Household Hand Hygiene in Indonesia: Public Health Determinants of Handwashing Facility Availability

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Abstract. Handwashing with soap is vital for preventing infectious diseases, yet data on household-level facilities in Indonesia remain limited. This study analyzed data from the 2020 Household Drinking Water Quality (HDWQ) survey, covering 15,721 households across 34 provinces, to determine the proportion of limited handwashing facilities among households with existing ones and the sociodemographic, environmental, and geographic factors related to their availability. Based on Joint Monitoring Programme (JMP) criteria, 37.1% of households had limited facilities, while 62.9% had basic facilities among households with existing infrastructure. Java-Bali and Eastern Indonesia had the lowest and the highest proportion of limited facilities (30.9% and 63.5%). Multivariable logistic regression with complex survey weighting showed that households in rural areas (AOR=1.95; 95% CI: 1.71-2.22), using unimproved water sources for hygiene (AOR=1.69; 95% CI: 1.37-2.09), unimproved sanitation (AOR=1.28, 95% CI: 1.05-1.55), or shared sanitation (AOR=2.00; 95% CI: 1.65-2.42) were more likely to have limited facilities. Despite national progress, regional disparities remain significant in access to handwashing facilities. Interventions should prioritize improving water and sanitation infrastructure in rural and Eastern Indonesia, while promoting household-level behavior change. These findings can inform national hygiene strategies in alignment with the Sustainable Development Goals.

1 Introduction

Handwashing with soap is one of the most effective and affordable public health practices for preventing infectious diseases, including diarrhea, respiratory infections, and skin-related illnesses. Despite its importance, access to adequate hygiene facilities remains uneven across populations. According to the latest Global Burden of Disease study, an estimated 395,000 diarrhoeal deaths in 2022 were directly attributable to unsafe water, sanitation, and hygiene (WASH), with children under five and elderly populations disproportionately affected [1].

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The broader impact of poor hygiene is reflected in global access gaps. In 2022, 25% of the global population, around 2.0 billion people, lacked basic hygiene services at home, defined as a handwashing facility with soap and water on premises. At the current rate of progress, 1.4 billion people are projected to remain without such access by 2030, posing a significant obstacle to achieving Sustainable Development Goal (SDG) 6.2, which aims to ensure universal access to safe sanitation and hygiene [2]. Similarly, disparities in access persist across Southeast Asia, and even when facilities are available, behavioural gaps remain.

In Indonesia, exposure to unsafe water, sanitation, and hygiene (WASH) remains a major public health concern. According to the World Health Organization's Global Health Observatory, the country had an estimated mortality rate of 15.8 per 100,000 population linked to unsafe WASH in 2022, with 14,824 deaths from diarrhea attributed to inadequate hygiene [3]. These conditions contribute substantially to environmentally related diseases, particularly among children under five years old. Diarrheal diseases remain one of the leading causes of morbidity in this age group; acute respiratory infections (ARI) are often linked to poor hand hygiene, which may increase household economic burden. These patterns highlight the urgent need for expanded access to hygiene services and behaviour change interventions at the household level.

In response to these global challenges, Indonesia has implemented several hygiene-focused initiatives, most notably the *Sanitasi Total Berbasis Masyarakat (STBM)* program, which is grounded in the Community-Led Total Sanitation (CLTS) approach. STBM promotes voluntary behavioral change across five pillars, with handwashing with soap as the second pillar [4]. The program has been integrated into broader national health strategies such as GERMAS (Healthy Living Community Movement). It is supported by cross-sectoral partnerships with government, NGOs, and private sector actors. However, access to handwashing products and infrastructure remains uneven, especially in rural and low-income areas. Until recently, nationally representative data on household-level access to handwashing facilities in Indonesia were limited. Statistics Indonesia reported that 78.30% of households owned handwashing stations with soap and water, a slight increase of 0.23 percentage points from 2019 [5]. However, handwashing practice remained low, with significant gaps between infrastructure and behaviour. Barriers such as limited access to soap, absence of permanent handwashing stations, and socioeconomic factors may discourage consistent hand hygiene practices.

