

## Research Paper

**Households' access to safely managed sanitation facility and its determinant factors in Jimma town, Ethiopia**Dereje Oljira Donacho <sup>a,b,\*</sup>, Gudina Terefe Tucho<sup>a</sup> and Abebe Beyene Hailu<sup>a</sup><sup>a</sup> Department of Environmental Health Science and Technology, Jimma University, Jimma, Ethiopia<sup>b</sup> Department of Health Informatics, College of Health Science, Mettu University, Metu, Ethiopia

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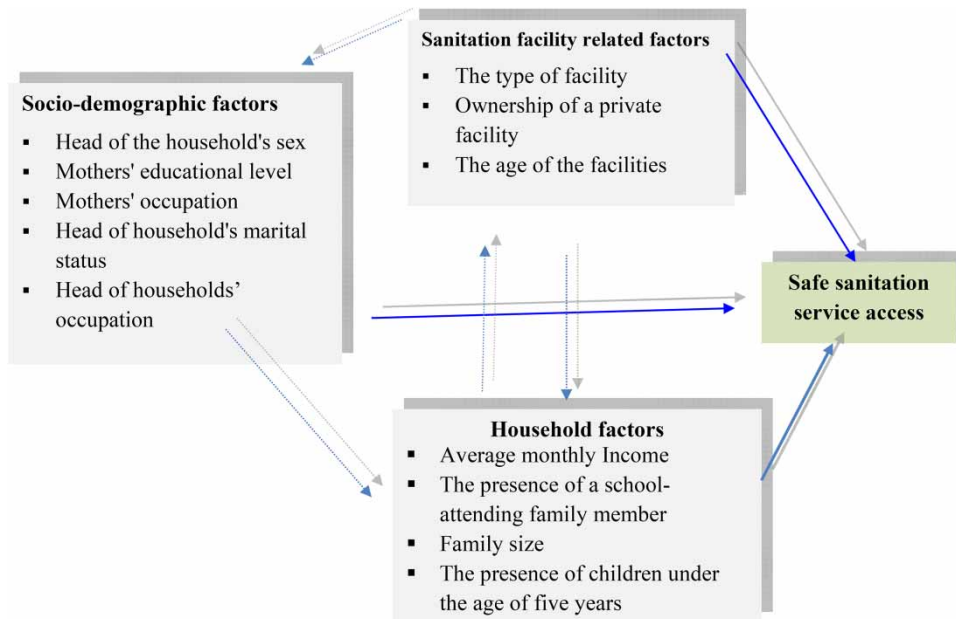
 DOD, 0000-0001-6145-2914**ABSTRACT**

Safe sanitation service is vital to a healthy life and promoting well-being. However, information on the proportion of households' access to safely managed sanitation services and its determinants in urban resource-limited settings is particularly scarce in Ethiopia. This study aimed to determine households' access to a safely managed sanitation service and its associated factors in Jimma, Ethiopia. A cross-sectional study design was conducted on 782 households selected randomly. Household heads were interviewed using a structured questionnaire and facility conditions were assessed using an observation checklist. The proportion of households with access to sanitation services was presented in frequency and percentage. A binary logistic regression analysis was employed to determine the association between the explanatory and dependent variables. The study found that a significant proportion of households (87%) use unsafe sanitation services. The presence of a school-attending family member, a smaller family size, heads of households engaged in private work, wives engaged in employed work, a higher monthly income, and toilet age are all associated with access to safely managed sanitation. To ensure safe sanitation access in the setting, sanitation interventions should take into account household differences, prioritize sustainable sanitation technology options in newly built toilets, improve households' economic status, and expand job opportunities and education for mothers, which demands long-term policy interventions.

**Key words:** determinant factors, Jimma town, safely managed, sanitation, Urban Ethiopia**HIGHLIGHTS**

- A large proportion (87%) of households in Jimma town use unsafely managed sanitation services.
- Factors contributing to the low level of safely managed sanitation include the household head's low educational level, gender, family size, wife's occupation, and household income.
- To address these constraints, an integrated intervention is required to encourage households to improve their sanitation facilities.

