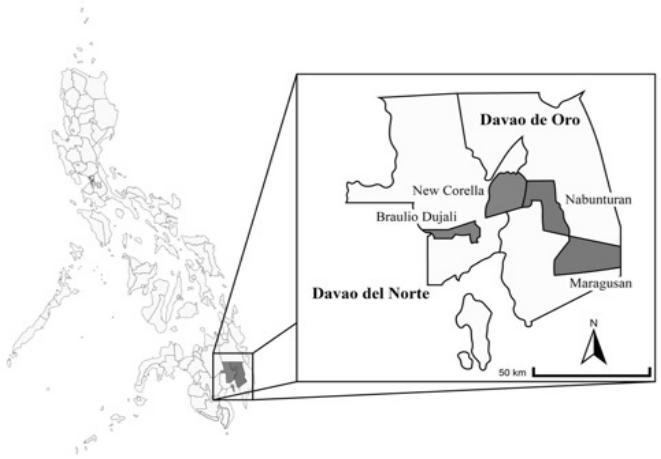

Figure 1. Map of the Philippines (left) and provinces of Davao de Oro and Davao del Norte highlighting the study sites (right).

Table 1. Selected municipalities and barangays chosen as study sites (n=16), Davao de Oro and Davao del Norte, the Philippines.

Province	Municipality	Barangays
Davao de Oro	Maragusan[a,c]	Lahi
		Pamintaran
		Tigbao
		Tupaz
	Nabunturan[b,c]	Basak
		Magsaysay
		Manat
		Pangutosan
Davao del Norte	Braulio Dujali[a,e]	Cabay-angan
		Magupising
		New Casay
		Poblacion
	New Corella[b,d]	Del Pilar
		Limbaan
		Mesaoy
		Poblacion

[a]*Non-ZOD*
[b]*Near-ZOD*
[c]*First-class municipality*
[d]*Second-class municipality*
[e]*Fourth-class municipality*

The minimum number of households (HHs) (n) surveyed in each selected municipality was estimated using the equation below, where Z is the standard normal deviation at 95% confidence level, P is the municipal-level data on sanitary toilet coverage in 2018, Q is the complement of P, and d is the margin of error set at 0.5.

$$n = \frac{Z^2 PQ}{d^2} \quad (1)$$

A total of 578 HHs were surveyed to assess sanitary toilet coverage and access to improved water source for drinking. In Davao de Oro, 243 HHs in Maragusan and 48 HHs in Nabunturan were surveyed on the assumption that the percentage of HHs with sanitary toilets is 80.7% and 96.6%, respectively. In Davao del Norte, 239 HHs in Braulio Dujali and 48 HHs in New Corella were included assuming the percentage of HHs with sanitary toilets is 81.1% and 96.9%, respectively.

Sampling Design

Systematic random sampling was employed in selecting the sample HHs. The master list of HHs provided by the barangay was the sampling frame. In the absence of the owner of the HH during the time of visit, the HH to the left of it was surveyed. In the absence of the owner of the latter, the HH to the right was surveyed instead.

Data Collection

Validated WASH data was collected through a house-to-house survey of randomly selected HHs for WASH indicators. The WASH assessment tool utilized was a modification of the HH Characteristics Questionnaire of the Philippine National Demographic Health Survey (NDHS) 2017 (*PSA/ICF 2018*) and the World Health Organization (WHO)/United Nations Children's Fund (UNICEF) Joint Monitoring Program (JMP) Core Questions on WASH for HH Surveys (*WHO 2018*). A WASH assessment team, composed of the project staff, trained field staff, and barangay health workers, collected HH-level data on the following WASH indicators: source of drinking water, amount of time to obtain drinking water, type of water treatment prior to drinking, access to a sanitary toilet, type of sanitation facility, source of water for other activities, presence of handwashing facility, and presence of water and/or soap at the handwashing facility. Reported WASH data was collected through a review of secondary data on ZOD status, sanitary toilet coverage, and access to safe drinking water from concerned RHUs.

Data Processing and Analysis

Validated data were recorded on WASH assessment forms and double-encoded using Microsoft Excel 2010. Data comparison was done using Epi Info version 3.5.3 to ensure data accuracy. The following parameters were calculated: percentage of HHs with access to improved water source for drinking, amount of time to obtain drinking water, distribution of HHs according to the type of water treatment prior to drinking, distribution of HHs with improved water source for other activities, percentage of HHs with access to sanitary toilets, percentage of HHs with access to handwashing facilities, and distribution of HHs according to availability of water and/or soap. Classification of drinking water sources (**Table 2**) and sanitation facilities **(Table 3**) as improved were based on the *WHO/UNICEF* (*2018*) and *Philippine Statistics Authority (PSA)/Inner City Fund (ICF)* (*2018*) definitions. Access to improved drinking water sources and sanitation facilities were compared to global and national targets. A handwashing facility was classified either as fixed, if it had a sink and a household tap or as mobile, if it utilized a bucket, jug, kettle, or dipper. Z-test for one population proportion was performed at confidence level of 95% to determine the difference between the reported and validated access to improved water source for drinking as well as between the reported and validated sanitary toilet coverages.

Table 2. Categorization of improved and unimproved drinking water sources.

Improved water sources	Unimproved water sources
• Piped into dwelling/yard/plot/ neighbor • Public tap/standpipe • Tube well/borehole • Protected dug well or spring • Rainwater • Bottled water/refilling station with improved source for cooking/handwashing	• Unprotected well • Unprotected spring • Tanker truck/cart with small tank • Surface water • Bottled water/re-filling station with unimproved source for cooking/handwashing

(WHO/UNICEF 2018 and PSA/ICF 2018)

Table 3. Categorization of improved and unimproved sanitation facilities.

Improved facilities	Unimproved facilities
• Flush/ pour flush toilet connected to piped sewer system • Flush/pour flush toilet connected to septic tank • Flush/pour flush toilet connected to pit latrine • Ventilated improved pit (VIP) • Pit latrine with slab • Composting toilet • Twin pit latrine with slab • Container-based sanitation (cartridge)	• Pit latrine without slab/open pit • Hanging toilet/latrine • Bucket • Other • Any facility shared with other households

(WHO/UNICEF 2018 and PSA/ICF 2018)

RESULTS AND DISCUSSION

Water

Access to improved water source for drinking. Validated access to improved water source for drinking in barangays in Davao de Oro ranged from 75.0% to 100.0%, while validated access was significantly lower than the reported in Pamintaran ($p<0.05$) and Basak ($p<0.05$) (**Figure 2**).

Validated access to improved water source for drinking in barangays surveyed in Davao del Norte ranged from 33.3% to 83.3%. Validated access was significantly higher ($p<0.05$) than the reported access in Cabay-angan. In contrast, validated access to improved water source was significantly lower ($p<0.05$) than the reported in all barangays in New Corella, and was lowest in Poblacion with a difference of 63.7% (**Figure 3**).

