Jurnal Presipitasi
Media Komunikasi dan Pengembangan Teknik Lingkungan
e-ISSN: 2550-0023

Vol 19, No 3, 2022, 720-728
Article available at homepage presipitasi

Research Article

A Cross-sectional Study of Household Characteristic of WASH Facilities in West Java, Indonesia

Aulia Salmaddiina[1]*, Almira Nur Hanifah[1]
[1] Faculty of Public Health, Universitas Indonesia, Pondok Cina, Beji, Depok City, West Java 16424
*Corresponding Author, email: aulia.salmaddiina@gmail.com

Abstract
Goal 6 of the SDGs goes beyond inadequate water, sanitation, and hygiene (WASH) access. In 2017, West Java's improved sanitation coverage was 64.4%, which is lower than Indonesia's average. The research objective is to investigate the correlation between household characteristics with WASH conditions in West Java. Data from the 2017 Indonesian DHS were used with 4,567 households. A cross-sectional study using logistic regression. The result showed an improved facility for WASH in West Java, respectively, source of drinking water (93.8%), sanitation facility (92.2%), handwashing facility (92.5%), and soap and water availability (95.7%). Based on data analysis, unimproved source of drinking water was associated with household age over 47 years (OR: 1.37, 95%CI 1.06-1.77), poor economic (OR: 6.14, 95% CI 4.12-9.15), and living in the rural area (OR: 4.63, 95% CI 3.56-6.03). Unimproved sanitation facilities, unimproved handwashing facilities, and unavailability of soap and water were associated with low education and poor economy. At the same time, those living in rural areas are more likely to have unimproved handwashing facilities. It is recommended for the intervention program to focus more on characteristics that proved to be associated with the study.

Keywords: Water; sanitation; hygiene; household

1. Introduction

Based on the SDGs report in Indonesia, SDG No 6: Ensure availability and sustainable management of water and sanitation for all, including target 6.1: Achieve universal and equitable access to safe and affordable drinking water for all, and target 6.2: Achieve access to adequate and equitable sanitation and hygiene for all and open defecation, paying special attention to the needs of women and girls and those in vulnerable situations, are still below the target. The targets imply to all locations, including households, schools, healthcare facilities, business, and public spaces. Additionally, '"for all" refers to all services that are appropriate for women, men, girls, boys all ages, as well as those who are living with disabilities. In addition, water, sanitation, and hygiene are also necessary to accomplish SDG 3: Good health and well-being, especially the availability of top-notch required healthcare services. WHO provides terms to classify this topic as WASH (Water, Sanitation and Hygiene) (Bartram and Cairncross, 2010). International organizations utilize the availability of safely managed sanitary facilities and access to clean water to measure how far they have come in the fight against what are seen as basic human rights, including poverty, disease, and death. Lack of clean water or sanitation access could lead to health effects, such as diarrhoea, malnutrition, schistosomiasis, trachoma, lymphatic filariasis, other nematode infections, and antimicrobial resistance (Bartram and Cairncross, 2010; World Health Organization (WHO), 2018).

According to World Health Organization, Improved drinking water sources are the ones that more likely to be guarded from external contamination, particularly feces. The examples of improved water resources are drilled wells, protected springs, and rainwater collection. Meanwhile, unimproved water resources are unprotected wells, unprotected springs, surface water (such as water from rivers, dams, or lakes), vendor-provided water, and truck-provided water. Due to restrictions on the possible quantity of the water, bottled water is not regarded as a better source of water. It is defined by WHO/UNICEF joint monitoring program that basic drinking-water services such as access to water from an upgraded source with a roundtrip collection time, including waiting in line, no longer than 30 minutes (Croft et al., 2018; WHO, 2022).

The definition of improved sanitation facilities is the sanitary separation of human waste from human interaction. The examples of improved sanitation are septic tank pit latrines, ventilated-enhanced pit latrines, pit latrines with slab or composting toilets, flush or pour-flush to pipped sewer system, and pit latrines. Open or shared sanitation facilities are not regarded as improved sanitation. Additionally, flushing or pouring water into different location, pit latrines without slabs or open pits, bucket latrines, hanging latrines, and open defecation are regarded as unimproved sanitation (Croft et al., 2018; WHO, 2022).

