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# Moving Up the Sanitation Ladder: A Study of the Coverage and Utilization of Improved Sanitation Facilities and Associated Factors Among Households in Southern Ethiopia

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## ABSTRACT

**BACKGROUND:** Improved sanitation facilities offer numerous advantages, ranging from the reduction of diarrheal illnesses and helminth infections to the improvement of psychosocial well-being. At the household level, attaining universal access to improved sanitation facilities demands a thorough understanding of the factors that influence their adoption and use. As a result, the purpose of this study was to assess the availability and utilization of improved sanitation facilities, as well as the factors that influence the adoption and proper use of such a facility among households in the Gedeb district of Southern Ethiopia.

**METHODS:** A community-based cross-sectional household survey was conducted from March to April 2019. A systematic random sampling technique was used to select 630 households at random. A pre-tested questionnaire was used to collect the respondents' self-reported data, which comprised socio-demographic, home characteristics, behavioral, and environmental elements. The factors related to the availability and utilization of improved sanitation facilities were identified using multivariable logistic regression.

**RESULT:** Improved sanitation facilities were present in 172 (27.3%) of the 630 households surveyed, with 111 (64.5%) of them being used properly. The availability of improved sanitation was associated with educational status [AOR = 2.73, 95% CI (1.59, 4.67)], upper wealth quintile [AOR = 2.18, 95% CI (1.21, 3.93)], ever hearing educational messages about latrines [AOR = 3.9, 95% CI (1.86, 8.18)], favorable attitude toward latrine construction [AOR = 2.81, 95% CI (1.67, 4.74)], and receiving support during construction [AOR = 3.78, 95% CI (2.15, 6.65)]. Furthermore, utilization was associated with the absence of children under the age of 5, knowledge of sanitation-related diseases, and a positive attitude toward latrine use.

**CONCLUSION:** Both the availability of improved sanitation facilities and the rate at which they were used properly fell far short of the National Hygiene and Environmental Health Strategy's goals. This study contributes to the body of knowledge on how to improve the availability of improved sanitation in Ethiopia.

**KEYWORDS:** Improved sanitation facilities, availability, utilization, Ethiopia

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## Introduction

Improved sanitation facilities are defined by the World Health Organization's (WHO) Joint Monitoring Program (JMP) as a sanitation system in which excreta are disposed of in a way that reduces the risk of feco-oral transmission to users and the environment, and include flush or pour-flush to a piped sewer system, septic tank or pit latrine, ventilated improved pit latrine, pit latrine with slab, and composting toilet.[1,2]

Improved sanitation is essential for the improvement of human health and economic growth.[3] Although its importance is now recognized on both a local and global scale, it remains a problem; 2.4 billion people worldwide still lack access to improved sanitation. And the vast majority of these individuals reside in Sub-Saharan Africa.[1] Despite tremendous improvements in access to water and sanitation infrastructure in Ethiopia, sanitation coverage remains limited. Approximately 72% of the population does not have access to improved sanitation facilities. Furthermore, more than a quarter of the population (29%) still defecates in the open.[4]

Diarrheal diseases are the most serious health consequences of poor sanitation, with a particularly severe impact on children. Unimproved sanitation, combined with poor hygiene and contaminated drinking water, is responsible for 88% of diarrheal disease worldwide.[5,6] In 2015, the global economic loss attributed to sanitation-related early deaths, healthcare costs for treating sanitation-related diseases, and lost productivity due to illness was projected to be 222.9 billion dollars.[7]

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In Ethiopia, unimproved sanitation and lack of hygiene are responsible for 60% of all diseases.[8] Diarrhea is the main cause of death in children under the age of 5, accounting for 23% of all deaths. Every year, around 64 540 children could be saved in the country if sanitation was improved.[8] Nearly 40% of children under the age of 5 are stunted, which is closely correlated to the incidence of diarrhea.[9]

One of the Sustainable Development Goals (SDG) is to ensure that everyone has access to adequate and equitable sanitation, as well as to eliminate open defecation.[10] Data on the factors (personal, household, and system-related) related to the availability and use of improved sanitation facilities is required to do this. As a result, the objective of this study was to determine the availability and utilization of improved sanitation facilities, as well as the factors that influence them, in the Gedeb district of Southern Ethiopia. In terms of socioeconomics and culture, the population in this study is representative of a typical rural district in Southern Ethiopia. As a result, the findings of this study will aid in the development of evidence-based, long-term, localized, contextualized, and indigenized interventions in Southern Ethiopia's resource-poor contexts.