Amount of time to obtain drinking water. Most HHs

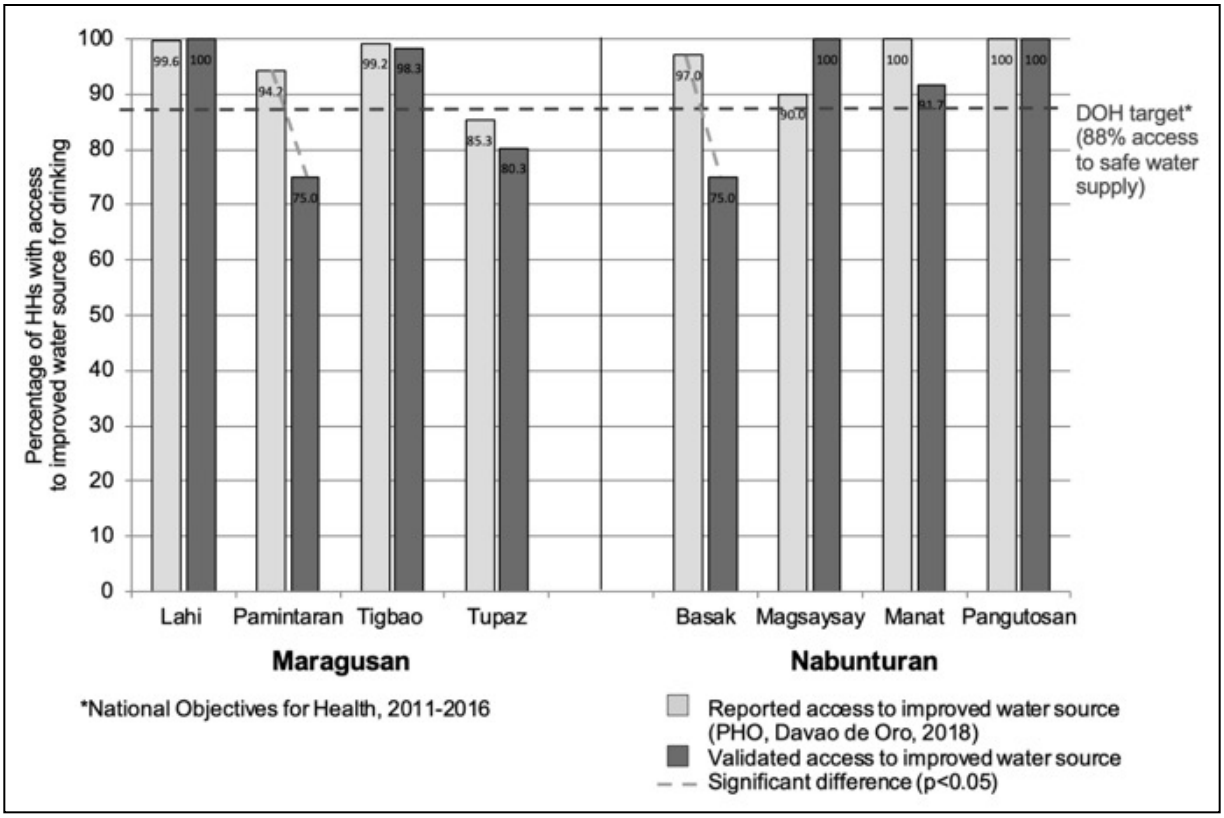

Figure 2. Reported and validated access to improved water source for drinking in selected barangays, Maragusan (n=243) and Nabunturan (n=48), Davao de Oro, the Philippines, October 2019.

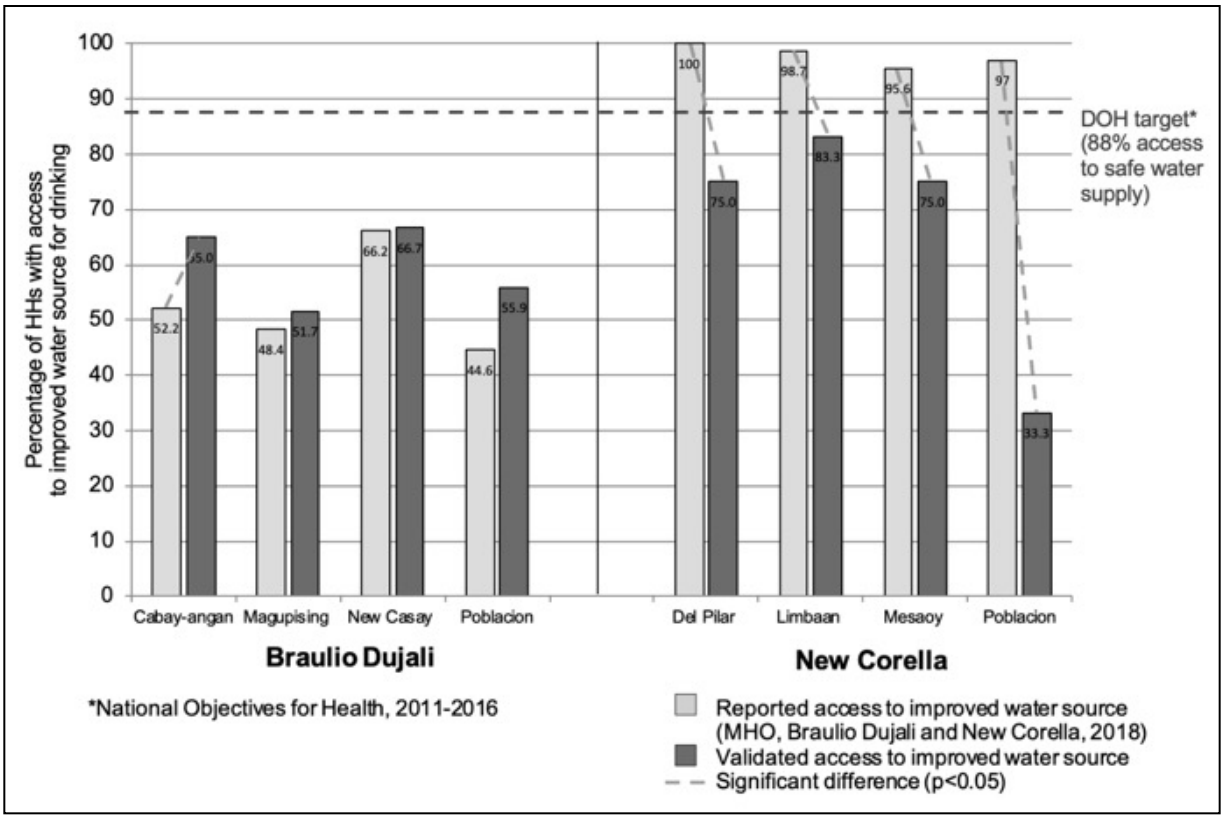

Figure 3. Reported and validated access to improved water source for drinking in selected barangays, Braulio Dujali (n=239) and New Corella (n=48), Davao del Norte, the Philippines, October 2019.

in Maragusan (95.1%) and Nabunturan (83.3%) in Davao de Oro were less than 30 minutes from obtaining drinking water (**Figure 4**). Similarly, most HHs in Braulio Dujali (92.9%) and New Corella (95.8%) in Davao del Norte were less than 30 minutes from obtaining drinking water (**Figure 5**).