To address infrastructure and quality gaps, the Ministry of Health conducted the 2020 Household Drinking Water Quality (HDWQ) survey across all provinces. It complemented earlier surveys, such as the National Socio-Economic Survey (SUSENAS), which excluded questions on handwashing behavior, and the Indonesia Health Survey, which, despite assessing infrastructure and behavior, is conducted only once every five years. Although the HDWQ's primary focus was drinking water, its scope also encompassed household hygiene infrastructure, including handwashing facilities. We assessed suboptimal or limited services to generate meaningful insights for policy development and resource allocation. Accordingly, this study aims to estimate the national proportion of limited handwashing facilities among households with existing infrastructure and identify key determinants of access. The findings will inform policy decisions on resource distribution and guide regional interventions related to hand hygiene.

2 Methods

2.1 Source of Data

The data were obtained from the 2020 Study on Household Drinking Water Quality in Indonesia (HDWQ), a nationally representative household survey designed to generate national estimates on drinking water quality, sanitation, and hygiene. This cross-sectional study utilized the March 2020 National Socio-Economic Survey (NSES) subsample. It was the first time such a study was conducted at the national level in Indonesia.

Household-level data collection was carried out across all 34 provinces and in all districts/cities, based on the sampling frame of census blocks and household lists from the March 2020 NSES. The 2020 HDWQ employed a two-stage sampling design: census blocks (CBs) were selected from the master frame developed during the 2010 Population Census, followed by a random selection of households within each selected CB. Detailed sampling procedures are documented in a separate publication [6].

Data collection was conducted in November–December 2020 using structured, paper-based questionnaires administered by trained enumerators. The final sample comprised 15,721 households, with the household serving as the unit of analysis.

2.2 Dependent Variable

The dependent variable in this study was the availability of soap-based handwashing facilities, categorized into limited handwashing facilities and basic handwashing facilities, based on the definitions provided by the Joint Monitoring Programme (JMP) [7]. In the questionnaire, this variable was constructed from the following questions: (a) Is there a facility commonly used for handwashing?; (b) Is water available at the handwashing facility?; and (c) Is soap, detergent, or antiseptic available at the handwashing facility? A household was classified as having limited handwashing facilities if it reported having a handwashing facility but only one of the two components (water or soap/detergent/antiseptic) was available. Households without any handwashing facilities were excluded from the analysis. Households without handwashing facilities (no service) were excluded from analysis to focus specifically on factors distinguishing basic from limited-service levels among households with existing infrastructure.

2.3 Independent Variables

Household characteristics considered to influence the availability of handwashing facilities were selected based on previous studies [8]. Age and sex in this study refer to the characteristics of the interview respondents, not the heads of households, due to the absence of such questions in the questionnaire. Household size was collected as an open-ended question and later categorized into ≤3, 4–7, and > seven members [8]. Since the sample design only allows for national-level estimates, not provincial ones, regions were grouped into seven major island groups in Indonesia. Place of residence was classified into urban and rural areas according to the administrative classification of villages and sub-districts. WASH-related variables included in the analysis were: source of drinking water, time required to collect water from the source, interruptions in water supply, source of water for hygiene purposes, type of sanitation facility, and the mode of use (Table 1). Detailed operational definitions for independent and dependent variables and referenced justifications are provided in Table 1.

2.4 Data Analysis

Descriptive analysis was used to present the distribution of households by their characteristics. All statistical analyses were conducted using sample weights. A multivariable

logistic regression model assessed the association between household characteristics and the availability of handwashing facilities. Statistical significance was determined by a p-value <0.05. All analyses were performed using SPSS version 17.

The independent variables were selected based on established WASH literature and simultaneously included in the multivariable model. Correlation analysis confirmed minimal overlap between predictors (all VIF < 2). Model fit was assessed using pseudo R-squared and classification accuracy, which are appropriate for complex survey designs [9]. The model showed acceptable performance (Nagelkerke R^2 = 0.118 and classification accuracy = 67.0%).

2.5 Ethics Statement

The ethical clearance for the HDWQ survey was approved by the Ethics Committee of the National Health Institute for Research and Development, Ministry of Health, under approval letter number LB.02.01/2/KE.531/2020, dated August 18, 2020.

