

## **Determinants of Handwashing Without Soap in Tanzania: Evidence from the 2015/16 Tanzania Demographic Health Malaria Indicator Survey**

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### **Abstract**

Handwashing with soap can reduce pathogens, leading to a reduction in the spread of diarrhoea and other diseases. Handwashing with soap is insufficiently practised in Tanzania despite its potential health benefits. This study identifies the determinants of high levels of handwashing without soap in rural and urban areas of Tanzania. It used the 2015/16 Tanzania Demographic Health Survey - Malaria Indicator Survey (TDHS-MIS) dataset. A sample of 9,695 households—3,058 from urban areas and 6,637 households from rural areas—were used in the analysis. Pearson chi-square test and multivariate logistics regression analysis were used to determine the association between the independent and dependent variables. The study found that handwashing without soap was more prevalent in rural areas (46%) than in urban areas (28%). Exposure to the media (listening to the radio in rural areas and watching television in urban areas), and improved access to water sources decreased the probability of handwashing without soap, both in rural and urban areas. A household-headed by a female, and a household-head who was married, showed a decreased odd of handwashing with water only in rural areas; while households with 7 and more members showed increased odds of handwashing with water only in rural areas. The study concludes that exposure to the media and improved access to water sources can reduce high rates of handwashing without soap in Tanzania. Efforts to reduce handwashing without soap should target urban and rural communities since handwashing is a complex human behaviour.

**Keywords:** *determinants, handwashing, soap, rural, urban, Tanzania*

### **1. Introduction**

Hands/fingers, utensils, and other objects frequently used may act as a medium to transmit pathogens from person to person through water or food (Briceño et al., 2015). Poor hand hygiene can result in diseases such as diarrhoea, which claims more than 5m lives of children in developing countries (Scott et al., 2007). The prevalence of diarrhoea in Tanzania ranges between 6–20% among children (Mashoto et al., 2014; Moyo et al., 2007; NBS & Macro, 2016; Temu et al., 2012). Poor hand hygiene, poor sanitation, and poor access to clean water sources are among the main causes of diarrhoea in Tanzania (Alexander et al., 2019). High rates of childhood stunting and chronic malnutrition are also linked to poor water, sanitation, and hygiene (WASH) practices in Tanzania.

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The United Nation's Sustainable Development Goal 6 (SDG6) aims at ensuring the availability and sustainable management of water and sanitation for all by 2030 (UN, 2017). Towards the end of 2019, the world experienced the COVID 19 pandemic which caused mortality in almost all parts of the world (Huong et al., 2020). Thus, enhancing water-sanitation-hygiene is vital to achieve SDG6 and contain the spread of COVID-19 (Ahmed & Yunus, 2020; Chaudhuri & Roy, 2017; WHO, 2020). Handwashing with soap (HWWS) is considered a great strategy to promote health, and one of the most cost-effective ways of eradicating infectious diseases in developing countries (Jamison et al., 2006). It can reduce the risk of infection-spread by faecal-oral from contaminated objects when done at the right time (Biran et al., 2014). HWWS leaves the hands clean, therefore reducing the transmission of pathogens from one person to another (Hirai et al., 2016; Hoque, 2003). Despite the importance of washing hands with soap, the practice is not widespread (Pickering et al., 2010; Scott et al., 2007). Globally, only 19% of people wash their hands with soap during critical times (Freeman et al., 2014). In low- and middle-income countries, only 3–34% of people wash their hands with soap at critical times (Islam et al., 2021).

Handwashing is a complex behaviour that is determined by several components (Hoque, 2003). Research has found out why people do not wash their hands, or wash their hands without soap. Some of the reasons include the dirtiness of the washing sink, time of the day, poor access to piped water at the household level, defecation site, the age of a household-head, method of stool disposal, mother's formal education, mother's health consciousness, exposure to media sex, knowledge of the most important time to wash hands, the cost of soap in relation to the income of a household, the inconvenience of fetching soap, fear that if soap is left at an inconvenient place children would play or ingest it, household wealth, etc. (Borchgrevink et al., 2013; Goiter et al., 1998; Luby et al., 2009; Schmidt et al., 2009; Scott et al., 2007).