Type of water treatment prior to drinking. Only 6.6% of households (HHs) in Maragusan used appropriate water treatment methods prior to drinking (i.e. boiling and chlorinating). In Nabunturan, boiling water prior to drinking was only observed in Basak at 16.67%. Among those who do not get their drinking water from water refilling stations, only 8.3% and 4.2% of the HHs in Braulio Dujali and New Corella, respectively, used appropriate water treatment methods (i.e. boiling, chlorinating, and filtering).

Type of water source for other activities. Most HHs in Maragusan (88.1%) and Nabunturan (68.8%) in Davao

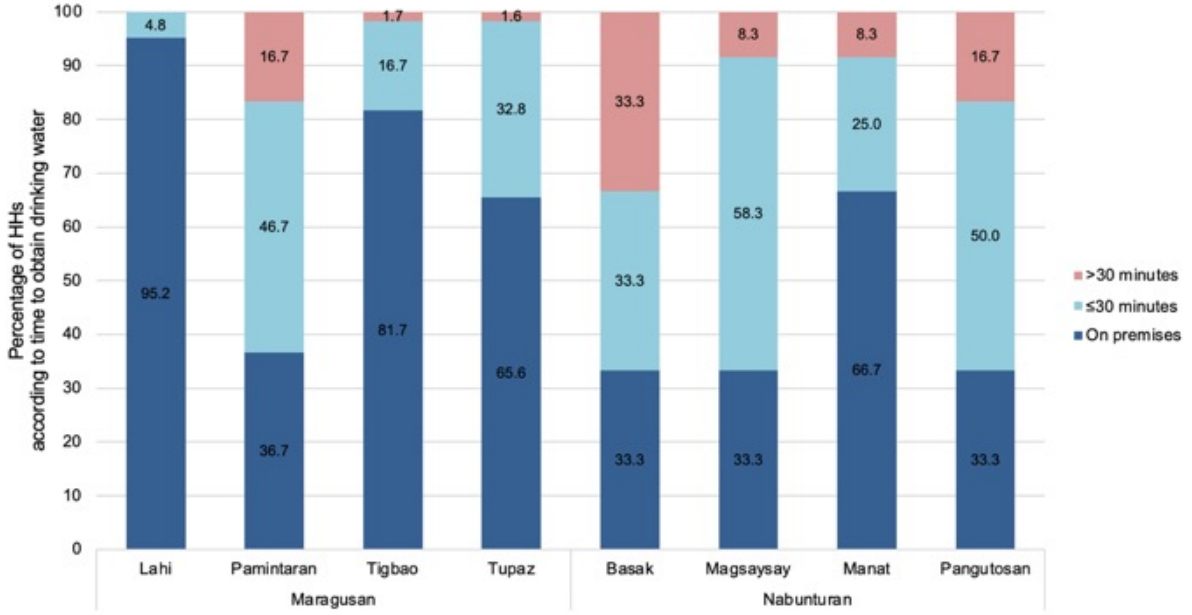

Figure 4. Distribution of HHs according to amount of time to obtain drinking water in selected barangays, Maragusan (n=243) and Nabunturan (n=48), Davao de Oro, October 2019.

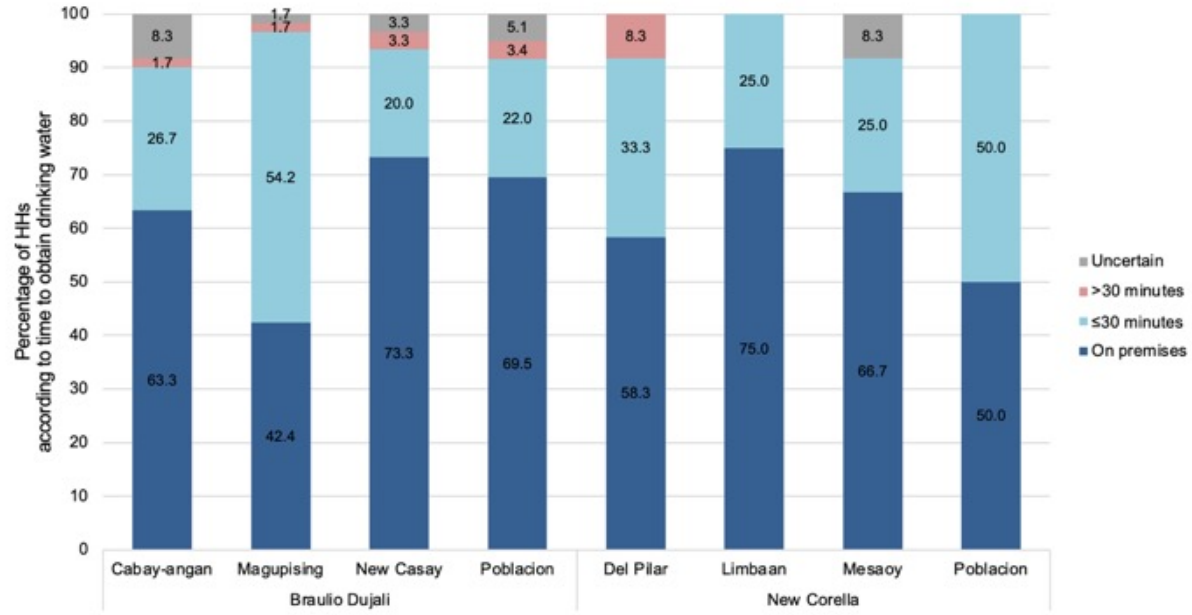

Figure 5. Distribution of HHs according to amount of time to obtain drinking water in selected barangays, Braulio Dujali (n=239) and New Corella (n=48), Davao del Norte, October 2019.

de Oro used improved water sources for other activities (e.g. cooking/handwashing). All HHs surveyed in Lahi and Tigbao in Maragusan and Manat in Nabunturan had access to improved water sources. However, most HHs surveyed in Basak in Nabunturan still used water from unprotected wells (**Figure 6**).

More than half of the HHs in Braulio Dujali (55.7%) and New Corella (75.0%) used improved water sources for other activities, while the proportion of HHs using unimproved water sources for other activities in selected barangays in Davao del Norte ranged from 8.3% to 56.7% (**Figure 7**).