Hence, every country has a specific and different problem with achieving the SDGs target. Some of the previous studies are related to economic status inequality, which resulted in several factors. First, an imbalance education level which impacted by disproportional income level and job opportunity. Second, there is inequality in terms of technology utilization level among the community which resulted from the level of knowledge, capacity, and practice skills of human resources which very diverse in one country. Third, difficult access within the country because the geographical barrier, due to the various landscape type that would be challenges for government and community to be connected with all the resources. At the same time, others reported that a different policy in every area also becomes an important things which could lead to negative impact in order to achieve this target (Afifah et al., 2018; Irianti et al., 2016; Irianti and Puguh Prasetyoputra, 2015; Lewis, 2017; Patunru, 2015; Suciyanti et al., 2021).

A approximately 2 billion people still do not have access to safely managed drinking water at home. In rural areas, it has been determined that 8 out of 10 people lack access to a basic source of drinking water. Basic sanitation is defined as the availability of facilities for the safe disposal of human waste, such as feces and urine, as well as the maintenance of hygiene conditions through services such as collection of waste, manufacturing and potentially dangerous waste management, and wastewater treatment and disposal. It is assumed that 1.7 billion people (roughly 21% of the world's population) still lack basic sanitation, with 494 million proceeding to open defecation. As for hygiene, 2.3 billion people (29% of the world's population) have no handwashing station with soap and water in their own home, which considered as fundamental hygiene services. One out of three rural residents have access to basic sanitation services (soap and water at home).

In 2017, SDG No 6 was calculated based on two aspects: only 72% of the Indonesian population have adequate access to drinking water, while less than 68% of households have access to improved or adequate sanitation (BPS Indonesia, 2019a, 2019b; Kementerian Desa, Pembangunan Daerah Tertinggal, dan Transmigrasi, 2018). This number is concerning, considering Indonesia has more than 264.7 million residents who live broadly in more than 18,000 islands. The previous study in Indonesia reported that the lack of access to improved water source and sanitation could lead to the incidence of diarrhoea, cholera, typhoid, viral hepatitis A, polio, acute respiratory infections, and other communicable diseases. Some of the studies also reported that it is associated with stunting cases which are affected by worm infection, iron deficiency, and zinc deficiency. Consuming water from unimproved water sources have a high contamination of coliform and *Escherichia coli* (Ardillah et al., 2020; Komarulzaman et al., 2017; Siregar et al., 2022). Despite that, an inadequate sanitation facility has associated with the head of household or parent's characteristics such as type of occupation, literacy, and education level, monthly

expenses. People who live in the remote village have higher possibility to have both risk factors which made them lose their access to improved WASH facility, due to the lack of clean water and toilets (Daniel et al., 2021; Muttaqin, 2018; Suciyanti et al., 2021).

To tackle this problem, Indonesia comes with STBM agenda. The objective was to encourage changing hygienic and sanitary behaviour through community empowerment (Kementrian Kesehatan RI, 2008). Since 2015, the STBM approach has already been implemented. Throughout the two years until 2017, there was an increase of around 7% overall in Indonesia coverage which is 49.3%. Specifically, talking about Indonesia with 34 Provinces. This study focused on West Java province because West Java province has a big area with the second highest population. West Java's STBM coverage is also found concerning, below the Indonesian coverage with only 42.9% (Kementrian Kesehatan RI, 2017). Other indicators, such as improved sanitation and drinking water coverage, are also below Indonesia's coverage with 64.4% and 59.61%, respectively (BPS Indonesia, 2019a, 2019b). Therefore, this study aims to investigates the correlation between household characteristics and WASH facilities in West Java, Indonesia. This study is necessary to be conducted in order to evaluate the ongoing intervention program and provide data analysis that could be used as a baseline for cohort studies in the future.