In most settings, rural-urban inequalities in infrastructural facilities exist with respect to water-sanitation-hygiene, although rapid urbanization and rapid population growth have slowed the provision of services in some urban areas. Urban areas are more likely to have public latrines compared to rural areas, and are therefore more likely to observe hygiene practices (Curtis et al., 1995). Rural dwellers are more likely to rely on groundwater and practise open defecation compared to their urban counterparts (Chaudhuri & Roy, 2017).

In Tanzania, handwashing with soap is not widely practised. The Tanzania Demographic and Health Survey - Malaria Indicator Survey 2015/16 (TDHS-MIS) indicates that although over 80% of the households had a place for handwashing, only 59% of handwashing places had water and a washing agent (NBS & ICF Macro, 2016). Thus, about 41% of Tanzanians wash their hands without soap or any other cleaning agent. This warranted an investigation into what lead people to wash their hands without using washing soap.

Rural areas of Tanzania are faced with the challenge of water availability and quality (URT, 2011; 2015). Given the rural-urban differences concerning water-sanitation-hygiene in Tanzania, this study aimed at identifying factors associated with high levels of washing hands without soap in urban and rural areas. Available evidence indicates that about 50% of houses in Tanzania have a handwashing place. Despite this, however, about 41% of the members wash their hands without soap or any other washing agent (NBS & ICF Macro, 2016).

There are several studies on handwashing in Tanzania, such as by Briceño et al. (2015), Briceño and Yusuf (2012), Davis et al. (2020), Okello et al. (2019), and Pickering et al. (2010). However, studies that have focussed on handwashing without soap, by comparing rural and urban settings at national level, are lacking. This study, therefore, aimed at identifying factors that determine handwashing without soap in rural and urban Tanzania, using data from the 2015/16 TDHS-MIS data set. The study is important for stakeholders dealing with WASH issues in Tanzania. The article is organized into four sections which include the introduction, methodology, findings and discussion, and conclusion.

## **2. Materials and Methods**

### ***2.1 Data and Sampling Procedures***

The study at hand used a cross-sectional research design where household quantitative data was collected at a single point in time, and patterns of association were examined. The 2015/16 TDHS-MIS primary objective was to provide up-to-date estimates of basic demographic and health indicators. The sample design for the 2015/16 TDHS-MIS was done in two stages, and was intended to provide estimates for the entire country: for urban and rural areas in Tanzania Mainland and Zanzibar (NBS & ICF Macro, 2016).

The first stage involved selecting sample points (clusters) consisting of enumeration areas (EAs) delineated for the 2012 Tanzania population and housing census. A total of 608 clusters were selected. The second stage involved a systematic selection of households. A complete households list was generated out for all 608 selected clusters before fieldwork started. From the list, 22 households were systematically selected from each cluster, yielding a representative probability sample of 13,376 households for the 2015/16 TDHS-MIS. The data was collected upon the consent of a male or female household adult aged between 15 and 49 years.

The 2015/16 TDHS-MIS data also captured information on handwashing using water only, water and soap, or other detergents; or using water and ash/mud/sand. Therefore, the study at hand used data on the sub-sample of households in which a place used for handwashing was observed, and where a cleaning agent was available. Excluding households with no place for handwashing, the study used a sample of 9,695 households; where 3,058 and 6,637 were urban and rural households, respectively.

## 2.2 Study Variables

The outcome variable of this study was handwashing using water only. The variable is binary: whether a household uses water only for handwashing (coded 1), or uses water and soap or other detergents (coded as 0). On the other hand, the independent variables used include the age of the head of household (1 = 15–34; 2 = 35–59; and 3 => 60), sex of the head of household (1 = male, 0 = female), marital status of the household-head (1 = married and 0 = not married), education of the household-head (1 = no education; 2 = primary level; 3 = secondary level; 4 = higher level), household size (1 = 1–3 people; 2 = 4–6 people; 3 = 7 and more), wealth quintile (5 = richest; 4 = rich; 3 = middle; 2 = poor; 1 = poorest), zone of residence,<sup>1</sup> listening to the radio (Yes/No), watching television (Yes/No), improved water source (Yes/No), and improved toilet facilities (Yes/No).