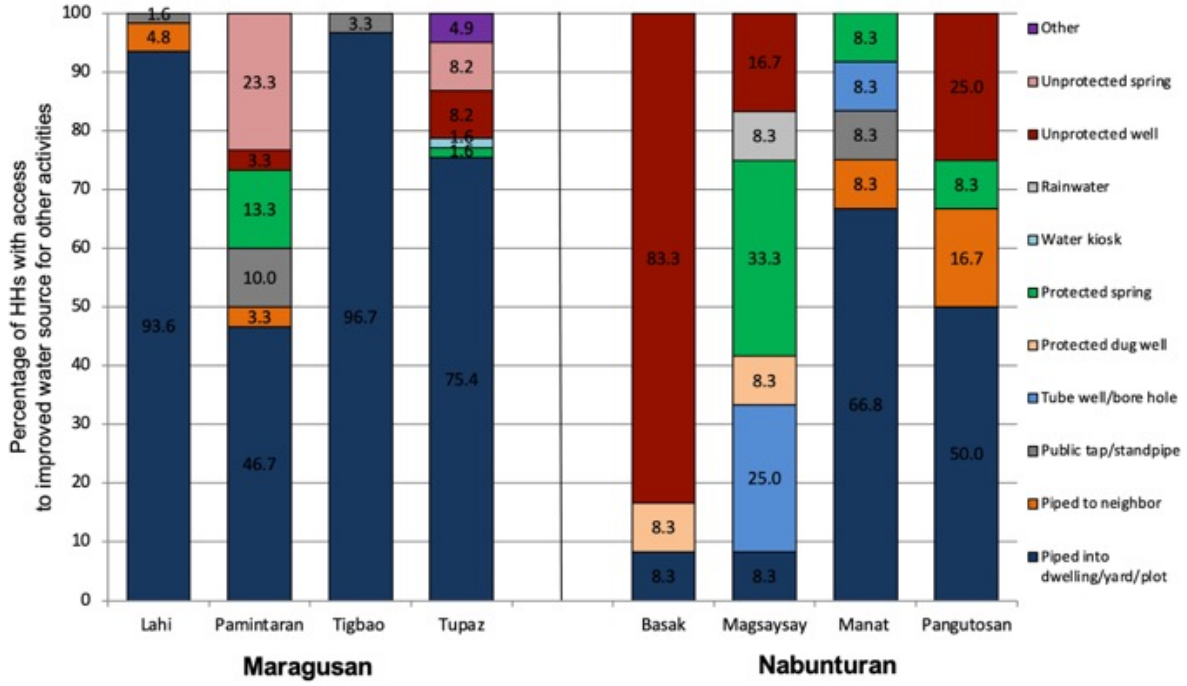

Figure 6. Distribution of HHs according to type of water source for other activities in selected barangays, Maragusan (n=243) and Nabunturan (n=48), Davao de Oro, October 2019.

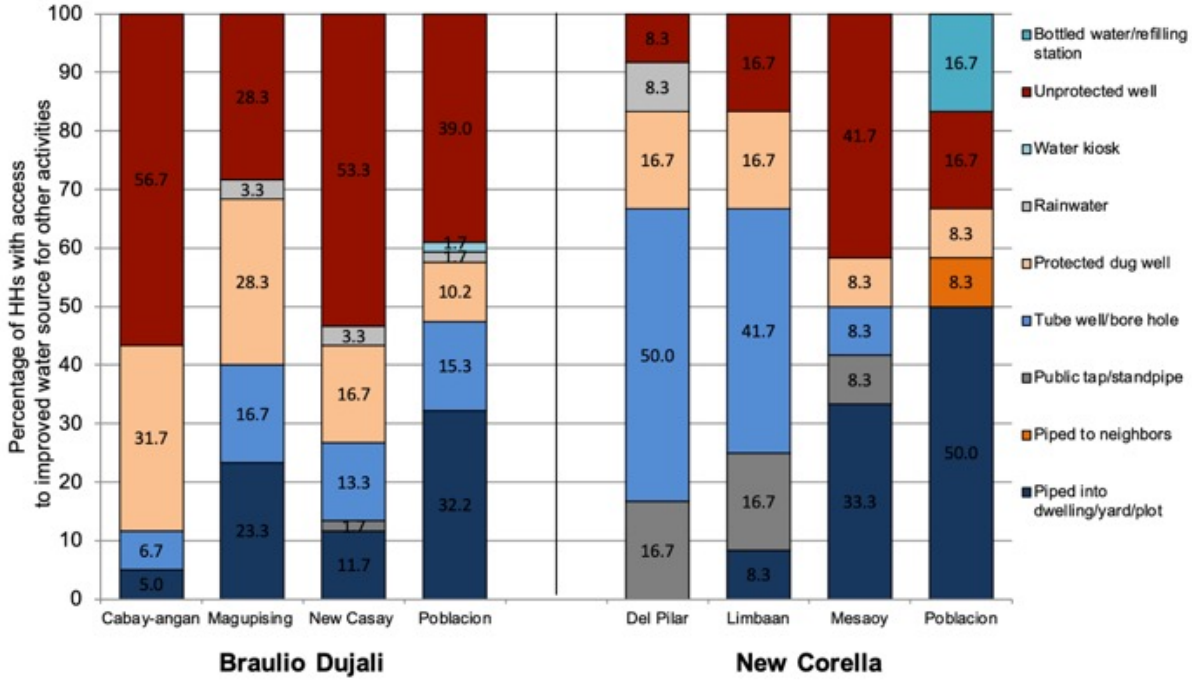

Figure 7. Distribution of HHs according to type of water source for other activities in selected barangays, Braulio Dujali (n=239) and New Corella (n=48), Davao del Norte, October 2019.

Safe water that is readily available, whether for drinking, food production, domestic use, or recreational purposes, is important for public health (*WHO 2019*). Three out of the eight selected barangays in Davao de Oro and all selected barangays in Davao del Norte did not reach the DOH target of 88.0% access to safe water supply (*DOH 2012*). The low access in some barangays may be attributed to their rural classification, (*PSA 2019*) which indicate underdevelopment in these areas. The low density of HHs in rural communities may challenge plans for development of water districts (house-to-house connection) as this may not be cost-efficient and would require a bigger per capita investment. In addition to this, there were still some households who were more than 30 minutes away from obtaining drinking water. Income classification may also be contributing to the low access. Relatively lower access to improved sources for drinking water as well as lower access to improved water sources for other activities were observed in the selected barangays in Davao del Norte than those in Davao de Oro. This was similar to the results of the JMP survey in 2017, where almost all of the upper class population had access to at least basic drinking water, while only 83.0% of those living in poverty had access to safe water (*WHO/UNICEF 2019*). Given that the study did not test for fecal and priority chemical contamination, classification of water sources as safely managed cannot be made, thus, comparison to the global target cannot be done.

The lowest access to an improved source for drinking water was seen in Braulio Dujali, which is a fourth-class municipality in terms of average annual income (*PSA 2019*), lowest among the four municipalities. This limits the capacity of Braulio Dujali to invest in WASH unlike upper class municipalities. Local water sources in Braulio Dujali were scarce that drinking water was regularly being transported by water tankers coming from Davao City. However, this source was considered unimproved as risk of water contamination is likely during water transport and storage (*Worrell et al. 2016*). Aside from being economically-challenged, Braulio Dujali was also observed to be flood-prone, where seasonal flooding may cause destruction of sanitation facilities and contamination of water sources. This may hinder future investments in the development of WASH in the area. However, improvement of level 1 sources (point sources) may be done to mitigate the potential risk stemming from unprotected sources.