## Materials and Methods

### *Study area and setting*

A community-based cross-sectional study was conducted from March to April 2019 in Ethiopia's Gedeb district. The district is located in 6°19′00″ north latitude and 38°16′00″ east longitude. In 2018, the total population of the Gedeb district was 156 274, with 75 637 men (48.4%) and 80 637 females (51.6%), for a population density of 726 persons per square kilometer. The district covers roughly 248 square kilometers and is made up of 17 rural Kebeles (Ethiopia's smallest administrative unit) with a total of 31 985 households. The majority of the district's inhabitants are farmers and livestock breeders.[11]

In 2012, the Community-Led Total Sanitation and Hygiene (CLTSH) initiative was introduced in all rural Kebeles, with the goal of "triggering" or "igniting" communities to modify their hygiene and sanitation behaviors, notably by building and using latrines instead of defecating in the open.[12] The program's ultimate goal is to assist individuals in progressing up the sanitation ladder, from open defecation to the use of simple latrines to the use of more improved latrine choices. By 2018, all Kebeles had been proclaimed open defecation-free (ODF) by the district health bureau. The Rural Health Extension Program (HEP), which focuses on increasing household water, hygiene, and sanitation services, was launched in the district 16 years ago. Ever since, 2 health extension workers (HEWs) from the program have been allocated to each Kebele in the district, to give door-to-door education.[13]

### *Sample size and sampling procedure*

Using Epi Info Version 7.2 software, the sample sizes for objectives 1 and 2 were calculated individually, using a formula for a single population, based on the following distinct assumptions.

- Population size 31 985 households
- The hypothesized proportion of availability of improved sanitation facilities is 35.9% in rural Lemo District, Southern Ethiopia.[14]
- Because there was no research on the use of improved sanitation facilities in our context, any attempt to adopt baseline prevalence from another setting could jeopardize the representativeness of this study. Characteristics in living arrangements, individual differences, environmental influences, and other factors can all lead to erroneous conclusions. As a result, the maximum sample size assumption was used to maximize the precision of the study's results, with 50% utilization of improved sanitation facilities 0.5% margin of error,
- 95% level of confidence ($Z = 1.96$)
- a design effect of 1.5 to allow clustering effect
- 10% non-response

As a result, the sample sizes for the availability and use of improved sanitation facilities were 576 and 634 households, respectively. The study was conducted with the biggest sample size (n = 634).

To achieve the study's objective, a multi-stage sampling technique was adopted. The lottery method was used in the first phase to select 5 rural Kebeles (representing 25%) from a total of 17 rural Kebeles. In the second stage, the entire sample size, 634, was allocated to the sampled Kebeles proportionally to their household size. Finally, using systematic random sampling, sample respondents were selected from each Kebele. The Sampling interval (K) was calculated by dividing the total number of homes in each Kebele by the sample size allotted. The first sample household was chosen by simple random sampling (lottery method), and every (Kth) household was chosen for data collection until the required sample was acquired in each selected Kebeles Figure 1.

### *Data collection*

Face-to-face interviews with participants were conducted using a pretested, closed-ended questionnaire and observational checklist devised by the researchers (S1Tool). In each home, the head of the household or other adult members were interviewed. In addition to the questionnaires, in-home observations were undertaken to better understand household sanitation practices, such as the use of latrines and the disposal of child feces.

An environmental health professional performed a forward translation of the questionnaire from English to Amharic (the lingua franca). An independent translator then reverse-translated the forward-translated version; to find discrepancies in terminology, meanings, and contents of the items, the translated and original English questionnaires were compared and