## 2.3 Data Analysis

The analysis was conducted by using Stata 17 (StataCorp, 2021); and results are reported at a 1%, 5%, and 10% significance levels. The analysis of variation in handwashing using water only by using household demographic and socio-economic factors across rural and urban residents was done by using cross-tabulation analysis, with relationship investigated using the Pearson chi-square test. Moreover, the association between demographic and socio-economic factors on handwashing using water only was done using logistic regression analysis to obtain the likelihood estimates of handwashing using water only among rural and urban households. The logistic model estimated in equation (1) was used because the dependent variable is binary. The presentation of the study findings was done using odds ratios (ORs), with a 95% confidence interval.

$$\ln\left(\frac{P_i}{1 - P_i}\right) = X\beta + \varepsilon_i \quad (1)$$

The model can be estimated empirically as shown in equation 2:

$$\begin{aligned} \ln\text{HWWATERONLY}_i &= \beta_0 + \beta_1\text{HHAGE}_i + \beta_2\text{HHSEX}_i + \beta_3\text{HHMARITAL}_i \\ &+ \beta_4\text{HHED}_i + \beta_5\text{HWEALTH}_i + \beta_6\text{ZONE}_i + \beta_7\text{LRADIO}_i \\ &+ \beta_8\text{WTELEV}_i + \beta_9\text{IMPRWATER}_i + \beta_{10}\text{IMPRTOILET}_i \\ &+ \beta_9\text{HHSIZE}_i + \varepsilon_i \quad (2) \end{aligned}$$

where:

$\ln\text{HWWATERONLY}$  is the log of odds of handwashing using water only;  $\text{HHSEX}$  is household-head sex;  $\text{HHMARITAL}$  is the household-head marital status;  $\text{HHED}$  is the household-head education;  $\text{WEALTH}$  is the household

<sup>1</sup> Zones of residence include Western, Northern, Central, Southern highlands, Southern, Southwest Highlands, Lake zone, Eastern zone, and Zanzibar.

wealth quintile; ZONE is the household zone of residence; LRADIO is the listening to the radio; WTELEV is the watching of television; IMPRWATER is access to improved water; IMPRTOILET is household having improved toilet; and HHSIZE is the household size.

### 3. Results and Discussion

#### 3.1 Household Demographic and Socio-economic Factors

The results in Table 1 indicate the statistical significance of handwashing using water only in rural and urban areas. The results show the highest prevalence of handwashing using water only in rural areas at 46% compared to 28% for urban households. On the other hand, handwashing using water and soap or detergent was highest among urban households at 72%, compared to 54% among rural households.

**Table 1: Percentage Distribution of Handwashing Using Water in Households Across the Place of Residence**

Handwashing	Place of Residence	
	Rural (n = 6637)	Urban (n = 3058)
Water and soap or detergent	3561(53.7%)	2207(72.2%)
Water only	3076 (46.3%)	852 (27.8%)
$X^2 = 297.3411 p = 0.000$		

Source: TDHS-MIS 2015/16

#### 3.2 Rural-urban Household Determinants of Handwashing Using Water Only

The socio-economic and demographic determinants of handwashing using water only were examined at the bivariate level of analysis. The Pearson chi-square test was used to investigate the association by comparing handwashing using water only by socio-economic and demographic factors for rural and urban households. Table 2 shows the results.

**Table 2: Household Socio-economic and Demographic Characteristics of Handwashing Practices**

Variables	Place of Residence				
	RURAL		URBAN		
	Water Only	Water and Soap or Detergent	Water Only	Water and Soap or Detergent	
<i>Household-head age</i>					
15-34	732(23.8%)	919(25.8%)	285(33.5%)	741(33.6%)	
35-59	1608(52.3%)	1928(54.1%)	434(50.9%)	1171(53.0%)	
60+	736 (23.9%)	715(20.1%)	133(15.6%)	296(13.4%)	
		$X^2 = 14.9414 p = 0.001$		$X^2 = 2.6480 p = 0.266$	