In terms of water used for cooking and/or handwashing, more than half of the HHs surveyed in Basak (83.3%), Cabay-angan (56.7%), and New Casay (53.3%) obtained water from unprotected wells. Unprotected wells are susceptible to fecal contamination (*Usman et al. 2016*), thereby exposing the user to potential waterborne diseases (*Moore and Bell 2018*). The low access in the study sites highlights the need for WASH interventions to be done alongside economic development.

A systematic review and meta-analysis on WASH and STH found that water-related access and practices were associated with lower odds of STH (*Strunz et al. 2014*). The use of piped water and treated water (filtered or boiled) was associated with lower *A. lumbricoides* and *Trichuris trichiura* infection rates. Safe drinking water was associated with significantly lower odds of schistosomiasis (*Grimes et al. 2014*).

Variability between reported and validated access to improved sources for drinking water was also observed, with six barangays having significantly lower ($p<0.05$) validated access to improved water source for drinking. This may again be linked to the gap in monitoring.

Sanitation

Sanitary toilet coverage. Validated sanitary toilet coverages in selected barangays in Davao de Oro ranged from 66.7% to 93.4%. In Maragusan, there was no significant difference between the reported and validated sanitary toilet coverages in all barangays, except in Pamintaran, where the validated sanitary toilet coverage was significantly higher ($p<0.05$) than the reported coverage. In all barangays of Nabunturan, the validated sanitary toilet coverages were significantly lower ($p<0.05$) than the reported sanitary toilet coverages (**Figure 8**).

Validated sanitary toilet coverages observed in selected barangays in Davao del Norte ranged from 68.3% to 91.7%, and were significantly lower ($p<0.05$) than the reported sanitary toilet coverages (**Figure 9**).

Assessment of sanitary toilet coverage revealed that all selected barangays in Davao de Oro and Davao del Norte have not yet reached the NSSPP target of 100% sanitary toilet coverage (*DOH 2010a*) despite a decade of program implementation. It was observed during the validation that some of the distributed toilets were not used. The lack of awareness and unfavorable attitudes of some of the residents toward the importance of sanitary toilet facilities may have contributed to the low coverage that was observed. There is a need to complement WASH interventions with a communication strategy aimed at educating the public on the proper use and maintenance

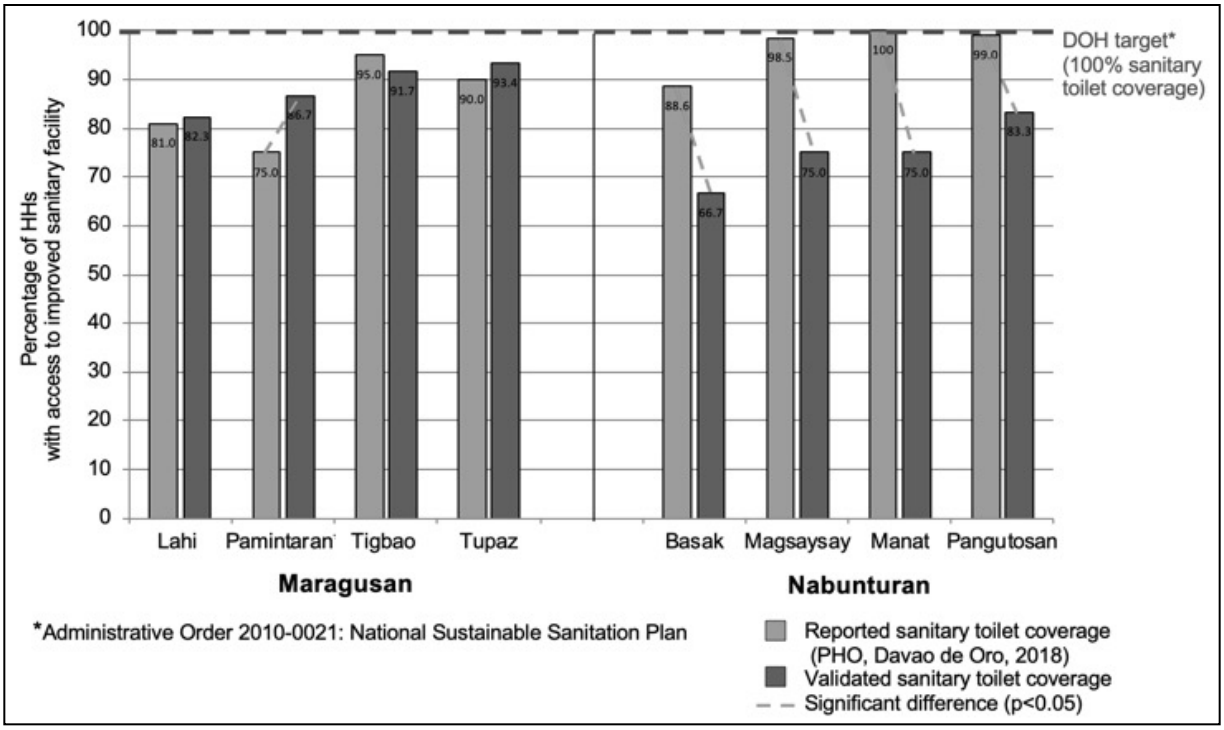

Figure 8. Reported and validated sanitary toilet coverages in selected barangays, Maragusan (n=243) and Nabunturan (n=48), Davao de Oro, the Philippines, October 2019.