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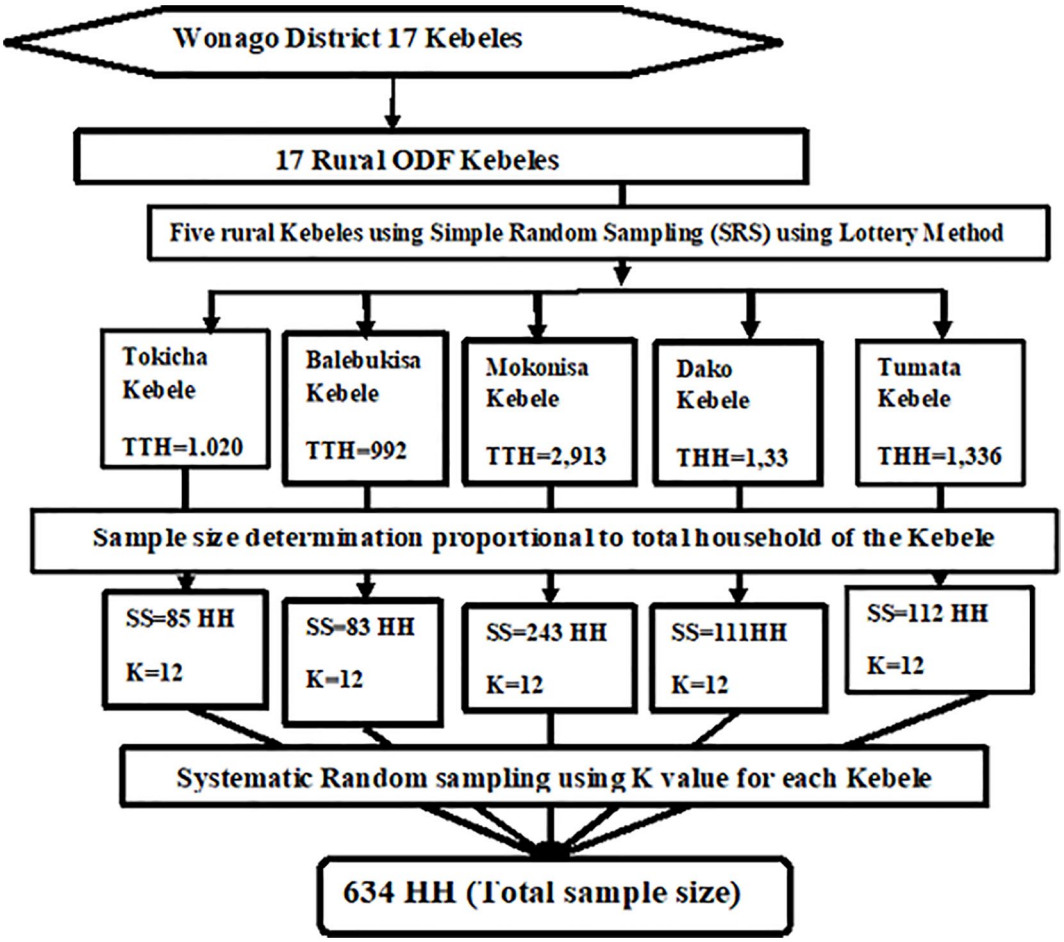



**Figure 1.** Diagrammatic presentation of the sampling procedure of households in Gedeb District, Southern Ethiopia, 2019.

examined. Before starting the survey, the tool was pilot tested on 5% of the entire sample (32 dwellings) in nearby Kebeles. The primary goal of the pre-test was to uncover any issues with the tool's design and readability.

The data collection tools include socio-demographic and other characteristics that would measure the availability and utilization of sanitation facilities and associated factors after reviewing relevant literature. Three pairs of interviewers (with prior data collection experience) and one supervisor (an Environmental health professional) helped collect the data. The data collectors were given a 2-day training session by the lead investigator at Dilla University before the pilot test. During the study, the focus was on sampling procedures, interview tactics, filling out questionnaires, and ethical considerations.

### *Study variables*

#### *Dependent variable*

- Availability of improved sanitation facilities (Households were considered to have an improved sanitation facility if they had a private improved pit latrine with a slab or vented improved pit latrine or composting toilet, flush or pour/flush facility connected to a piped sewer system/ septic tank/pit, regardless of whether it is shared with other households)
- Utilization of improved sanitation facilities (Households were considered as properly utilizing their latrines if: the latrine is hygienic and every member of the household whose age is above 5 are reported to use the facility by the respondents, there is safe disposal of child feces, no observable feces in the compound/or latrine slab, at least one sign of use (clear footpath to the latrine not covered by grass or anything, the latrine is smelly, presence of anal cleansing material, or the slab is wet).[15]

*Independent variables.* Socio-demographic variables (sex, age, occupation, educational status of the household head, household size, and household wealth status), Environmental variables (availability of enough space, availability construction materials, and soil property), Psychosocial and Personal variables (awareness, knowledge, attitude, social norms, and beliefs regarding adoption and utilization of sanitation facilities and water-borne diseases) Program/assistances related variables (supervision by health extension/health worker and availability of skilled mason).

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*Operational definitions.* **Functional latrine/toilet:** a latrine with sub and superstructures and that provided services at the time of data collection even if the latrine required maintenance.[16]

**Knowledge**: Respondents were asked a series of knowledge-related questions, with the correct answer receiving a value of 1 and the erroneous answers receiving a value of 0. The overall score was then calculated by adding all of the items together, and the respondents' score was divided into 3 categories: poor (<50%), medium (50%-75%), and good knowledge (>75%).