**Household-head sex**

Female	710(23.1%)	823(23.1%)	226(26.5%)	538(24.4%)
Male	2366(76.9%)	2739(76.9%)	626(73.5%)	1670(75.6%)
	$X^2 = 0.0005 p = 0.982$		$X^2 = 1.5309 p = 0.216$	

**Household-head marital status**

Not married	750 (24.4%)	832(23.4%)	271(31.9%)	624 (28.3%)
Married	2326 (75.6%)	2729(76.6%)	579 (68.1%)	1584(71.7%)
	$X^2 = 0.9423 p = 0.332$		$X^2 = 3.8882 p = 0.049$	

**Household-head education**

No education	843(27.4%)	687(19.3%)	113(13.3%)	152(6.9%)
Primary	2003(65.2%)	2327(65.4%)	526(61.74%)	1180(53.5%)
Secondary	211(6.9%)	502(14.1%)	194(22.7%)	679(30.8%)
Higher	16(0.5%)	44(1.2%)	19(2.2%)	195(8.8%)
	$X^2 = 136.9660 p = 0.000$		$X^2 = 88.4752 p = 0.000$	

**Household size**

1-3	791(25.7%)	1014(28.5%)	326(38.3%)	815(36.9%)
4-6	1235(40.2%)	1558(43.7%)	335(39.3%)	899(40.7%)
7+	1050(34.1%)	990(27.8%)	191(22.4%)	494(22.4%)
	$X^2 = 31.2543 p = 0.000$		$X^2 = 0.5990 p = 0.741$	

**Wealth quintile**

Poorest	865(28.1%)	543(15.2%)	52(6.1%)	51(2.3%)
Poorer	902(29.3%)	726(20.4%)	25(2.9%)	36(1.6%)
Middle	774(25.2%)	957(26.9%)	71(8.3%)	88(3.9%)
Richer	425(23.8%)	962(27.0%)	310(36.4%)	572(25.9%)
Richest	110(3.6%)	374(10.5%)	394(46.2%)	1461(66.2%)
	$X^2 = 430.6473 p = 0.000$		$X^2 = 117.5731 p = 0.000$	

**Zone of residence**

Western	295(9.6%)	276(7.8%)	47(5.5%)	137(6.2%)
Northern	275(8.9%)	467(13.1%)	68(7.9%)	240(10.9%)
Central	405(13.2%)	315(8.8%)	68(7.9%)	145(6.6%)
Southern highlands	284(9.3%)	430(12.1%)	79(9.3%)	228(10.3%)
Southern	200(6.5%)	181(5.1%)	47(5.5%)	94(4.3%)
South West highlands	435(14.1%)	376(10.6%)	141(16.6%)	216(9.8%)
Lake zone	905(29.4%)	859(24.1%)	169(19.8%)	344(15.6%)
Eastern zone	66(2.2%)	226(6.3%)	153(17.9%)	630(28.5%)
Zanzibar	211(6.9%)	432(12.1%)	80(9.4%)	174(7.9%)
	$X^2 = 227.1221 p = 0.000$		$X^2 = 69.4669 p = 0.000$	

**Listen radio**

No	1808(58.8%)	1594(44.7%)	357(41.9%)	717(32.5%)
Yes	1268(41.2%)	1968(55.3%)	495(58.1%)	1491(67.5%)
	$X^2 = 129.9974 p = 0.000$		$X^2 = 23.9922 p = 0.000$	

**Watch television**

No	2925(95.1%)	3091(86.8%)	540(63.4%)	985(44.6%)
Yes	151(4.9%)	471(13.2%)	312(36.6%)	1223(55.4%)
	$X^2 = 134.3484 p = 0.000$		$X^2 = 86.6363 p = 0.000$	

<i>Improved water</i>				
No	1619(52.6%)	1488(41.8%)	139(16.3%)	230(10.4%)
Yes	1457(47.4%)	2074(58.2%)	713(83.7%)	1978(89.6%)
	$X^2 = 78.1733 \ p = 0.000$		$X^2 = 20.1657 \ p = 0.000$	
<i>Improved toilet</i>				
No	2687(87.4%)	2627(73.8%)	304(35.7%)	444(20.1%)
Yes	398(12.7%)	935(26.5%)	548(64.3%)	1764(79.9%)
	$X^2 = 191.2836 \ p = 0.000$		$X^2 = 80.7165 \ p = 0.000$	