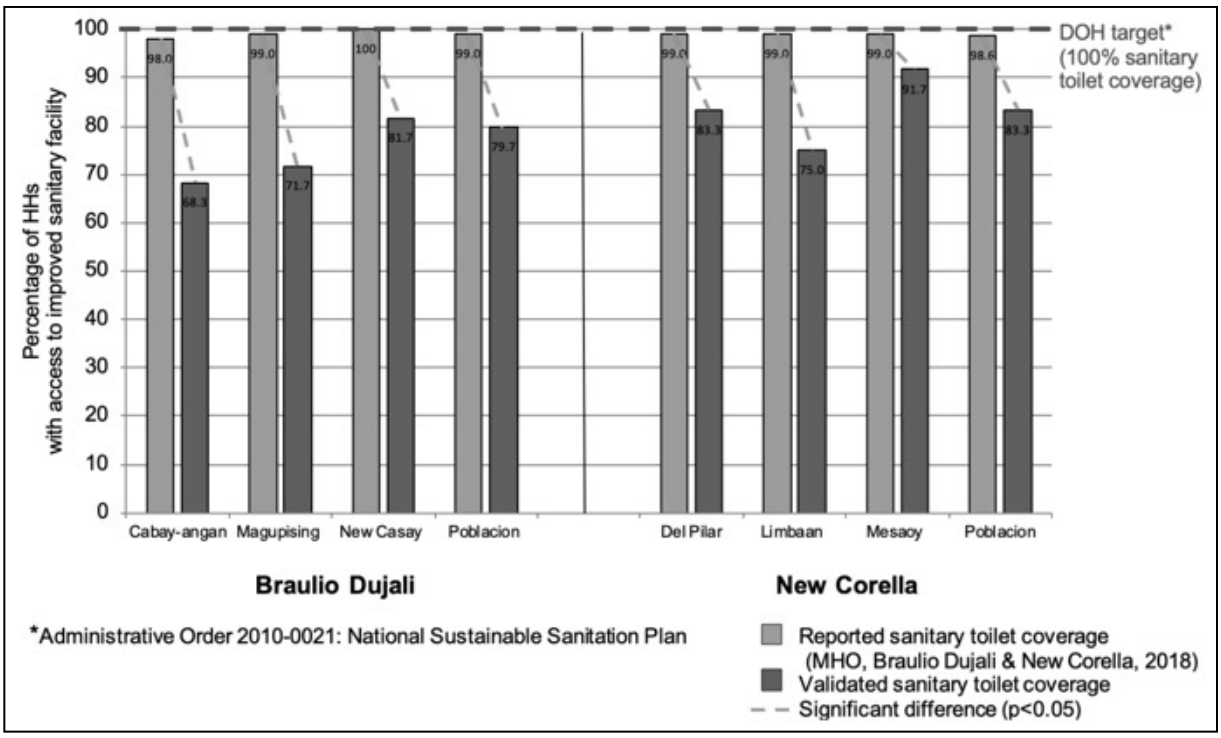

Figure 9. Reported and validated sanitary toilet coverages in selected barangays, Braulio Dujali (n=239) and New Corella (n=48), Davao del Norte, the Philippines, October 2019.

of such facilities and its impact on the health of the community.

The sanitary toilet coverage in selected barangays in Davao del Norte was lower compared to those in Davao de Oro. This may be attributed to the lower income classification of the municipalities of Braulio Dujali and New Corella compared to the municipalities of Maragusan and Nabunturan (*PSA 2019*). There is an existing inequality between the upper and lower classes, with people of lower income groups having decreased access to improved WASH. In the Philippines, an

estimated 95.0% of the richest had access to basic sanitation facilities, while only 50.0% of the marginalized population had access to these services in 2017 (*WHO/UNICEF 2019*).

Overall, 12.0% of the sampled households (HHs) in the study sites used a shared sanitation facility. All shared facilities are by default classified as unimproved by the JMP due to increased exposure to health risks and the tendency of shared toilets to be poorly managed (*Rheinlander et al. 2015*). The use of shared sanitation facilities showed a significant increase in the incidence of diarrheal diseases (*Ramlal et al. 2015*). Sharing latrine between HHs was also identified as one of the risk factors for having Ascaris sp. infection (*Vaz Nery et al. 2019a*).

Availability of sanitation facilities was associated with significant protection against STH (*Ziegelbauer et al. 2012*). This was consistent with the results of the parasitologic assessment conducted by the project team in the study sites in June 2019, where the highest prevalence of STH in Davao del Norte was seen in Cabay-angan in Braulio Dujali, which also had the lowest validated sanitary toilet coverage. Access to basic sanitation facilities was also found to reduce the morbidity of schistosomiasis by 77% (*Esrey et al. 1991*). A study found that schistosomiasis prevalence was significantly lower in communities where more than 50% of people used hygienic lavatories (*Yang et al. 2009*).

Although the study sites have yet to attain ZOD status, validated sanitary toilet coverages were significantly lower ($p<0.05$) than reported coverages in all selected barangays in Nabunturan, Davao de Oro and all selected barangays in Braulio Dujali and New Corella, Davao del Norte. This may indicate possible overreporting in coverage, which may be caused by the gap in monitoring as the Department of Health (DOH) conducts their assessment once a barangay is candidate for ZOD. The burden of monitoring falls upon the local government units through rural sanitation inspectors which periodically submit reports to the DOH.

Hygiene

Type of Handwashing Facility. Majority of the HHs in selected barangays in Maragusan (93%) and Nabunturan (85%) had a handwashing facility (i.e. fixed facility and mobile object [*WHO/UNICEF 2018*]). Type of handwashing facilities in most barangays were mobile type (**Figure 10**).

Majority of the HHs in selected barangays in Braulio Dujali (82.0%) and New Corella (89.6%) had a handwashing facility, with most having mobile type (**Figure 11**).

Availability of water and/or soap at the handwashing facility. Among those with a handwashing facility, less

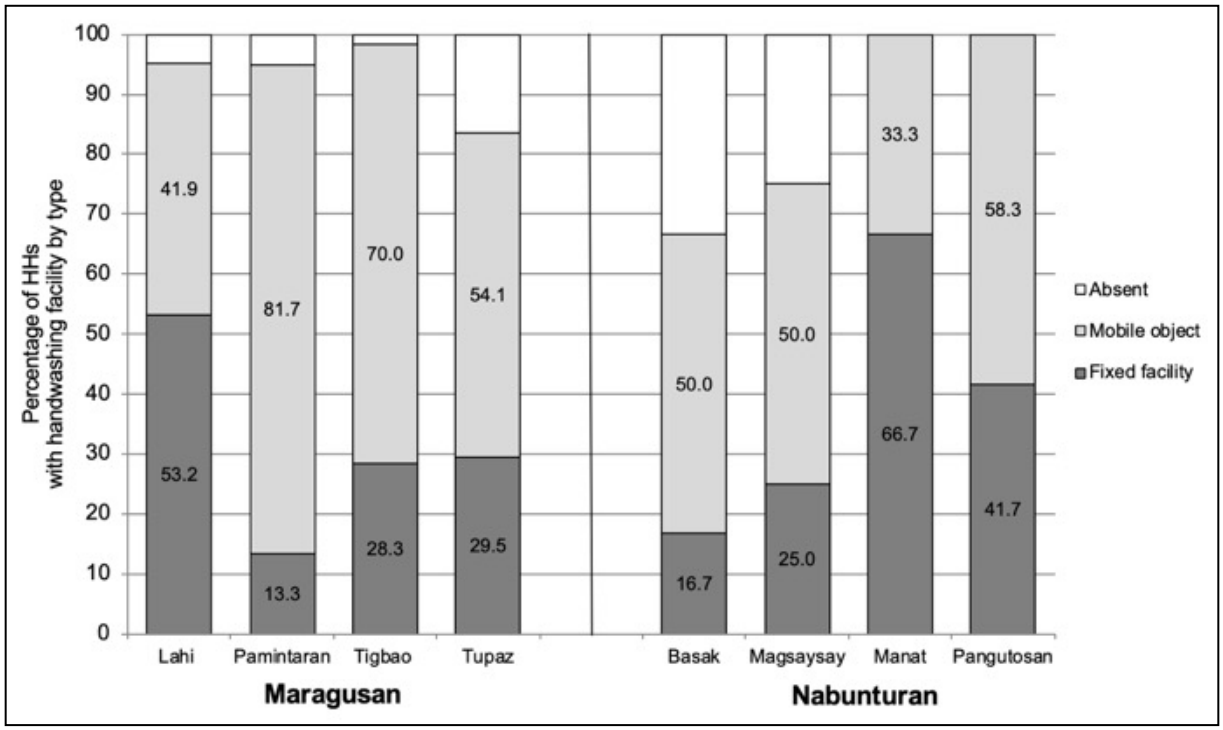

Figure 10. Distribution of HHs according to type of handwashing facility in selected barangays, Maragusan (n=243) and Nabunturan (n=48), Davao de Oro, the Philippines, October 2019.