**Attitude**: On a 5-point Likert scale, respondents were asked attitude-related questions. The respondents' score was then computed by adding all of the questions together, and the respondents' score was dichotomized as favorable (>mean) or unfavorable (<mean).

*Data entry and analysis.* Using a data entry template, the acquired data was coded and entered into Epi Info version 7.2. For the first specific objective, determining the prevalence of availability and utilization of improved sanitation, frequency tables, percentages, and proportions were used to display descriptive findings. Descriptive statistics along with a Chi Square ($\chi^2$) test were used to discover association between improved sanitation facility adopters and non adoperts in relation to the variables under study, while Cramer's V gave the power of the relationship.

Binary logistic regression was used to identify factors associated with availability and utilization. The analysis began with a crude analysis in which each independent variable was explored separately for a relationship with the outcome. A *P*-value <.25 was used as a cutoff point to select the candidate variables for multivariable analysis. The cutoff point was selected to reduce an excessive number of variables and an unstable estimate in the multivariable logistic regression.[17]

During the analysis, the variance inflation factor (VIF < 5) was used to look for multicollinearity among the explanatory variables. The principal component analysis (PCA) was used to produce the wealth index for households. The wealth index was constructed using 21 binary variables, and the Kaiser-Meyer-Olkin (KMO) value was 0.79, which is acceptable. The first component (factor 1), which was separated into 3 categories, each with 33.3%, was used to generate the wealth index. Households in the first category were the poorest (lower wealth quintile), while those in the third category were the richest (upper wealth quintile). Variables with a *P*-value of less than .05 were considered statistically significant and presented by Adjusted Odds Ratio (AOR) with a 95% confidence interval in the multivariable analysis.

## Result

### *Socio-demographic characteristics of respondents*

A total of 630 families with a latrine took part in the study, with a response rate of 99.4%. Males made up 371 (58.9%) of the respondents, and they led the majority of families (574) (91.1%). The household heads' mean age was 35.42 years, with a standard deviation of 8.96 years and a range of 20 to 70 years. In 530 cases, the family's head was married (85.4%). In terms of educational attainment, 382 household heads (60.6%) were literate. Farmers made up over two-thirds of the participants (67%). There were children under the age of 5 in 235 (37.3%) of the families. The average number of people in a household was 6.2 (Table 1).

### *Availability and utilization of improved sanitation facilities*

Traditional pit latrines with cement/plastic slabs and with mud slabs accounted for 146 (23.2%) and 273 (43.3%) of the latrines, respectively. 172 (41.1%) of the available pit latrines with either slab type had a squatting hole cover. Only 172 (27.3%) of the total households in the study had improved sanitation facilities.

One hundred and thirteen (59.9%) of the available improved sanitation facilities had cement/plastic slabs. None of the latrines had been emptied before the data collection. Around 93 (54.1%) were within 10 to 15 m of the residence, and 38 (22.1%) were constructed within the previous 2 years of the data collection period. 77 (88.5%) of families with children under the age of 5 appropriately dispose of their children's excrement. When it came to utilization, 111 (64.5%) of the households had latrines with at least one indicator of use (clear footpath to the toilet not covered by grass, presence of anal cleansing material, fresh feces in the squat hole/pit, or the slab is wet) (Table 2).

### *Knowledge, attitude, and prior training related characteristics*

About 466 (74%) of survey participants had heard an educational message on improved sanitation facilities; of these, only 139 (29.8%) knew about multiple types of improved sanitation facilities. When it came to sources of information, over half (49.6%) had heard from health extension workers. 170 (27%) of those surveyed had a good knowledge of improved sanitation facilities. 302 respondents (47.9%) were in favor of improved sanitation facilities (Table 3).

### *Environmental factors*

Only 94 (14.9%) of the households in the survey received financial or material aid in building their latrines; the majority, 81 (86.2%), received help from non-governmental organizations (NGOs), while the remaining received help from their families. Natural disasters, such as flooding, affected only 10 (1.6%) of the total households in the study. 187 homes (29.7%) had a handwashing facility, with 95 (50.8%) homes utilizing only water and 17 (17.9%) using both water and soap. In the month before data collection, 84 (15.8%) of homes reported having insufficient drinking water, while the majority (84.1%) of households had access to improved water

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**Table 1.** Socio-demographic characteristics of the respondents in Gedeb, Southern Ethiopia, 2019.