Source: TDHS-MIS 2015/16

The results in Table 2 show that household-head’s education, wealth quintile, zone of residence, listening to the radio, watching television, having improved water source, and improved toilet were statistically significant both in rural and urban areas ( $p < 0.05$ ). Household age and household size were only statistically significant in rural areas. Moreover, only the marital status of the head of the household was statistically significant for urban areas. Further, the sex of the household-head was not significant in both rural and urban areas. Therefore, since all the variables were important in predicting handwashing using water only, they were used in a multivariate level of analysis.

### 3.3 Multivariate Analysis Results

The multivariate analysis found that watching television in urban areas, listening to the radio in rural areas, and access to improved water sources were significantly associated with decreased odds of handwashing without soap both in rural and urban areas. Other variables such as the age, sex and marital status of a household-head and household size were significantly associated with handwashing with water only in rural areas as shown in Table 3. Household-head’s education, wealth quintile and zone of residence were not significantly associated with handwashing practices in this study.

**Table 3: Rural-urban Household Determinants of Handwashing Using Water Only**

Variables	Place of residence	
	Urban	Rural
	OR	OR
<i>Household-head age</i>		
15-34 <sup>a</sup>	1.000	1.000
35-59	0.955 (0.0963)	0.994 (0.0666)
60+	0.885 (0.128)	1.215** (0.100)
<i>Household-head sex</i>		
Male <sup>a</sup>	1.000	1.000
Female	0.841 (0.109)	0.809** (0.0716)

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<i>Household-head marital status</i>		
Not married <sup>a</sup>	1.000	1.000
Married	0.856 (0.109)	0.860* (0.0767)
<i>Household-head education</i>		
No education <sup>a</sup>	1.000	1.000
Primary	0.780 (0.118)	0.892* (0.0608)
Secondary	0.554*** (0.0961)	0.724*** (0.0833)
Higher	0.222*** (0.0646)	0.798 (0.252)
<i>Household size</i>		
1-3 <sup>a</sup>	1.000	1.000
4-6	0.943 (0.0979)	1.020 (0.0685)
7+	0.904 (0.115)	1.232*** (0.0949)
<i>Wealth quintile</i>		
Poorest <sup>a</sup>	1.000	1.000
Poorer	0.716 (0.238)	0.879* (0.0675)
Middle	0.841 (0.219)	0.625*** (0.0495)
Richer	0.730 (0.169)	0.400*** (0.0414)
Richest	0.601* (0.160)	0.345*** (0.0707)
<i>Zone of residence</i>		
Western <sup>a</sup>	1.000	1.000
Northern	0.800 (0.180)	0.928 (0.113)
Central	1.100 (0.256)	1.458*** (0.170)
Southern highland	0.946 (0.208)	0.852 (0.102)
Southern	1.231 (0.316)	1.240 (0.170)
South West highland	1.582** (0.329)	1.248* (0.142)
Lake	1.198 (0.239)	1.119 (0.111)
Eastern	0.734 (0.146)	0.357*** (0.0599)
Zanzibar	1.816*** (0.413)	1.114 (0.154)

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<i>Listen to radio</i>		
No <sup>a</sup>	1.000	1.000
Yes	0.956 (0.0914)	0.801*** (0.0453)
<i>Watch television</i>		
No <sup>a</sup>	1.000	1.000
Yes	0.786* (0.0998)	0.809 (0.118)
<i>Improved water</i>		
No <sup>a</sup>	1.000	1.000
Yes	0.713*** (0.0903)	0.870** (0.0495)
<i>Improved toilet</i>		
No <sup>a</sup>	1.000	1.000
Yes	0.820 (0.0996)	0.963 (0.0918)
Constant	1.784* (0.594)	1.778*** (0.260)
Observations	3,058	6,637