## GRAPHICAL ABSTRACT



## ABBREVIATIONS

HH	Head of the household
SDG	Sustainable development goal
UNCIF	United Nations Children's Fund
WHO	World Health Organization

## INTRODUCTION

Safe sanitation is critical for health, disease prevention, and contributing to long-term development (WHO 2018). Diseases spread through human excreta are caused by a lack of safe sanitation (Mara *et al.* 2010). According to a United Nations report, more than 297,000 children under the age of 5 died from diarrheal diseases caused by poor sanitation, hygiene, and unsafe drinking water in 2019 (UN-water 2020). Every year, 775,000 people around the world die as a result of poor sanitation (Ritchie & Roser 2019). This fact highlights the contribution of safe sanitation as a complete interruption of feco-oral disease transmission.

Globally, about 3.6 billion people lack safely managed sanitation services, and more than 673 million practice open field defecation (WHO & UNICEF 2020). More than 1.7 billion people worldwide live without access to basic sanitation services, and 709 million are in sub-Saharan African countries (WHO 2019c; Ritchie & Roser 2019). An estimated two-thirds (62%) of urban residents in low-income countries live in terrible sanitation conditions, with sanitation being a major concern (WWAP & UNESCO 2019). In sub-Saharan Africa, progress made on sanitation access in the last decades shows the potential to achieve basic sanitation coverage by 2030 (WHO 2019b; Roche *et al.* 2017). However, 'only one out of ten countries is on track to achieve universal basic sanitation by 2030' (UN-Water 2019).

Ethiopia, and sub-Saharan Africa more generally, is urbanizing at an extremely fast rate (Thomas *et al.* 2020), but the majority of studies on sanitation access continue to be drawn from rural settings. In Ethiopia, many people do not have access to safe sanitation services (WHO 2020). According to the 2016 Ethiopian Demographic and Health Survey (EDHS) report, only 6% of households use improved sanitation, while 53% (approximately 58.6 million people) are unimproved, 9% have shared facilities, and 32% (26.8 million people) have no access to any form of sanitation facility (CSA 2017; Azage *et al.* 2020). The report shows a significant decrease in the proportion of people practicing open defecation in urban areas from 15.9% in 2000 to 6.9% in 2016 (CSA[Ethiopia] & ICF 2017). However, despite such achievements,

information concerning the coverage of safely managed sanitation services and their associated factors is not available for most of the country's major cities.

Jimma town is one of the growing cities in the western part of the country (Abebe *et al.* 2019), where only meager information is available on households' access to safely managed sanitation services as defined by the WHO (2020). Therefore, this study aimed to identify the proportion of households with access to safely managed sanitation facilities and their associated factors following the SDG sanitation 'service ladder' (Bain *et al.* 2018). The study's findings are critical for gaining insight into the country's urban sanitation progress in order to meet the goals outlined in the SDGs and design a better sanitation program. More importantly, it can be used for planning by key stakeholders in the sanitation sector, allowing them to focus on interventions in the determinants.

Access to safely managed sanitation is at the top of the sanitation ladder. The sanitation ladder divides sanitation access into 4 categories: safely managed sanitation, basic, limited, and open field defecation (WHO 2019a). A safe sanitation service involves the use of improved sanitation facilities that are not shared with other households and excreta is treated *in-situ* or off-site. Basic access refers to the use of improved facilities that are not shared with other households, whereas limited access refers to the use of improved facilities that are shared among households. Unimproved sanitation facilities, on the other hand, include the use of pit latrines without a slab or platform, hanging latrines, or bucket latrines. The practice of disposing of human feces in fields, forests, bushes, open bodies of water, beaches, and other open spaces, or with solid waste, is known as open field defecation. Ensuring sanitation services are safely managed is critical to a healthy life, well-being, and health-related sustainable development goals (SDG) (WHO/UN 2017).