2. Methods

The methodology that is used for this research, is decided based on the characteristic of the available data which present primary data on one-time collection. For this reason, this study is a cross-sectional study that only captures the incidence and exposure or risk factors over the same period. A quantitative study using data from Indonesian Demographic and Health Surveys (DHS) in 2017, which contains four type of questionnaire including Household, Individual Women, Men, Couple, and Children. On this study, we specifically using data from Household Questionnaire. DHS uses questionnaires to collect primary data from the respondent, home by home. The respondent will have to answer a couple of questions and the enumerator will input into the questionnaire document (more about the methodology: https://dhsprogram.com/). The sample selection using stratified random sampling, with total number of respondents was 47,963, which included all 34 Provinces in Indonesia. This study only focused on West Java, using all the respondents from Indonesia DHS dataset with 4,886 respondents. After cleaning a missing data, the total number of respondents used for this study is 4,567. Cleaning data is done by excluding the incomplete dataset of a respondent to ensure only a complete dataset is included for analysis. Data analysis was conducted using IBM SPSS ver. 25. Two stages included bivariate analysis and multivariate analysis. The bivariate analysis using chi-square test results show that the variables with ≤ 0.25 p-value are included in the next stage. The second stage is a multivariate analysis using multiple regression logistics (Grant et al., 2019).

Categorization of the variables is based on certain condition. After conducted a literature review related with the associated factors from previous research. This study have seven independent variables consisting of age of head of household (HH) (cut off point: 47 years old; 1) > 47; 2) ≤ 47), sex of head of household (female and male), education level of head of household (low: no education/primary and high: secondary/higher), number of household members (cut off point: 4 people; 1) > 4; 2) ≤ 4), type of residence (urban and rural), wealth index (poor: poorest/poorer/middle and rich: richer/richest), and duration to get water source (cut off point: 30 minutes; 1) > 30; 2) ≤ 30). At the same time, the dependent variables consist of four WASH variables: source of drinking water (improved and unimproved), sanitation facility (improved and unimproved), handwashing facility (improved and unimproved), and soap & water availability (improved and unimproved).

3. Result and Discussion

The result showed an improved facility for WASH in West Java, respectively, source of drinking water (93.8%), sanitation facility (92.2%), handwashing facility (92.5%), and soap and water availability (95.7%). Variable distributions are listed below, the household characteristic subsists of the head of

household's age, sex, and education level. The percentage respectively, 52.6% of respondents are under 47 years old, 86.5% are male, and 54.1% attended a higher education level. Other than that, 67.5% lived with less than four household members, and around 76.9% lived in urban areas. The economic status is considered poor (50.2%), and 98.7% of all households need less than 30 minutes to get to the water source.

Bivariate analysis showed the result of a correlation between the variables. The source of drinking water is associated with the head of household's age and education level, number of household members, type of residence, and wealth index. Both sanitation facilities and the availability of soap and water are associated with education level, type of residence, and wealth index. While handwashing facility correlated with household age, education level, residence type, and wealth index (See **Table 1**). For the multivariate analysis, variables with ≤ 0.25 p-value are included. The unimproved source of drinking water is most likely to be found in rural areas (OR: 4.63; 95% CI 3.53-6.03) with poor economic status (OR: 6.14, 95% CI 4.12-9.15) and head of household's age more than 47 years old (OR: 1.37, 95% CI 1.06-1.78). The source of safety drinking water still becomes a problem in rural areas due to difficult access to the city or diverse geographical challenges which increase the procurement cost. The second variable, sanitation facility, is linked to the education level and wealth index, respectively (OR: 1.43, 95% CI 1.11-1.82) and (OR:8.77, 95% CI 6.1-12.62). Same as the previous variables, sanitation facility is a big challenge in a remote area and there is also a limitation on other supported factors such as education and the economic growth of the community. The third variables, head of household with low education level (OR: 1.5, 95% CI 1.16-1.93) and poor economic, located in rural areas (OR: 1.35, 95% CI: 1.06-1.73) and considered poor economic status (OR 2.5, 95% CI 1.9-3.29) are correlated to handwashing facility. The availability of the handwashing facility could be a problem due to the expensive cost and the education gap about personal hygiene in their education system. The last variable is the availability of soap and water within the head of the household with a low level of education (OR: 1.75; 95% CI 1.26-4.23) and poor economic status (OR: 3.07; 95% CI 2.11-4.45). In accordance with the other variables, in a certain community, some of the people have not developed a habit to use soap and water for handwashing (See **Table 2**).