Table 1. Dependent and independent variables

Variables	Descriptions	References
Availability of handwashing facility (HWF)	**Limited HWF**: HWF is available with water **or** soaps/detergents/antiseptic liquid at the premises. **Basic HWF**: HWF is available with water **and** soaps/detergents/antiseptic liquid at the premises.	[7,8]
Age	The respondents' ages were categorized into <20, 20-29, 30-39, 40-49, ≥50.	[8]
Sex	Sex of respondents interviewed, grouped into male and female.	[8]
Number of household members	The number of household members, divided into three groups: ≤3, 4-7, >7.	[8]
Region	The major islands where respondents live are classified into Eastern Indonesia (Papua-Maluku-Nusa Tenggara); Sulawesi; Kalimantan; Sumatera; Java-Bali.	
Place of residence	The classification of the sub-district where the respondent lives was divided into rural and urban.	[8]
Water source for drinking	**Unimproved:** When the current main water source for drinking is: unprotected well, unprotected spring, or surface water. **Improved:** When the current main water source for drinking is: piped water, borehole, protected well, protected spring, rainwater, water hydrant, water terminal, retail water purchase, refill water, or packaged water.	[7,8]
Time to get drinking water	Time to get water from the drinking water source, grouped into: >30 minutes and ≤30 minutes round-trip. Water source inside the house, water source within home premises, or packaged water was included in the ≤30 minutes group.	[8]
Interruption in the main drinking water supply	**No.** Packaged water was also placed in this category.	

Variables	Descriptions	References
	Yes: There is an interruption at least once, or when the respondent did not know if it had occurred.	
Water source for hygiene (bath or wash)	**Unimproved:** When the current main water source for hygiene is: unprotected well, unprotected spring, or surface water. **Improved:** When the current main water source for hygiene is: piped water, borehole, protected well, protected spring, rainwater, water hydrant, water terminal, retail water purchase, refill water, or packaged water.	[7]
Sanitation facility	**Improved facilities** refer to pour-flush latrines (with water seal), slab latrines with a cover, or slab latrines without a cover, where excreta are directed to a piped sewer system, a septic tank, or a pit latrine. **Unimproved facilities** include hanging toilets or any facilities other than improved sanitation, where excreta are disposed of into covered or uncovered pits, surface water bodies such as ponds, rivers, lakes, or the sea, or onto agricultural fields, open land, or other similar environments.	[7,8]
Sanitation facility use	**Shared sanitation** refers to sanitation facilities shared with other households within the same building, neighbors in different buildings, or the general public. **Private sanitation** refers to sanitation facilities used exclusively by members of a single household, without being shared with other households.	

3 Results And Discussion

A total of 37.1% of households had limited handwashing facilities, while 62.9% had basic facilities (Table 2). This accounts for approximately 25.5 million households out of Indonesia's estimated 68.7 million total households, potentially affecting over 102 million individuals nationwide. National survey data show a gradual increase in household handwashing coverage, rising from 78.3% in 2020 to 80.15% in 2023, with a target of reaching 100% by 2030 [10].

Furthermore, most respondents were female and over 50 years old. The majority of households had 4–7 members (58.8%), were located in Java-Bali (66.9%), and resided in urban areas (61.3%). Most households used improved sources for drinking water (94.9%), accessed drinking water in under 30 minutes (96.9%), and did not experience interruptions in the water supply (96.9%). Additionally, 91.4% used improved water sources for hygiene purposes. Nearly 90% of households reported having improved and private sanitation facilities. These household characteristics provide important context for understanding this survey's relatively high coverage of basic handwashing facilities.

Compared to these findings, lower levels of handwashing coverage have been reported in countries such as Somalia and across sub-Saharan Africa, where most households lack adequate facilities [8,11,12]. Indonesia's progress may be partly attributed to national

sanitation strategies, notably the *Sanitasi Total Berbasis Masyarakat (STBM)* program, based on the Community-Led Total Sanitation (CLTS) approach. This initiative encourages voluntary behavioral change through five key pillars, one of which is handwashing with soap [4]. While this pillar has succeeded in certain areas, results remain uneven due to persistent barriers such as informal handwashing stations, limited soap availability, and inconsistent local support.