| VARIABLES | FREQUENCY | PERCENT |
|---|---|---|
| Sex of the respondent | | |
| Male | 371 | 58.9 |
| Female | 259 | 41.1 |
| Sex of the household head | | |
| Male | 574 | 91.1 |
| Female | 56 | 8.9 |
| Age of household head | | |
| 20-35 y | 368 | 58.4 |
| 36-50 y | 226 | 35.9 |
| ⩾51 y | 36 | 5.7 |
| Marital status of the household head | | |
| Married | 538 | 85.4 |
| Divorced and widowed | 92 | 14.6 |
| Educational status of the household head | | |
| Illiterate | 248 | 39.4 |
| Literate (able to read and write or formal education) | 382 | 60.6 |
| The main occupation of the household head | | |
| Farmer | 422 | 67 |
| Governmental office | 37 | 5.9 |
| Merchant | 122 | 19.3 |
| Daily laborer and other | 49 | 7.8 |
| Educational status of the wife[+] | | |
| Illiterate | 335 | 62.3 |
| Literate | 203 | 37.7 |
| The main occupation of wife[+] | | |
| Farmer | 268 | 49.8 |
| Housewife | 135 | 25.1 |
| Governmental office employee | 3 | 0.6 |
| Merchant | 132 | 24.5 |
| Presence of under-5 children | | |
| Yes | 235 | 37.3 |
| No | 395 | 62.7 |
| Family size | | |
| ⩽5 Persons | 287 | 45.6 |
| >5 Persons | 343 | 54.4 |
| Wealth quintiles | | |
| Lower | 210 | 33.3 |
| Middle | 210 | 33.3 |
| Upper | 210 | 33.3 |

[+]Analysis only conducted for 2-parent households.

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**Table 2.** Availability, conditions, and utilization of improved sanitation facilities among households in Gedeb, Southern Ethiopia.

| VARIABLES | FREQUENCY | PERCENT |
|---|---|---|
| Type of latrine owned | | |
| Pit latrine with cement/plastic slab | 146 | 23.2 |
| Pit latrine with wood and mud slab | 273 | 43.3 |
| Pit latrine without a slab | 211 | 33.5 |
| Presence of squatting hole cover | | |
| Yes | 172 | 41.1 |
| No | 247 | 58.9 |
| Availability of improved sanitation facilities | | |
| Yes | 172 | 27.3 |
| No | 458 | 72.7 |
| Type of slab | | |
| Cement/plastic | 103 | 59.9 |
| Wood with mud | 69 | 40.1 |
| Service level classification of the facilities | | |
| Safely managed services+ | 170 | 27 |
| Limited service++ | 2 | 0.3 |
| Unimproved services+++ | 458 | 72.7 |
| Distance of latrine from dwelling* | | |
| <10 m | 68 | 39.5 |
| 10-15 m | 93 | 54.1 |
| >15 m | 11 | 6.4 |
| Year since the latrine was constructed* | | |
| <2 y | 38 | 22.1 |
| 2-3 y | 102 | 59.3 |
| >3 y | 32 | 18.6 |
| Safe disposal of child feces∞ | | |
| Yes | 77 | 88.5 |
| No | 10 | 11.5 |
| Proper utilization of improved sanitation facility* | | |
| Yes | 111 | 64.5 |
| No | 61 | 35.5 |

*Analysis conducted for 172 households.
+Use of improved facilities that are not shared with other households and where excreta are safely disposed of in situ or removed and treated offsite.
++Use of improved facilities shared between 2 or more households.
+++Use of pit latrines without a slab or platform, hanging latrines or bucket latrines.
∞Analysis conducted only for households with children under the age of 5.

**Table 3.** Knowledge, attitude, and prior training related characteristics of respondents in Gedeb, Southern Ethiopia.

| VARIABLES | FREQUENCY | PERCENT |
|---|---|---|
| Who initiated you to construct your latrine | | |
| Self | 486 | 77.1 |
| Other* | 144 | 22.9 |
| Ever heard an educational message | | |
| Yes | 466 | 74 |
| No | 164 | 26 |
| Source of information+ | | |
| Health extension worker | 231 | 49.6 |
| Health professionals | 48 | 10.3 |
| Government official | 8 | 1.7 |
| Other** | 25 | 5.4 |
| Mixed | 154 | 33 |
| Type of improved sanitation facilities respondents knew | | |
| Pit latrine with slab | 267 | 57.4 |
| Ventilated improved pit latrine | 56 | 12 |
| Multiple | 139 | 29.8 |
| Other*** | 4 | 0.8 |
| Knowledge of respondents | | |
| Poor | 239 | 37.9 |
| Medium | 221 | 35.1 |
| Good | 170 | 27 |
| Attitude of respondents | | |
| Positive | 302 | 47.9 |
| Negative | 328 | 52.1 |

+Computed for households who ever heard educational messages about latrines.
Other* = Health extension workers, health professionals, Government officials.
Other** = Women's development army, Family members.
Other*** = Flush or pour-flush toilet and Compositing latrine.

sources. Four hundred and twenty-eight households (80.8%) spent thirty minutes or less to get their drinking water (Table 4).