Table 1. Chi-square analysis of household characteristic of wash facilities in West Java, Indonesia

Variables	Source of drinking water	Sanitation facility	Handwashing facility	Soap and water availability
	OR (95% CI)	OR (95% CI)	OR (95% CI)	OR (95% CI)
Age of head of household	1.64** (1.28 – 2.09)	1.22* (0.98 – 1.52)	1.27** (1.02 – 1.59)	1.29* (0.97 – 1.72)
Sex of head of household	0.91 (0.65 – 1.29)	0.81* (0.61 – 1.09)	0.76* (0.57 – 1.03)	0.77* (0.53 – 1.13)
Education level of head of household	3.57** (2.72 – 4.69)	2.88** (2.29 – 3.64)	2.32** (1.84 – 2.93)	2.70** (1.99 – 3.67)
Number of household members	0.67** (0.51 – 0.89)	0.915 (0.73 – 1.16)	0.89 (0.70 – 1.13)	0.92 (0.68 – 1.26)
Type of residence	7.10** (5.50 – 9.167)	2.02** (1.61 – 2.54)	1.98** (1.57 – 2.50)	2.01** (1.49 – 2.70)
Wealth index	9.61** (6.51 – 14.18)	10.17** (7.17 – 14.42)	3.20** (2.49 – 4.12)	3.88** (2.75 – 5.49)
Duration to get water source	0.827 (0.26 – 2.66)	1.11 (0.44 – 2.80)	0.67 (0.21 – 2.16)	0.79 (0.19 – 3.24)

*≤ 0.05 p-value, unadjusted OR is associated;

** ≤ 0.05 p-value, unadjusted OR is associated and ≤ 0.25 p-value, included in multivariate analysis

To support the finding from the quantitative analysis, literature review was conducted according to study's keyword or point of views on "unimproved" and "unavailability" WASH facilities. There are four dependent variables which included unimproved of 1) source of drinking water, 2) sanitation facility, 3) handwashing facility, and the unavailability of soap and water. Hence, the independent variables contain of household heads characteristic (age, sex, and education level), number of household member, type of residence, wealth index, and duration to get water source.

Table 2. Multiple logistic regression analysis of household characteristic of wash facilities in West Java, Indonesia

Variables	OR	95% CI	p-value
Unimproved source of drinking water			
Age of head of household *(> 47 years old)*	1.37	1.06 – 1.77	0.015
Type of residence *(rural)*	4.63	3.56 – 6.03	0.000
Wealth index *(poor)*	6.13	4.12 – 9.15	0.000
Unimproved sanitation facility			
Education level of head of household *(low)*	1.42	1.11 – 1.82	0.005
Wealth index *(poor)*	8.76	6.09 – 12.62	0.000
Unimproved handwashing facility			
Education level of head of household *(low)*	1.50	1.16 – 1.93	0.002
Type of residence *(rural)*	1.35	1.06 – 1.73	0.016
Wealth index *(poor)*	2.50	1.90 – 3.29	0.000
Unavailability of soap and water			
Education level of head of household *(low)*	1.75	1.26 – 2.43	0.001
Wealth index *(poor)*	3.07	2.11 – 4.45	0.000

The findings of this study indicated that several factors were associated with unimproved WASH Facilities. First, age of head of household with age 47 and over more likely to have unimproved WASH facilities which in line with previous study in Northwest Ethiopia with (OR: 3.24, 95% CI 2.00-8.44) this finding might be affected by the high prevalence of unemployment within those age range and impacted to their ability to afford improved drinking water & sanitation facility. While the other study that carried out in South Africa (OR: 0.62, 95% CI 0.57-0.69) and Benin (OR=6.02, 95% CI=3.95–9.18) stated the opposite, reported that a younger household head more likely to use unsafe drinking water or sanitation facility which probably resulted by unstable income and poor economic status (Gaffan et al., 2022; Gebremichael et al., 2021; Simelane et al., 2020). The age variables were always associate with WASH facilities and strongly related with the amount of monthly income or economic stability of the head of household. The result from this study and others might be diverse due to the characteristic of the respondent and area which showed that age variables could be potential confounders in other study with different design study type (Armah et al., 2018).