## MATERIALS AND METHODS

### Study design and setting

A cross-sectional study design was conducted on 782 households from December 2019 to January 2020 in Jimma town. Jimma town is located 352 km from Addis Ababa. Jimma town has an estimated total population of 195,228 (CSA-Ethiopia 2013), residing in 17 kebeles (small administrative villages) with an estimated 40,450 households. The town is located at 7°40'24.47" N latitude and 36°5'4.95" E longitude (Abebe *et al.* 2019).

### Size determination

The sample size for the study was calculated using a single population proportion formula (Lwanga *et al.* 1991), with a 95% confidence interval, a margin of error of 5%, an estimated population proportion of 50%, and an adjustment of 5% for non-response rate, and a design effect of 2. This provides a total sample size of 806 households. A total of 782 households were included in the survey, with 24 households having no responses after 2 rounds of visits.

A multi-stage sampling technique was used to address variations between households' access to safely managed sanitation services, which socio-demographic and economic factors could influence. In the first stage, 6 kebeles were selected randomly using a lottery method. On the second stage, households were selected from selected kebeles using proportional allocation to the size. The number of households in each kebele was assigned proportionally based on their size. Accordingly, 134, 124, 237, 69, 22, and 196 households were selected from Hermata Markato, KitoBaso, Bacho Bore, Jeren, Kofe, and Ginjo Guduru kebeles, respectively. Study households were selected using a systematic random sampling technique. Only household heads (HH) at the age of over 18 years, and who were willing to give consent and were willing to be involved in the study, were considered.

### Data collection tools and process

A structured questionnaire and observation checklists were used to collect the data. The data collection tools were developed from literature (Komakech *et al.* 2019) and pre-tested in the nearby town of Agaro in the Jimma zone. The questionnaire was prepared in English and then translated into the local languages (i.e., Afan Oromo and Amharic). Before it was used, it was back translated by experts to check the consistency of the translation. Following the pre-test, the final version of the questionnaire was handled by trained environmental health professionals.

In the fieldwork, 3 environmental health professionals conducted the interviews using a pre-tested structured questionnaire. Information on socio-demographic and socio-economic characteristics of the households and their accessibility to sanitation services (sanitation facility options, emptying, transporting, and treatment of fecal sludge) were collected using a structured

questionnaire (S1). The information on the conditions of sanitation facilities (i.e., availability of toilet facilities, type of latrine, place of the toilet, functionality, and hand-washing facility) was gathered by using observational checklists (S2).

### Data processing and analysis

We used Epidata version 3.1 (Lauritsen 2004) for data entry and Statistical Package for the Social Sciences (SPSS) version 20.0 software (IBM Corp 2011) for its analysis. Descriptive statistics were used to provide the frequency distribution of household socio-demographic characteristics, access to different sanitation facilities, and fecal sludge management options.

In the current analysis, a safely managed level was calculated from the use of improved sanitation facilities that are not shared with other households and excreta is treated off-site or *in-situ* (WHO 2019a). At this level, the first analysis is the type of toilet facility they used, followed by improvement (improved facilities /unimproved facilities), households sharing (shared/not shared), and finally, the fecal sludge treatment option (Yes/No). The households using the indicated level were considered as safely managed (Yes) and the remaining options were categorized as not being a safely managed service (No). Basic access involves the use of improved facilities that are not shared with other households; limited access involves the use of improved facilities that are shared among households. On the other hand, unimproved sanitation facilities include the use of pit latrines without a slab or platform, hanging latrines, or bucket latrines.

A bivariate logistic regression was used to analyze the association of socio-demographic predictors with 2 outcome variables: access to safely managed sanitation services and access to improved toilet facilities. The variables that showed statistically significant associations in binary logistic regression ( $P$ -value less than 0.025) were moved to multivariable logistic regression models for further analysis. The odds ratio with a 95% confidence interval was used to identify the factors associated with the outcome variables in the final model. The predictor variables' degrees of multicollinearity were explored. The Hosmer and Lemeshow goodness-of-fit test was used to assess the model's appropriateness.