### *Factors associated with the availability of improved sanitation facilities*

The household head's educational status had a significant relationship with the availability of improved sanitation facilities, with literate-headed households being more likely than illiterate-headed households to have improved sanitation [AOR = 2.73, 95% CI (1.59, 4.67)]. Households in the upper wealth quintile were more likely to have improved sanitation

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**Table 4.** Environmental condition among households in Gedeb, Southern Ethiopia.

| VARIABLES | FREQUENCY | PERCENT |
|---|---|---|
| Facing natural disaster | | |
| Yes | 10 | 1.6 |
| No | 620 | 98.4 |
| Presence of handwashing facility | | |
| Yes | 187 | 29.7 |
| No | 443 | 70.3 |
| The functionality of water supply in handwashing facility[+] | | |
| Yes | 95 | 50.8 |
| No | 92 | 49.2 |
| Presence of detergent near hand washing basin[++] | | |
| Soap | 17 | 17.9 |
| Ash/mud | 22 | 23.2 |
| None | 56 | 58.9 |
| Type of main drinking water source | | |
| Improved | 530 | 84.1 |
| Unimproved | 100 | 15.9 |
| Time spent collecting water[+++] | | |
| ⩽30 | 428 | 80.8 |
| >30 | 102 | 9.2 |
| Insufficient water during the last 30 days[+++] | | |
| No | 446 | 84.2 |
| Yes | 84 | 15.8 |

[+]Analysis conducted only for households with handwashing facility present.
[++]Analysis conducted for households with functional water supply in handwashing facility.
[+++]Analysis conducted for households with improved water sources.

facilities than those in the lower wealth quintile [AOR = 2.18, 95% CI (1.21, 3.93)].

Respondents who had ever received an educational message on improved sanitation had a higher odds of adopting improved latrines than those who hadn't [AOR = 3.9, 95% CI (1.86, 8.18)]. Similarly, respondents with a positive attitude were more likely to have improved sanitation facilities than those with a negative attitude [AOR = 2.81, 95% CI (1.67, 4.74)]. Households who received any funding during construction were more likely than those who did not have improved sanitation facilities [AOR = 3.78, 95% CI (2.15, 6.65)] (Table 5).

### *Factors associated with utilization of improved sanitation facilities*

Households without under-5 children were more likely than those with under-5 children to utilize their facility appropriately [AOR = 6.78, 95% CI (2.27, 20.22)]. When compared to those who had inadequate knowledge about improved sanitation facilities, those who had good knowledge had a higher odd of properly using their facility [AOR = 11.48, 95% CI (3.62, 36.43)]. Similarly, respondents with positive attitudes had a higher odd of using their facility appropriately than those who did not [AOR = 6.71, 95% CI (2.28, 19.75)] (Table 6).

## Discussion

Improved sanitation facilities were available in 27.1% of the homes surveyed in this study. This coverage was significantly higher than the findings of the 2015 Joint Monitoring Program (JMP) report, which found 5% coverage in rural Ethiopian areas, and the Ethiopian Demographic Health Survey (EDHS) 2016 report, which found coverage of 4%.[8,18] This study was done in Community-led total sanitation and hygiene (CLTSH) implemented Kebeles, and the study population consisted of households with latrines, which could explain the variance.

The results, on the other hand, were lower than the 35.9% reported in Lemo district, Ethiopia.[14] This indicates that there are significant regional and district-level disparities in sanitation coverage across the country, which may be due to the country's different socioeconomic, cultural, and environmental characteristics. Furthermore, just 111 (64.5%) of the 172 homes with improved sanitation facilities used them effectively. The presence of a sanitation facility does not guarantee its proper use, according to past studies.[19-21] The disparity between availability and utilization suggests that some members of the community are uninformed of sanitation-related diseases. Management and eventual elimination of a disease may be challenging if a given population does not regard it as a significant public health issue.[22] As a result, there is an obvious need to supplement community knowledge on sanitation-related illnesses to appropriately improve hygiene and sanitation-related awareness to a level that influences practices, with a focus on behavioral change.