The other factor is education level of household head, this study showed low level education become an associated factor. This result supported by the study in Nepal with odds ratio respectively (drinking water (OR: 1.10; 95% CI 0.63-1.93) and handwashing facilities (OR: 2.36, 95% CI 1.82-3.06)) and Benin's odd ratio based on variables; combine (OR=9.84, 95% CI=6.55–14.77), sanitation (OR=3.54, 95% CI=2.73–4.59), and handwash (OR=3.18, 95% CI=2.50–4.04). This finding could happen might be because household heads with low education level have less information and knowledge about the possible health risk and personal hygiene which caused by the improper sanitation facilities. Based on a previous study, the lack of personal hygiene knowledge it is influenced by the limited information which should be promoted in educational institution. In Indonesia, there is a mandatory session for the

student about personal hygiene, but still the low implementation rate could be the reason the lack of access to improved water and sanitation facilities still happening (Gaffan et al., 2022; Gebremichael et al., 2021; Oskam et al., 2021; Wada et al., 2022).

The third associated factor is type of residence; people who lives in rural area more likely to have unimproved sanitation facility. This result could be associated with improper built infrastructure consider rural area only have a small population density and limited access due to the geographical contour. Besides that, the villager more likely to consumed or used natural springs which in their perspective are safer, meaning that the water less exposed to chemical contamination (Armah et al., 2018; Dhital et al., 2022; Oskam et al., 2021). The lack access to the rural area, also affected the education and economic level. Accordance to that statement, inadequate sanitation facility could also be impacted by lessen knowledge about sanitation and hygiene or incapability to buy the clean water and build a proper sanitation facility (Oskam et al., 2021). This finding in line with the study in South Africa, respondent with a higher education background potentially have access to improved drinking water sources (OR; 2.63; 95% CI 2.29-3.02) (Simelane et al., 2020).

On the other hand, the wealth index or the economic status is also associated with the unimproved WASH facilities. Previous study in Bangladesh (OR: 5.27; 95% CI 4.67-5.95), Lao (OR: 6.24; 95% CI 5.33-7.32), Benin (OR=380.23, 95% CI=55.99–2,581.98) confirm this finding which presented households with rich or richest people would have better access to improved sanitation facility (Gaffan et al., 2022; Muramatsu-Noguchi et al., 2022; Yunus et al., 2021). Since the households with poor economic status may have been several conditions such as the limited access resulted in expensive transaction cost which they could not be able to afford. Poor economic status often followed and/or caused by the low education level which influence their decision to not prioritize provides sanitation facility in their home (Armah et al., 2018; Oskam et al., 2021). Sometime, this also could happened due to external factors such as government policies. In developed country, this issue will not considered as a risk factors, since the goverment provided the equal water system for both rural and urban area (Luh and Bartram, 2016).

The result from this study showed that sex of the head household, number of household member, and duration to get water source were not associated with unimproved WASH facilities in Indonesia. A literature review on other studies was conducted as a comparation of the findings in this study. On a study on where the head of household were men, the gender of the head household were not associated with distribution of unimproved WASH facilities, in Nepal (Dhital et al., 2022). The same outcome also found in the study on North-West Ethiopia, where the sex of household head did not significantly determine the source of water (improved or unimproved) used for the family (Gebremichael et al., 2021). On the other hand, study found the exact opposite. Compared to household led by male, female-headed household were more likely to have access to improved water, where also found a higher likelihood to access improved toilet facilities (Andualem et al., 2021).

Unlike the outcome of this study where duration of getting water source were not significantly associated with WASH facilities, other research showed the contrary. Access to better water supplies depends on how far away the drinking source from home. Households with less than 30 minutes to obtained drinking water were more likely to access improved water source (Andualem et al., 2021).Households that need to travel longer distance (30 minutes or more) had lower rate to use improved water source. But, distance to water source and improved sanitation were not substantially correlated (Dhital et al., 2022).