### Ethical approval

Prior to data collection, an ethical approval letter was obtained from the Jimma University Institute of Health Institutional Review Board (IRB), and written consent was obtained from the study participants. Moreover, study participants were given a chance to leave the study at any time and/or could refuse to respond to the questions posed if they decided to do so. The confidentiality of the participants' personal information was also assured.

## RESULTS

### Socio-demographic characteristics of the study participants

In total, 782 households were interviewed, with a 97% response rate. The vast majority of respondents (91.4%) were males. The respondents' average age was 43 years, and the average household family size was 4. The majorities of HH were married (89.6%), worked in the private sector (85.4%) and had attended a secondary school level or higher (72.4%). More than half, 536 (68.5%), had a family size of less than 4. A majority of households had at least one family member (FM) currently attending primary school (83.1%) or secondary school (95.9%) and 19.7% households had at least one child less than 5 years of age. More than half of the mothers (62%) were housewives, 43.8% had a secondary education or higher and 8.9% were the head of the household. The average monthly family income was 4,957 birr (\$113.5) (Table 1).

### Household's access to sanitation facilities

The majority of the households, 739 (94.5%), had access to toilet facilities, of which 571 (77.3%) were improved toilet facilities, and traditional pit latrines represented 421 (56.97%) of the total latrine use. Of the total toilet facilities, 496 (67.1%) were constructed within the last 5 years before the survey, and around half of the toilets, 411 (55.6%), were shared among 2 or more households. As per observation results of our survey, the available toilets were in different conditions: 496 (67.1%) had doors, 547 (74%) had iron sheet roofing, and 198 (26.8%) had hand-washing facilities with water and soap during the observation (Table 2).

### Fecal sludge management in the selected households

The on-site sanitation options account for 677 (91.6%) of households where fecal sludge is contained. Of the total households having toilets (739), 266 (36%) of them had fecal sludge treated on-site or off-site. Despite access to sanitation facilities, 473 (64%) of the households directly released untreated toilet contents into the surrounding environment, including nearby river water. Of the contained facilities, 204 (30.1%) were emptied at least once in the past 2 years, of which 191 (93.6%) were

**Table 1** | Socio-demographic characteristics of the selected households in Jimma town, Southwest Ethiopia 2020

Variables	Categories	Frequency (%)
Age of respondent ( <i>n</i> =782)	18–29	96 (12.3)
	30–39	227 (29)
	40–49	260 (33.2)
	50–59	128 (16.4)
	≥60	71 (9.1)
Sex of HH ( <i>n</i> =782)	Female	67 (8.6)
	Male	715 (91.4)
Marital status of HH ( <i>n</i> =782)	Married	701 (89.6)
	Single	24 (3.1)
	Widowed	19 (2.4)
	Separated	31 (4.0)
	Divorced	7 (0.9)
HH occupation ( <i>n</i> =782)	Government employee	100 (12.8)
	Housewife	14 (1.8)
	Private employed	668 (85.4)
Mothers' occupation ( <i>n</i> =746)	Government employee	49 (6.55)
	Housewife	469 (62.9)
	Private employed	228 (30.55)
HH educational status ( <i>n</i> =782)	Can read and write	16 (2.05)
	Primary (1–8)	200 (25.57)
	Secondary (9–12)	242 (30.95)
	Above secondary	324 (41.43)
Mothers educational status ( <i>n</i> =746)	Can read and write	70 (9.4)
	Primary (1–8)	349 (46.8)
	Secondary (9–12)	262 (35.1)
	Above secondary	65 (8.7)
Presence of primary school attending FM ( <i>n</i> =782)	No	132 (16.9)
	Yes (at least one FM)	650 (83.1)
Presence of secondary school attending FM ( <i>n</i> =782)	No	32 (4.1)
	Yes (at least one FM)	750 (95.9)
Presence under 5 child in the household ( <i>n</i> =782)	No	609 (77.9)
	Yes	149 (19.1)
Monthly family income ( <i>n</i> =782)	≤5,000 (<\$114.5)	444 (56.8)
	>5,000 (≥\$114.5)	338 (43.2)
Family size ( <i>n</i> =782)	Less than 4	536 (68.5)
	4 and above	246 (31.5)

emptied by manual method following rain and discharged to runoff, while 13 were emptied by vacuum truck and dumped at a disposal place near the town. Following the safely managed service indicator, use of improved facilities not shared, and fecal sludge treated on-site or off-site, 102 (13%) of households had access to safely manage their waste (Table 3).