In terms of latrine ownership, past research has revealed that the likelihood of owning a latrine increases as both genders' educational levels increase.[14,23,24] This was also true in the current study, with literate households having higher odds of owning an improved sanitation facility [AOR = 2.73, 95% CI (1.59, 4.67)]. Previous research has shown that populations that have had some exposure to latrines and have a good understanding of their benefits are more likely to use them. People who have been exposed to latrines in metropolitan settings during their formal schooling are one of them.[25] However, illiteracy and a lack of formal education are not insurmountable barriers to latrine usage, especially if people are encouraged to use them and educated to recognize their universal vulnerability to sanitation-related diseases.[26]

Higher-income households are more likely to construct improved sanitation facilities,[27] and the Gedeb district was no exception. Households in the upper socioeconomic class were more likely to have improved sanitation facilities than those in

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**Table 5.** Bivariate and multivariable regression of factors associated with the availability of improved sanitation in Gedeb, Southern Ethiopia.

| VARIABLES | AVAILABILITY OF IMPROVED SANITATION FACILITIES | | CHI-SQUARE $\chi^2$ *P*-VALUE | COR (95% CI) | AOR (95% CI) |
|---|---|---|---|---|---|
| | YES | NO | | | |
| Age of household head | | | | | |
| 20-35 | 110 (29.9) | 258 (71.1) | Pearson ch$^2$ = 9.885 | 2.62 (1.14, 6.0) | 1.41 (0.50, 3.92) |
| 36-49 | 55 (25.9) | 157 (74.1) | *P*-value = .007 | 2.15 (0.91, 5.06) | 1.71 (0.6, 4.87) |
| >50 | 7 (14.0) | 43 (86.0) | Cramer's V = 0.125 | 1 | 1 |
| Educational status of head | | | | | |
| Illiterate | 29 (11.7) | 219 (88.3) | Pearson ch$^2$ = 50.201 | 1 | 1 |
| Literate | 143 (37.4) | 239 (63.6) | *P*-value = .000 | 4.52 (2.91, 7.01) | 2.73 (1.59, 4.67)*** |
| | | | Cramer's V = 0.282 | | |
| Occupation of head | | | | | |
| Farmer | 91 (21.6) | 331 (78.4) | Pearson ch$^2$ = 28.104 | 1 | 1 |
| Governmental office | 17 (45.9) | 20 (54.1) | *P*-value = .000 | 3.09 (1.56, 6.15) | 0.67 (0.29, 1.55) |
| Merchant | 52 (42.6) | 70 (57.4) | Cramer's V = 0.211 | 2.70 (1.76, 4.14) | 1.64 (0.93, 2.89) |
| Daily laborer and other | 12 (24.5) | 37 (75.5) | | 1.18 (0.59, 2.36) | 1.09 (0.49, 2.46) |
| Wealth quintiles | | | | | |
| Lower | 31 (14.8) | 179 (85.2) | Pearson ch$^2$ = 66.714 | 1 | 1 |
| Middle | 41 (19.5) | 169 (80.5) | *P*-value = .000 | 1.4 (0.84, 2.33) | 0.97 (0.54, 1.73) |
| Upper | 100 (47.6) | 110 (52.4) | Cramer's V = 0.325 | 5.25 (3.29, 8.38) | 2.18 (1.21, 3.93)** |
| Ever heard an educational message | | | | | |
| Yes | 162 (34.8) | 304 (65.2) | Pearson ch$^2$ = 50.225 | 8.21 (4.21, 15.99) | 3.90 (1.86, 8.18)*** |
| No | 10 (6.1) | 154 (93.9) | *P*-value = .000 | 1 | 1 |
| | | | Cramer's V = 0.282 | | |
| Knowledge of respondents | | | | | |
| Poor | 38 (15.9) | 201 (84.1) | Pearson ch$^2$ = 47.777 | 1 | 1 |
| Medium | 55 (24.9) | 166 (75.1) | *P*-value = .000 | 1.75 (1.1, 2.78) | 1.10 (0.59, 2.04) |
| Good | 79 (46.5) | 91 (53.5) | Cramer's V = 0.275 | 4.59 (2.9, 7.27) | 0.91 (0.50, 1.65) |
| Attitude of respondents | | | | | |
| Favorable | 131 (43.4) | 171 (56.6) | Pearson ch$^2$ = 80.145 | 5.36 (3.60, 7.99) | 2.81 (1.67, 4.74)*** |
| Unfavorable | 41 (12.5) | 287 (87.5) | *P*-value = .000 | 1 | 1 |
| | | | Cramer's V = 0.357 | | |
| Support during construction | | | | | |
| Yes | 55 (58.5) | 39 (41.5) | Pearson ch$^2$ = 54.219 | 5.05 (3.19, 7.99) | 3.78 (2.15, 6.65)*** |
| No | 117 (21.8) | 419 (78.2) | *P*-value = .000 | 1 | 1 |
| | | | Cramer's V = 0.293 | | |