Table 2. Household characteristics, HDWQ 2020

Variables	**n**	**%**
Availability of HWF		
Limited HWF	5840	37.1
Basic HWF	9881	62.9
Age		
<20	383	2.4
20-29	1479	9.4
30-39	3374	21.5
40-49	4079	25.9
≥50	6406	40.7
Sex		
Male	6815	43.4
Female	8906	56.6
Number of household members		
≤3	5877	37.4
4-7	9245	58.8
≥8	599	3.8
Region		
Eastern Indonesia	762	4.8
Sulawesi	906	5.8
Kalimantan	844	5.4
Sumatera	2692	17.1
Java-Bali	10517	66.9
Place of residence		
Rural	6082	38.7
Urban	9639	61.3
Water source for drinking		
Unimproved	807	5.1
Improved	14914	94.9
Time to get drinking water		
>30 minutes	493	3.1
≤30 minutes	15228	96.9
Interruption in the main drinking water supply		
Yes	493	3.1
No	15228	96.9
Water source for hygiene		
Unimproved	1356	8.6
Improved	14365	91.4
Sanitation facility		
Unimproved	1745	11.1

Variables	**n**	**%**
Improved	13976	88.9
Sanitation facility use		
Shared	1686	10.7
Private	14035	89.3

Regional disparities were observed in using unimproved water sources for hygiene and drinking (Figure 1). For hygiene, the highest proportions were recorded in Kalimantan (21.01%) and Eastern Indonesia (14.50%), followed by Sulawesi (11.71%) and Sumatera (9.90%), with Java-Bali reporting the lowest (5.93%). Similarly, for drinking water, Eastern Indonesia had the highest proportion of unimproved use (12.07%), followed by Kalimantan (10.07%), Sulawesi (5.30%), and Sumatera (3.63%), while Java-Bali again had the lowest (1.41%).

These patterns reflect entrenched inequalities in access to improved water infrastructure. Coverage levels vary widely across Indonesia, with eastern regions often trailing behind their western counterparts in access to safe drinking water and sanitation. Such disparities are shaped not only by geography but also by structural factors, underscoring the need for context-specific strategies to ensure equitable WASH access nationwide.

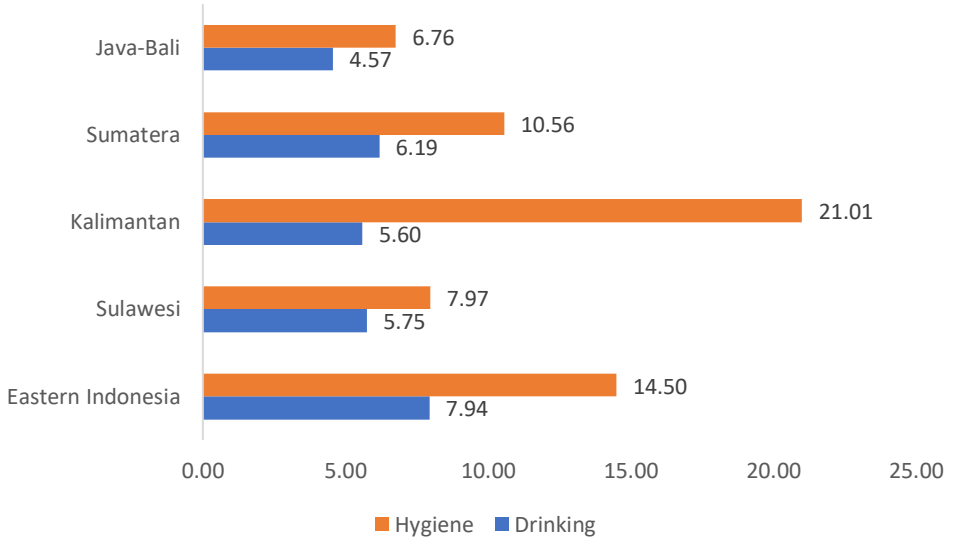

Fig. 1. Proportions of Indonesian households that used unimproved water sources for hygiene and drinking by region, HDWQ 2020

Compared to households in Java-Bali, those in other regions had significantly higher adjusted odds of having limited handwashing facilities (Table 3). The highest adjusted odds were observed in Eastern Indonesia (AOR: 3.343, 95% CI: 2.665–4.193), followed by Sumatera, Sulawesi, and Kalimantan.