According to the sanitation ladder (WHO/UNICEF/JMP 2015), of the 782 households, only 102 (13%) had access to safely managed service, 173 (22%) had basic access (improved, not shared with other households), 296 (38%) had limited access (i.e., shared with others), 168 (21.5%) had access to unimproved facilities, and 43 (5.5%) had no access to any facilities (defecate open field) (Figure 1).

### Factors associated with sanitation access

A bivariate analysis was conducted to examine the association of socio-demographic factors with 2 levels of household access to sanitation facilities: access to safely managed sanitation and improved toilet facilities. Accordingly, factors associated with access to safely managed sanitation facilities were the female-headed households (AOR=2.8, 95% CI: 1.20–6.56); households' level of education (AOR=3.37, 95% CI: 1.77–6.42); households' occupation (AOR=5.52, 95% CI: 2.19–13.93); marital status

**Table 2** | Toilet facility access and sanitation services among selected households in Jimma town, Southwest Ethiopia 2020

Toilet facility access	Categories	Frequency (%)
Availability of toilet facility ( <i>n</i> =782)	No	43 (5.5)
	Yes	739 (94.5)
Type of toilet facility ( <i>n</i> =739)	Pour flush to a septic tank	84 (11.36)
	Pour flush to a pit latrine	33 (4.47)
	Pour flush open field	62 (8.39)
	VIP latrine	33 (4.47)
	Pit latrine with slab	421 (56.97)
	Pit latrine without a slab	106 (14.34)
Condition of latrine ( <i>n</i> =739)	Improved	571 (77.3)
	Unimproved	168 (22.7)
Nature the underground structure ( <i>n</i> =739)	Unlined pit	364 (46.5)
	Lined pit	313 (40.0)
	Piped Sewerage	62 (7.9)
Functionality of the facilities ( <i>n</i> =739)	No	10 (1.4)
	Yes	729 (98.6)
Toilet sharing other households ( <i>n</i> =739)	No	328 (44.4)
	Yes	411 (55.6)
Toilet has a door ( <i>n</i> =739)	No	243 (32.9)
	Yes	496 (67.1)
Super structure ( <i>n</i> =739)	Iron sheet roof	547 (74.02)
	Plastic roof	151 (20.43)
	No roof	41 (5.55)
Age of toilet ( <i>n</i> =739)	<5 years	496 (67.1)
	≥5 Years	243 (32.9)
Availability of hand washing ( <i>n</i> =739)	With water and soap	198 (26.8)
	Without water and soap	260 (35.2)
	No hand washing facility	281 (38)

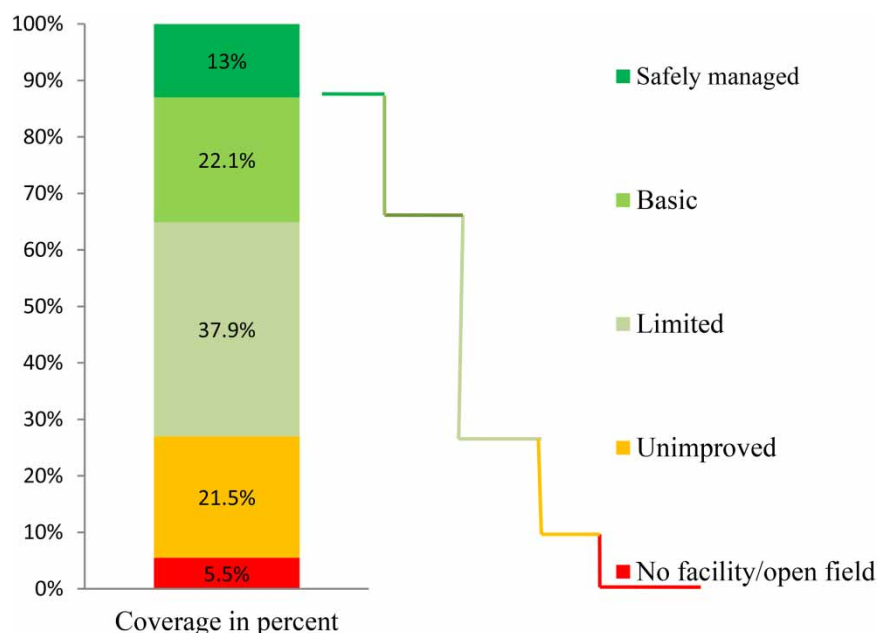
**Table 3** | Fecal sludge management among selected households in Jimma town, Southwest Ethiopia, 2020