This study found that number of household member were found to be not associated with WASH facilities. The study in Ethiopia showed the same result. The study found no statistically significant differences in the availability of fundamental handwashing facilities between households with improved water sources and those with easy access to water. The result of no influence is intriguing because it shows that households can allocate water for handwashing regardless of where it comes from or how easily they can acquire it (Armah et al., 2018; Odo and Mekonnen, 2021) . However,

a different study found the adverse result. Average family size of 4 people per household or middle-sized family, uses improved water sources of drinking water more frequently than smaller and larger families (Gebremichael et al., 2021). Also, a study in Benin, West Africa found that household with five or less people were more likely to have access to basic water facilities compared to the more member of household (Gaffan et al., 2022)

This study's limitation is related to the factors that probably are not observed, which could be potential confounding factors. Since data come from the survey or are self-reported by the respondents, there is a possibility, not an actual number, that is being input. Therefore, it is suggested that the future study conduct a feasibility study to ensure the quality of the collected data.

4. Conclusions

Based on the analysis, unimproved WASH facilities in West Java, Indonesia, are associated with the head of household's age and education level, residence type, and wealth index or economic status. In order to improve WASH facilities , it is recommended to develop an intervention program related to accelerating education access and quality or create an economic empowerment program. This recommendation based on the previous study that stated, community participation-based intervention reported to have a great influence to the service quality of community-based drinking water and sanitation (Bisman et al., 2019). In addition, to maintain the sustainability of the implemented approach, such as STBM (*Sanitasi Total Berbasis Masyarakat*) or Community Led Total Sanitation, education institution should have a structured curriculum to build awareness and strengthen knowledge.

Acknowledgement

The authors would like to thank the Indonesian Demographic Health Survey to provide the database.

References

Afifah, T., Nuryetty, M.T., Cahyorini, Musadad, D.A., Schlotheuber, A., Bergen, N., Johnston, R. 2018. Subnational regional inequality in access to improved drinking water and sanitation in Indonesia: results from the 2015 Indonesian National Socioeconomic Survey (SUSENAS). Glob. Health Action 11.

Andualem, Z., Dagne, H., Azene, Z.N., Taddese, A.A., Dagnew, B., Fisseha, R., Muluneh, A.G., Yeshaw, Y. 2021. Households access to improved drinking water sources and toilet facilities in Ethiopia: A multilevel analysis based on 2016 Ethiopian Demographic and Health Survey. BMJ Open 11.

Ardillah, Y., Sari, I.P., Windusari, Y., 2020. Association of environmental residential sanitation factors to communicable disease risk among musi side-river household in Palembang,Indonesia: A Study of Slum Area.

Armah, F.A., Ekumah, B., Yawson, D.O., Odoi, J.O., Afitiri, A.R., Nyieku, F.E. 2018. Access to improved water and sanitation in sub-Saharan Africa in a quarter century. Heliyon 4.

Bartram, J., Cairncross, S. 2010. Hygiene, sanitation, and water: Forgotten foundations of health. PLoS Med. 7, 1–10.

BPS Indonesia. 2019a. Persentase rumah tangga menurut provinsi dan memiliki akses terhadap sanitasi layak.

BPS Indonesia. 2019b. Persentase rumah tangga menurut provinsi dan memiliki akses terhadap layanan sumber air minum layak dan berkelanjutan 40 bawah menurut provinsi.

Croft, T.N., Aileen, M.J.M., Courtney, K.A., Arnold, F. 2018. Guide to DHS statistics, ICF.

Daniel, D., Djohan, D., Machairas, I., Pande, S., Arifin, A., Al Djono, T.P., Rietveld, L. 2021. Financial, institutional, environmental, technical, and social (FIETS) aspects of water, sanitation, and hygiene conditions in indigenous - rural Indonesia. BMC Public Health 21, 1–15.

Dhital, S.R., Chojenta, C., Evans, T.J., Acharya, T.D., Loxton, D. 2022. Prevalence and correlates of water, sanitation, and hygiene (WASH) and spatial distribution of unimproved WASH in Nepal. Int. J. Environ. Res. Public Health 19.

Gaffan, N., Kpozèhouen, A., Dégbey, C., Glèlè Ahanhanzo, Y., Glèlè Kakaï, R., Salamon, R. 2022. Household access to basic drinking water, sanitation and hygiene facilities: secondary analysis of data from the demographic and health survey V, 2017–2018. BMC Public Health 22.

Gebremichael, S.G., Yismaw, E., Tsegaw, B.D., Shibeshi, A.D. 2021. Determinants of water source use, quality of water, sanitation and hygiene perceptions among urban households in North-West Ethiopia: A cross-sectional study. PLoS One 16, 1–20.