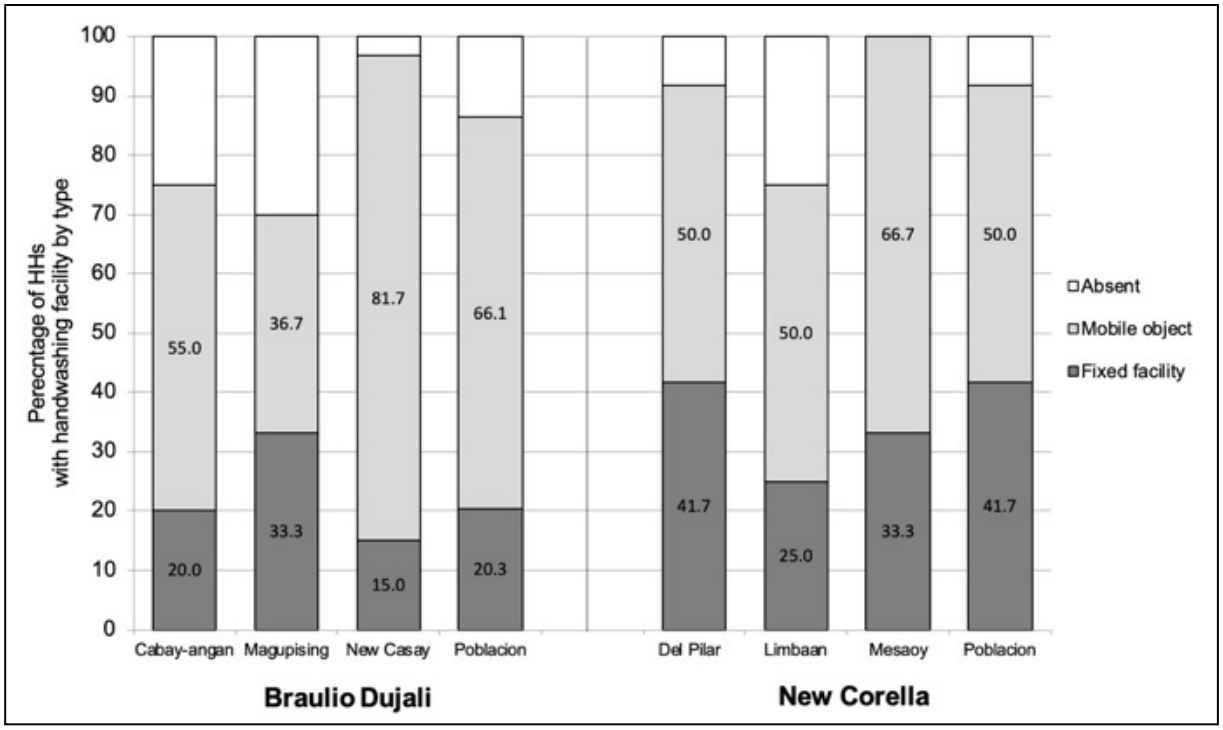

Figure 11. Distribution of HHs according to type of handwashing facility in selected barangays, Braulio Dujali (n=239) and New Corella (n=48), Davao del Norte, the Philippines, October 2019.

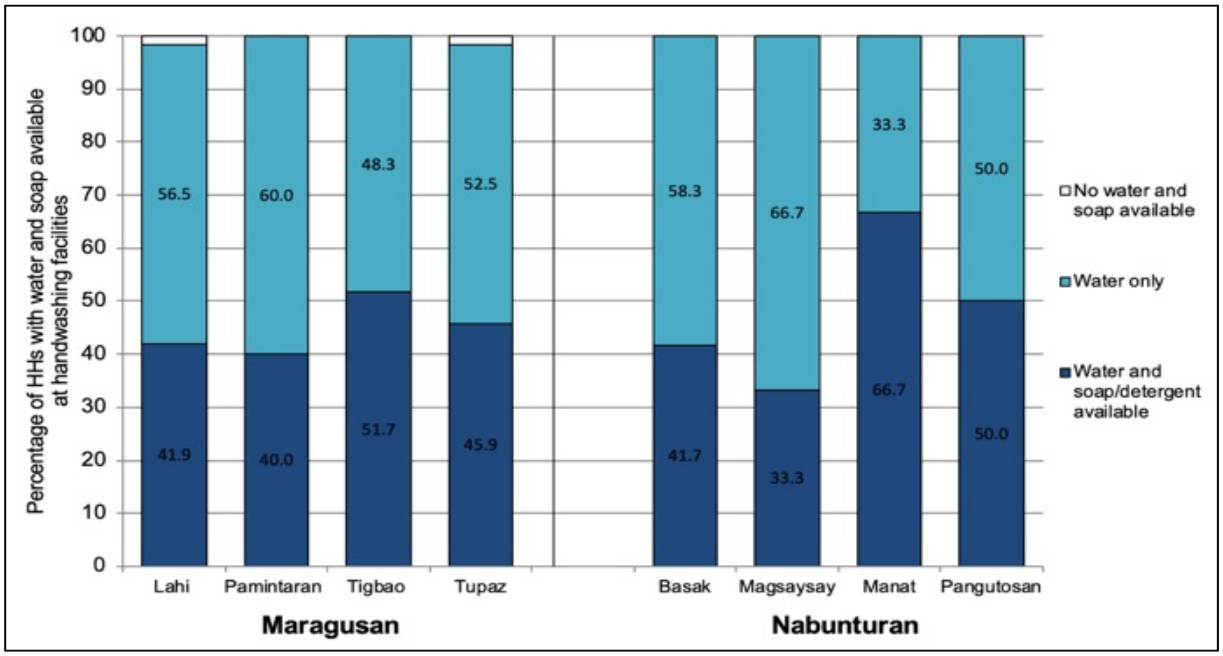

Figure 12. Distribution of HHs according to availability of water and/or soap in selected barangays, Maragusan (n=243) and Nabunturan (n=48), Davao de Oro, the Philippines, October 2019.

than half of HHs in most barangays in Davao de Oro had both water and soap available at the site for handwashing (**Figure 12**). Meanwhile, at least half of the HHs in all selected barangays in Davao del Norte had water and soap available (**Figure 13**).