Variables	Categories	Frequency (%)
Off-site/on-site ( <i>n</i> =739)	On-site	677 (91.6)
	Off-site	62 (8.4)
Containment ( <i>n</i> =739)	Contained	677 (91.6)
	Discharge	62 (8.4)
Treated ( <i>n</i> =739)	Treated <sup>a</sup>	266 (36)
	Not treated	473 (64)
Emptied ( <i>n</i> =677)	Emptied	204 (30.1)
	Not emptied	473 (69.9)
Transportation options ( <i>n</i> =204)	Traditional emptied	191 (93.6)
	Vacuum truck	13 (6.4)
Safely managed service ( <i>n</i> =782)	Not safely managed	680 (87.0)
	Safely managed	102 (13.0)

<sup>a</sup>Treated: when the pit is full, it is covered with soil, and the new pit is replaced or safely emptied and dumped at the disposal site.

(AOR=6.31, 95% CI:1.48–26.95); wife's occupation (AOR=2.15, 95% CI:1.31–3.54); presence of a secondary school-attending family member (AOR=3.86, 95% CI:1.48–10.07); family size (AOR=6.28, 95% CI:3.01–13.11); family income (AOR=3.83, 95% CI: 2.33–6.28); and age of the toilet (AOR=2.30, 95% CI: 1.40–3.80) (Table 4).





**Figure 1** | Sanitation ladder among selected households in Jimma town, Ethiopia 2020 (Source: Household Survey).

**Table 4** | Final logistic regression model for households' safely managed sanitation services in Jimma town, 2020

Variables	Categories	Safely managed sanitation services		Crude OR (95% CI), P-value	Adjusted OR (95% CI), P-value
		Yes (%)	No (%)		
Head of household (HH) sex	Female	17 (2.2)	50 (6.4)	2.52 (1.39–4.57)	2.81 (1.20–6.56), 0.017**
	Male	85 (10.9)	630 (80.5)	1	1
HH education	Secondary or above	88 (11.3)	478 (61.1)	2.66 (1.48–4.78)	3.37 (1.77–6.42), <0.001*
	Primary or less	14 (1.8)	202 (25.8)	1	1
HH occupation	Private	96 (12.3)	572 (73.1)	3.02 (1.29–7.07)	5.52 (2.19–13.93), <0.001*
	Gov't or House wife	6 (0.8)	108 (13.8)	1	1
Mothers occupation	Gov't or Private	55 (7.37)	222 (29.76)	2.22 (1.46–3.39)	2.15 (1.31–3.54), 0.002*
	Housewife	47 (6.30)	422 (56.57)	1	1
Secondary school attending FM	Yes	92 (11.8)	658 (84.1)	1	1
	No	10 (1.3)	22 (2.8)	3.25 (1.5–7.08)	3.86 (1.48–10.07), <0.001*
Family size	Less than 4	93 (11.9)	443 (56.6)	5.5 (2.7–11.2)	6.28 (3.01–13.11), <0.01*
	4 and above	9 (1.2)	237 (30.3)	1	1
Monthly family income (ETB)	5,000 and above	61 (7.8)	277 (35)	2.16 (1.4–3.31)	3.83 (2.33–6.28), <0.001*
	Less than 5,000	41 (5.2)	403 (52)	1	1
Marital status of HH	Married	99 (12.7)	602 (77)	4.28 (1.32–13.81)	6.31 (1.48–26.95), 0.013**
	Single	3 (0.4)	78 (10)	1	1
Age of the facility (year)	5 and above	45 (6.1)	198 (26.8)	1.75 (1.14–2.68)	2.30 (1.40–3.80), 0.001*
	Less than 5	57 (7.7)	439 (59.4)	1	1