Grant, S.W., Hickey, G.L., Head, S.J. 2019. Statistical primer: multivariable regression considerations and pitfalls. Eur. J. Cardio-thoracic Surg. 55, 179–185.

Irianti, S., Prasetyoputra, P., Sasimartoyo, T.P. 2016. Determinants of household drinking-water source in Indonesia: an analysis of the 2007 Indonesian family life survey. Cogent Med. 3, 1151143.

Irianti, S., Puguh, P. 2015. Environmental, demographic, and socio-economic correlates of access to improved sanitation : empirical evidence from Papua and West Papua Provinces 10, 11–26.

Kementerian Desa, Pembangunan Daerah Tertinggal, dan Transmigrasi, I. 2018. SDGs desa nomor 6: desa layak air bersih dan sanitasi.

Kementrian Kesehatan RI. 2008. Strategi nasional sanitasi total berbasis masyarakat, Kepmenkes RI No 852.

Kementrian Kesehatan RI. 2017. Pelaksanaan STBM.

Komarulzaman, A., Smits, J., de Jong, E. 2017. Clean water, sanitation and diarrhoea in Indonesia: effects of household and community factors. Glob. Public Health 12, 1141–1155.

Lewis, B.D., 2017. Does local government proliferation improve public service delivery? Evidence from Indonesia. J. Urban Aff. 39, 1047–1065.

Luh, J., Bartram, J. 2016. Eau potable et assainissement: progrès réalisés dans 73 pays par rapport aux indicateurs socioéconomiques. Bull. World Health Organ. 94, 111A-121A.

Muramatsu-Noguchi, Y., Nonaka, D., Kounnavong, S., Kobayashi, J. 2022. Association between socio-economic status and the presence of soap at handwashing facilities in lao people's democratic republic: a cross-sectional study. Asia-Pacific J. Public Heal. 0–3.

Muttaqin, T., 2018. Determinants of unequal access to and quality of education in Indonesia. J. Perenc. Pembang. Indones. J. Dev. Plan. 2, 1–23.

Odo, D.B., Mekonnen, A.G. 2021. Availability and factors influencing community level handwashing facility in Ethiopia: Implication for prevention of infectious diseases. PLoS One 16, 1–13.

Oskam, M.J., Pavlova, M., Hongoro, C., Groot, W. 2021. Socio-economic inequalities in access to drinking water among inhabitants of informal settlements in south africa. Int. J. Environ. Res. Public Health 18.

Patunru, A.A. 2015. Access to safe drinking water and sanitation in Indonesia. Asia Pacific Policy Stud. 2, 234–244.

Simelane, M.S., Shongwe, M.C., Vermaak, K., Zwane, E. 2020. Determinants of households' access to improved drinking water sources: a secondary analysis of eswatini 2010 and 2014 multiple indicator cluster surveys. Adv. Public Heal. 2020.

Siregar, N., Tanjung, W.W., Harahap, L.J. 2022. Depot sanitation, hygiene, and analysis of total microba control in refilled drinking water in the Barus District. Int. J. Basic Appl. Sci. 10, 154–162.

Suciyanti, D., Wangge, G., Iskandar, E., Fahmida, U., Supali, T. 2021. Social determinants and access to Water-Sanitation-Hygiene as dominant risk factors of stunting among under-five children in rural area of East Indonesia. Preprints 1–15.

Wada, O.Z., Olawade, D.B., Oladeji, E.O., Amusa, A.O., Oloruntoba, E.O. 2022. School water, sanitation, and hygiene inequalities: a bane of sustainable development goal six in Nigeria. Can. J. Public Heal. 113, 622–635.

WHO. 2022. Improved sanitation facilities and drinking-water sources [WWW Document]. WHO. URL https://www.who.int/data/nutrition/nlis/info/improved-sanitation-facilities-and-drinking-water-sources

World Health Organization (WHO). 2018. Guidelines on sanitation and health, World Health Organization.

Yunus, F.M., Ahmed, M.S., Islam, M.I., Das, M.C., Khan, A. 2021. Mapping and situation analysis of basic WASH facilities at households in Bangladesh: evidence from a nationally representative survey. PLoS One 16, 1–12.