These findings highlight notable regional disparities in access to hand hygiene infrastructure across Indonesia. This pattern is consistent with evidence from other settings; for instance, a study in Somalia found that access to basic hygiene services was also disproportionately distributed among regions [12]. Such disparities underscore the

importance of designing context-specific interventions that reflect localized challenges and meet the specific needs of each community [12].

Households in rural areas had 1.950 times the odds of having limited handwashing facilities than urban households. This finding aligns with previous studies conducted in sub-Saharan Africa [11]. Several challenges contribute to this disparity in rural areas, including limited access to education, information, and basic infrastructure. Many rural communities are unaware of the importance of clean and healthy living practices. According to previous studies, media exposure plays a significant role in hygiene behavior; households with access to radio and television were likelier to have basic handwashing facilities [8,11]. Moreover, limited access to improved drinking water and sanitation infrastructure remains a major barrier in many remote areas of Indonesia. In rural communities, shared sanitation often faces serious challenges related to privacy, stigma, and gender roles, which can hinder its use and management. Women, in particular, may experience stress and health risks due to inadequate privacy and safety, while cultural norms often place the burden of maintenance on them. Addressing these issues requires strategies that improve facility security, promote gender-inclusive decision making, and strengthen community involvement [13]. Given regional diversity, facilities and infrastructure in remote and isolated areas will differ from those in other regions. Therefore, central and regional governments can prioritize development in areas with poor water sources and limited sanitation infrastructure. Local governments can integrate available local resources to ensure the provision of accessible handwashing facilities in public facilities. For example, allocating village funds to build and improve infrastructure related to hand hygiene, which includes providing improved water sources and sanitation.

Households using unimproved water sources for hygiene were 1.693 times more likely to have limited handwashing facilities than those using improved sources. This may be due to water being prioritized for essential needs like drinking and cooking. At the same time, unimproved sources often involve seasonal shortages, long collection times, and poor water quality, which discourage use for handwashing [8]. Wolf et al. also found that high levels of faecal contamination, commonly linked to unimproved sources, can reduce the effectiveness of hygiene interventions like handwashing, especially when contaminated water is visibly unappealing [14]. These findings underscore the importance of ensuring reliable, safe, and accessible water to support effective hygiene practices.

Additionally, those with unimproved sanitation had 1.275 times higher odds, and those using shared sanitation facilities had 2.001 times higher odds than households with unimproved and private sanitation. A household latrine can promote sustained hygiene practices and support the establishment of a permanent handwashing facility at home [15]. In contrast, unimproved and shared sanitation often lack privacy, cleanliness, and basic provisions, discouraging consistent use. The WHO/UNICEF Joint Monitoring Programme classifies shared sanitation below the criteria for basic or safely managed services, underscoring their limitations [7]. In such contexts, handwashing may be neglected due to privacy concerns or infrastructure gaps. These insights reinforce the urgent need to expand access to private and improved sanitation systems as a foundation for consistent and effective handwashing practices.

In this study, age, gender, and household size were not significantly associated with handwashing facilities after adjustment. These findings suggest that demographic characteristics may have limited explanatory power when considered alongside environmental and structural factors. In particular, access to water, sanitation infrastructure, and place of residence appear to exert greater influence on hygiene-related outcomes than individual-level traits.

This study has several limitations. First, the cross-sectional design restricts the ability to draw causal inferences between variables. Second, self-reported data may be subject to social

desirability bias. Third, although we used JMP service ladder definitions for handwashing facilities, these definitions may not capture the quality of soap or cleansing agents, facility maintenance, or consistent daily functionality. Fourth, geographic analysis was restricted to island groups rather than provinces due to constraints in the sampling design. Finally, unmeasured socioeconomic and cultural factors may confound the observed associations.