**Key:** Single=Unmarried or widowed or separated or divorced, Gov't=government employee.

\*Significant at  $P < 0.01$ .

\*\*Significant at  $P < 0.05$ .

Factors associated with access to an improved sanitation facility were the presence of a child under 5 years of age in the family (AOR=2.95, 95% CI: 1.92–4.52), family size of less than 4 people (AOR=1.62, 95% CI: 1.09–2.39), mother's education level (AOR=1.64, 95% CI: 1.12–2.41), age of the toilet (AOR=4.85, 95% CI: 2.84–8.26) and sharing of toilet facilities (AOR=1.62, 95% CI: 1.09–2.41) (Table 5).

**Table 5** | Final logistic regression model for households' access to improved sanitation facilities in Jimma town, 2020

Variables		Improved Sanitation		COR (95% CI)	AOR (95% CI), P-value
		Yes (%)	No (%)		
Presence of child under 5 years of age in HH	Yes (at least one)	78 (11)	56 (8)	1	1
	No	472 (66)	109 (15)	3.11 (2.09–4.64)	2.95 (1.92–4.52), <0.001*
Family size	Less than 4	405 (51)	98 (13)	1.74 (2.08–4.64)	1.62 (1.09–2.39), 0.017**
	4 and above	166 (22)	70 (9)	1	1
Mother's education	Primary and less	315 (45)	76 (11)	1.61 (1.13–2.28)	1.64(1.12–2.41), 0.01*
	Secondary and above	227 (32)	88 (12)	1	1
Age of the facility	5 years and above	224 (30)	19 (3)	5.06 (3.05–8.40)	4.85 (2.84–8.26), <0.001*
	Less than 5 years	347 (47)	149 (20)	1	1
Shared toilet facilities	Not shared	275 (37)	53 (7)	2.02 (1.4–2.90)	1.62(1.09–2.41), 0.017**
	Shared	296 (40)	115 (16)	1	1

\*Significant at P&lt;0.01.

\*\*Significant at P&lt;0.05.

## DISCUSSION

In this study, we assessed households' levels of access to safely managed sanitation services and access to improved sanitation based on SDG indicators. We found that only 13% of the households had access to safely managed sanitation services, despite 73% of households having access to improved sanitation facilities. The level of access to the safely managed facility is lower than the national urban safely managed sanitation facilities and improved toilet facilities (15.9%) (Soboksa 2021), Babati Town Council in Tanzania (31%) (Komakech *et al.* 2019), Addis Ababa (20%) (Andualem *et al.* 2021), and Dire Dawa (24%) (Azage *et al.* 2020; Sahiledengle *et al.* 2018). This variation could be attributed to the town's size and the settlement condition in which Jimma town is located.

As shown in the results, the head of the households' sex, educational status, marital status, and household income had all shown a statistically significant association with the households' access to safely managed facilities. It has been demonstrated that female-headed households are 2.8 times more likely to have access to safely managed facilities than male-headed households. This underlines the critical role of women in ensuring the availability of safe sanitation facilities (Indarti *et al.* 2019; Armah *et al.* 2018). This could be linked to female empowerment in the family leadership role, as having control over household resources gives them more opportunities to demonstrate.

This study revealed a positive association between higher monthly household income (earning 5,000 or more birrs per month) and access to safely managed sanitation facilities (AOR: 3.82, CI: 2.33–6.28). This implies that households with a better income are about 4 times more likely to have access to safely managed sanitation facilities. Moreover, poor households living in urban areas of developing countries mostly live in slum areas without access to basic infrastructure. The study reports from other studies in sub-Saharan Africa found that more highly educated households with a better income had more access to improved sanitation facilities (Armah *et al.* 2018; Nyambe *et al.* 2020).