Although 87.5% of HHs had handwashing facilities, only 51.2% of which had both water and soap available at the site for handwashing. This limits the capacity of these HHs to observe hygiene practices. Handwashing before eating was associated with lower odds of *A. lumbricoides* infection, while use and/or availability of soap was significantly associated with lower infection with any STH (*Strunz et al. 2014*). Hygiene

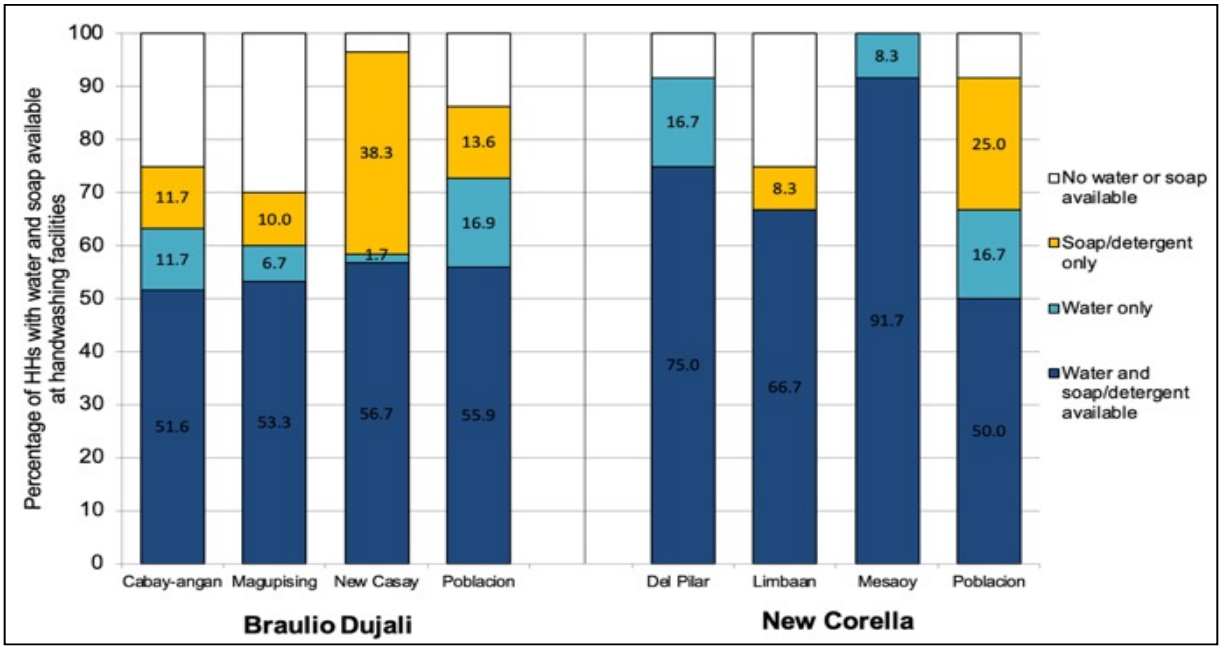

Figure 13. Distribution of HHs according to availability of water and/or soap in selected barangays, Braulio Dujali (n=239) and New Corella (n=48), Davao del Norte, the Philippines, October 2019.

practices, particularly soap use, may also play a role in schistosomiasis prevention as soap is toxic to cercariae, miracidia, and specific freshwater snails (*Grimes et al. 2015*). This highlights the co-dependency of WASH services with one another and must be improved altogether to establish an effective intervention.

WASH assessment and actions needed for WASH

As improvement in WASH may be hindered by the economic capacity of communities and individuals, there is a need to strengthen collaboration of the WASH sector with other stakeholders including local government and non-government agencies. This will pave the way to the development of and investment in WASH facilities in these areas. The importance of co-development in economic and WASH conditions is recognized by the United Nations which aims "to end poverty in all forms everywhere" and "to achieve universal access to basic services" as stated in SDGs 1 & 1.4, respectively (*UN 2015*).

Recent updates to the core WASH indicators and service ladders used in global monitoring may indicate a need to assess the current tool being used at the national level. Updating the DOH assessment tool will optimize its capacity to represent the true contribution of WASH to the burden of NTDs and will align the tool with global standards. As safely-managed drinking water is the ultimate goal, evaluation of microbiological and priority chemical contaminants as part of future WASH assessments is necessary for this classification. This must be complemented by capacity building of local WASH assessment teams. A comprehensive tool and trained personnel are essential to generate appropriate data that will serve as basis for improved WASH service delivery and policy enhancement.

While STH and schistosomiasis can be treated in the short-term with preventive chemotherapy, re-infection is common (*Strunz et al. 2014, Grimes et al. 2015*). Therefore, better integration of comprehensive WASH interventions alongside mass drug administration is essential. Health education should also be integrated in interventions involving deworming and WASH for more sustainable and effective control (*WHO 2002, Strunz et al. 2014, Exum et al. 2019*). A cluster-randomized trial combining deworming, hygiene promotion, and provision of WASH observed a decrease in *A. lumbricoides* re-infection by as much as 44.0% (*Freeman et al. 2013*). As STH and schistosomiasis prevalence was low in the study sites and the greatest impact of WASH on STH was in low prevalence settings (*Vaz Nery et al. 2019b*), improvements in WASH service delivery (i.e. WASH governance, adequate financing and infrastructure investments) may help push these infections towards elimination. Furthermore, emphasis must be put on identifying benchmarks for WASH to encourage investment on WASH programs in STH-endemic areas (*Freeman et al. 2019*).

CONCLUSION AND RECOMMENDATIONS

The findings of this study revealed that national and global WASH targets have not been met despite a decade of program implementation. Achieving the targets is challenged by the gap in monitoring. Improvements in WASH along with the implementation of WASH communication strategy are crucial because they complement the pharmacological interventions and contribute to more sustainable soil-transmitted helminthiasis and schistosomiasis control. Comparing reported and validated access to improved water and sanitation services with the DOH targets, there is a need to standardize indicators and optimize the Department of Health tool as well as capacitate local health personnel to allow a comprehensive assessment of WASH practices. This will help generate local data in line with national guidelines and global recommendations to enhance policy and to determine priority areas for improved WASH service delivery.

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ACKNOWLEDGMENT

The authors would like to give special thanks to Dr. Soledad Natalia M. Dalisay, Dr. Aleyla E. de Cadiz, Dr. Mary Jane C. Flores, and Dr. Rohani C. Navarro for their invaluable contribution in the development and conduct of the study. The authors would also like to thank the research staff of the Neglected Tropical Diseases Study Group of the University of the Philippines Manila for their assistance during data collection. The authors would also like to express their sincerest gratitude to the following for their support: Department of Health-Davao Center for Health Development; local government units (LGUs) of the provinces of Davao de Oro and Davao del Norte; the LGUs in the municipalities of Maragusan and Nabunturan in Davao de Oro and in the municipalities of Braulio Dujali and New Corella in Davao del Norte. Special thanks to Commission on Higher Education, Republic of the Philippines for providing financial support for this study.