Table 3. Logistic regression results for factors associated with the handwashing facilities in Indonesian households, HDWQ 2020

Variables	Limited HWF		Basic HWF		OR	95%CI	AOR	95%CI
	n	%	n	%				
Age								
<20	129	33.7	254	66.3	0.866	0.665 – 1.129	0.842	0.644 – 1.101
20-29	564	38.1	915	61.9	1.052	0.901 – 1.227	0.974	0.825 – 1.150
30-39	1308	38.8	2065	61.2	1.081	0.961 – 1.214	1.040	0.914 – 1.184
40-49	1472	36.1	2607	63.9	0.964	0.862 – 1.077	0.971	0.863 – 1.094
≥50	2367	36.9	4039	63.1	Ref		Ref	
Sex								
Male	2599	38.1	4216	61.9	1.077	0.979 - 1.186	1.084	0.980 – 1.200
Female	3241	36.4	5665	63.6	Ref		Ref	
Number of household members								
≤3	2260	38.5	3616	61.5	1.228	0.976 – 1.545	1.238	0.957 – 1.600
4-7	3378	36.5	5867	63.5	1.131	0.904 – 1.414	1.145	0.894 – 1.467
≥8	202	33.7	397	66.3	Ref		Ref	
Region								
Eastern Indonesia	484	63.5	278	36.5	3.889*	3.102 – 4.877	3.343*	2.665 – 4.193
Sulawesi	452	49.8	455	50.2	2.220*	1.869 – 2.635	1.969*	1.671 – 2.322
Kalimantan	354	41.9	490	58.1	1.611*	1.333 – 1.947	1.396*	1.155 – 1.686
Sumatera	1300	48.3	1392	51.7	2.088*	1.793 – 2.430	1.938*	1.654 – 2.271
Java-Bali	3251	30.9	7266	69.1	Ref		Ref	
Place of residence								
Rural	3020	49.6	3062	50.4	2.384*	2.101 – 2.704	1.950*	1.711 – 2.222
Urban	2821	29.3	6819	70.7	Ref		Ref	
Water source for drinking								
Unimproved	469	58.1	338	41.9	2.466*	1.939 – 3.135	1.110	0.854 – 1.444
Improved	5371	36.0	9543	64.0	Ref		Ref	
Time to get drinking water								

Variables	Limited HWF		Basic HWF		OR	95%CI	AOR	95%CI
	n	%	n	%				
>30 minutes	220	44.7	272	55.3	1.382*	1.034 - 1.846	0.890	0.668 – 1.186
≤30 minutes	5620	36.9	9608	63.1	Ref		Ref	
Interruption in the main drinking water supply								
Yes	238	48.3	255	51.7	1.605*	1.204 - 2.139	1.146	0.864 – 1.520
No	5602	36.8	9626	63.2	Ref		Ref	
Water source for hygiene								
Unimproved	779	57.5	577	42.5	2.483*	2.042 - 3.019	1.693*	1.374 – 2.085
Improved	5061	35.2	9304	64.8	Ref		Ref	
Sanitation facility								
Unimproved	795	45.6	950	54.4	1.482*	1.224 – 1.795	1.275*	1.052 – 1.545
Improved	5045	36.1	8931	63.9	Ref		Ref	
Sanitation facility use								
Shared	918	54.5	768	45.5	2.214*	1.861 – 2.633	2.001*	1.653 – 2.423
Private	4922	35.1	9113	64.9	Ref		Ref	

Notes: HWF, handwashing facility; OR, odds ratio; AOR, adjusted odds ratio; CI, confidence interval

4 Conclusion

This study highlights persistent disparities in the availability of handwashing facilities across Indonesian households, based on data from the nationally representative 2020 HDWQ survey. While the majority of households had access to basic handwashing facilities, a significant proportion (37.1%) were still classified as having limited facilities. Determinants associated with limited handwashing access included regions, residence in rural areas, use of unimproved water sources for hygiene, and unimproved or shared sanitation facilities. The strongest disparity was observed in the eastern regions of Indonesia, where households had over three times the odds of limited handwashing facilities compared to those in Java-Bali.

Despite the limitations due to the study design, the findings underscore the interdependence of WASH components and point to structural inequities in access that must be addressed to meet national and global health targets. Strengthening WASH infrastructure, especially in rural and underserved areas, with village funds, and enhancing the implementation of hygiene-focused programs like STBM are critical. Policymakers should prioritize region-specific strategies that ensure sustained access to water and sanitation as a foundation for universal hand hygiene, in line with Sustainable Development Goal 6.

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