The impact of education on households' accessibility to improved sanitation facilities has been confirmed in different studies (Armah *et al.* 2018; Nyambe *et al.* 2020), which show that households with higher levels of education have better access to improved sanitation facilities. The current study also showed a similar positive association between access to education and safely managed sanitation (AOR; 3.86: CI, 1.48–10.07). The head of household with a higher level of education is 3.37 times more likely to have access to improved sanitation (AOR; 3.37: CI, 1.77–6.42). The wife's primary educational level also showed a positive association with accessing improved sanitation facilities (AOR; 1.64: CI, 1.12–2.41). This could be associated with changes in households' attitude towards access to sanitation facilities. The possibility of achieving sustainable development goals would be promising due to the high investment of governments in developing countries in education, particularly for women.

Households' sanitation facility ownership has a significant association with households' accessibility to safely manage sanitation facilities. Households not sharing toilet facilities are 1.6 times more likely to have improved facilities (AOR; 1.62: CI, 1.09–2.41). This study is consistent with the report from Zambia, showing that households not sharing toilets safely manage



their waste (Nyambe *et al.* 2020). This could be due to a lack of ownership of the facilities, resulting in poor maintenance and improvement. Household head engagement in private business is positively associated with accessing a safely managed service (AOR; 5.5; CI, 2.19–13.93). Moreover, mothers' engagement in private or government organizations (AOR, 2.1; CI, 1.31–3.54) also has a positive association. This can be related to households' access to better incomes and improved living standards. Households with a smaller family size (AOR; 95% CI, 1.6; CI, 1.09–2.4) also showed the likelihood of access to improved sanitation facilities.

The age of the toilet was positively associated with improved facilities (AOR, 2.84; 95% CI, 2.84–8.26). Households with old latrines are 4.8 times more likely to have access to improved sanitation than those constructed in the last 5 years prior to the survey. Most of the facilities built in the previous 5 years before the survey were unimproved. This might be due to the expansion of illegal settlements and rapid urban growth without basic infrastructure (Abebe *et al.* 2019). The problems associated with illegal settlement could remain a challenge due to the inability to provide basic infrastructure in the near future. However, this study did not address the comparison of the illegal settlement segments of the population separately, so that may have less coverage and the factors at the town level may not be the same for urban slums.

## CONCLUSION

A large proportion of households use unsafe managed sanitation services despite having access to improved sanitation facilities. This is partly associated with household income being too low to have their own latrine, and sharing and illegal settlement, explained by the age of the toilets. Consequently, many households directly dispose of their toilet waste in the open environment, including river water. Despite the positive moves by governments in developing countries to improve access to education and income, particularly for women, illegal settlements will remain a challenge to improving access to improved sanitation facilities. An integrated policy is needed to encourage households to have improved sanitation facilities and step up the sanitation ladder to address those constraints. Furthermore, improving household economic status, expanding job opportunities for mothers, and matching family size with family income have a positive role in ensuring safely managed sanitation access in this setting that demands long-term policy interventions.

## AUTHOR'S CONTRIBUTIONS

D.O. designed the survey, trained the research team, oversaw the fieldwork, and participated in drafting the manuscript. A.B. and G.T. participated in the design of the survey, approved the survey, and oversaw the critical revision of the manuscript. All authors read and approved the final version of the manuscript.

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## ETHICAL APPROVAL AND CONSENT TO PARTICIPATE

Ethical clearance was obtained from the Jimma University, Faculty Public Health Institutional Research Ethics Review Committee, Jimma, Ethiopia. Before each interview, data collectors sought verbal informed consent from each respondent.

## COMPETING INTERESTS

The authors declare that they have no competing interests.

## CONSENT FOR PUBLICATION

All authors agreed to the publication of this manuscript.

## DATA AVAILABILITY STATEMENT

All relevant data are included in the paper or its Supplementary Information.

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