Notes: Standard errors in parentheses; \*\*\* p<0.01, \*\* p<0.05,

\* p<0.1 OR Odds Ratio, <sup>a</sup> Reference category

Source: TDHS-MIS 2015/16

A household-head that listened to the radio predicted a decrease in odds of handwashing using water only among rural households, compared to a household that did not listen to the radio. Likewise, a household that watched television predicted decreased odds of handwashing using water only in urban areas, compared to a household that did not watch television. Available studies indicate that the association between exposure to media and handwashing practices is mixed. Some studies that are consistent with the findings of this study show a positive association of exposure to the media with decreased handwashing without soap (Scott et al., 2007; Alexander et al., 2019; Islam et al., 2021; Schmidt et al., 2009). Some studies posit that exposure to, or ownership of, media is likely to increase knowledge of the importance of handwashing with soap, and can help household members to recall and practise handwashing with soap (Islam et al., 2021; Schmidt et al., 2009). On the other hand, in some instances ownership/exposure to the media has shown no or little impact on handwashing with soap, as found out by Galiani et al. (2012) and Islam et al. (2021).

Access to improved water sources predicted a decrease in odds of handwashing using water only in both rural and urban areas compared to a household with access to unimproved water source. This finding is similar to that of a study in Kenya, which showed that odds of handwashing with soap increased with increased access to water (Schmidt et al., 2009). Access to safe

water is associated with improved hygiene and health in general. It is vital to one's health: it is one of the basic human rights and one of the targets of the Sustainable Developments Goals (SGDs) (Matta & Kumar, 2017; WHO, 2022). Although this study found access to improved water sources showed a positive association between improved access to water sources and decreased odds of handwashing with water only in both rural and urban areas, most rural areas in Tanzania still have inadequate access to water (URT, 2011). Compared to urban areas, rural communities face additional challenges in water security such as scarcity and quality, which are likely to negatively affect handwashing practices (URT, 2015).

Household-head's age and household size predicted increased odds of handwashing using water only in rural areas. Compared to a household with a head aged 15–34, household-heads aged 60 and above were more likely to wash their hands using water only. Several studies have shown that older people are more likely to wash their hands than those who are younger (Smith et al., 2021; Luby et al., 2009; Tao et al., 2013; Borchgrevink et al., 2013) contrary to the finding of this study. For example, a study in China found that adults in both rural and urban areas were more likely to wash hands with soap and other sanitizers (Tao et al., 2013). A recent study that assessed handwashing practices among adolescents from 80 countries indicates that adolescents from low- and middle-income countries were less likely to wash hands with soap at critical times, compared to adolescents from high-income countries (Smith et al., 2021). It should be noted that the study at hand targeted household-heads only. Thus, information about other household members with respect to their age and their handwashing practices was not captured.

People in a household with 7 and more members were more likely to wash their hands using water only in rural areas compared to households with 1–3 household members. Generally, rural households in Tanzania have relatively more members compared to urban ones (NBS, MOF & OCGS, 2013). Thus, a household with more members may demand more soap and water, which are sometimes not readily available due to poor socio-economic status and other factors. Also, a household with a female-head was associated with a decreased odds of handwashing using water-only, compared to male-headed households. Households with married household-heads are associated with decreased odds of handwashing using water-only, compared to those with unmarried household-heads. Available research indicates that, in most cases, men and younger children are less likely to wash their hands with soap compared to adults and females (Luby et al., 2009; Borchgrevink et al., 2013). However, women in rural areas are likely to be disadvantaged when it comes to water supply, which may negatively affect their handwashing with soap. In addition, poor socio-economic status among rural women increases the chances of washing hands without soap (Luby et al., 2009; Smith et al., 2021).

#### **4. Conclusion**

Regardless of the place of residence, access to improved water sources and exposure to the media have the potential to reduce the chances of handwashing without soap. When households have access to water and practise handwashing with soap, there is a likelihood of reducing transmissions, hence reducing the likelihood of infectious diseases. Exposure to the media—such as radio and television—in rural and urban areas may increase people’s awareness of the importance of handwashing, and handwashing with soap. Although women are likely to wash hands more frequently than men, women living in rural areas are likely to practise handwashing without soap compared to women living in urban areas due to factors such as the availability of water and poor socio-economic status. Since handwashing is a complex behaviour, factors that determine handwashing without soap may vary from one place to another. Therefore, efforts to reduce handwashing without soap need to target all members of the community living in both rural and urban areas.

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