*Significant at *P* value <.05 to .01. **Significant at *P* value <.01 to .001. ***Significant at *P* value <.001.

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**Table 6.** Bivariate and multivariate regression of factors associated with utilization of improved sanitation among households in Gedeb, Southern Ethiopia.

| VARIABLES | PROPER UTILIZATION OF IMPROVED SANITATION FACILITY | | CHI-SQUARE $\chi^2$ *P*-VALUE | COR (95% CI) | AOR (95% CI) |
|---|---|---|---|---|---|
| | YES | NO | | | |
| Educational status of head | | | | | |
| Illiterate | 14 (48.3) | 15 (51.7) | Pearson ch$^2$ = 4.029 | 1 | 1 |
| Literate | 97 (67.8) | 46 (32.2) | *P*-value = .045 | 2.25 (1.01, 5.07) | 3.19 (0.84, 12.06) |
| | | | Cramer's V = 0.153 | | |
| The main occupation of the head | | | | | |
| Farmer | 64 (70.3) | 27 (29.7) | Pearson ch$^2$ = 4.717 | 1 | 1 |
| Governmental office | 10 (58.8) | 7 (41.2) | *P*-value = .191 | 0.60 (0.20, 1.74) | 0.37 (0.09, 1.54) |
| Merchant | 28 (53.8) | 24 (46.2) | Cramer's V = 0.166 | 0.49 (0.24, 0.99) | 0.29 (0.11, 1.82) |
| Daily laborer and other | 9 (75.0) | 3 (25.0) | | 1.27 (0.31, 5.04) | 0.52 (0.1, 2.68) |
| Presence of under-5 children | | | | | |
| Yes | 48 (55.2) | 39 (44.8) | Pearson ch$^2$ = 6.742 | 1 | 1 |
| No | 63 (74.1) | 22 (25.9) | *P*-value = .009 | 2.33 (1.22, 4.42) | 6.78 (2.27, 20.22)** |
| | | | Cramer's V = 0.198 | | |
| Type of slab | | | | | |
| Cement/plastic slab | 74 (71.8) | 29 (28.2) | Pearson ch$^2$ = 5.994 | 2.21 (1.16, 4.18) | 0.81 (0.34, 1.95) |
| Wood/mud slab | 37 (53.6) | 32 (46.4) | *P*-value = .014 | 1 | 1 |
| | | | Cramer's V = 0.187 | | |
| Knowledge of respondents | | | | | |
| Poor | 13 (34.2) | 25 (65.8) | Pearson ch$^2$ = 39.732 | 1 | 1 |
| Medium | 28 (50.9) | 27 (49.1) | *P*-value = .000 | 1.99 (0.85, 4.68) | 1.09 (0.38, 3.15) |
| Good | 70 (88.6) | 9 (13.4) | Cramer's V = 0.481 | 14.96 (5.7, 39.25) | 11.48 (3.62, 36.43)*** |
| Attitude of respondents | | | | | |
| Favorable | 97 (7.04) | 34 (26.0) | Pearson ch$^2$ = 21.720 | 5.50 (2.59, 11.70) | 6.71 (2.28, 19.75)** |
| Unfavorable | 14 (34.1) | 27 (65.9) | *P*-value = .000 | 1 | 1 |
| | | | Cramer's V = 0.355 | | |
| Availability of hand washing facility | | | | | |
| Yes | 70 (73.7) | 25 (26.3) | Pearson ch$^2$ = 9.702 | 2.46 (1.29, 4.66) | 1.29 (0.53, 3.1) |
| No | 41 (53.2) | 36 (46.8) | *P*-value = .008 | 1 | 1 |
| | | | Cramer's V = 0.238 | | |

**Significant at *P* value .05 to .01. ***Significant at *P* value <.01 to .001.

the lower socioeconomic class [AOR = 2.18, 95% CI (1.21, 3.93)]. The expense of constructing a latrine is a significant barrier to latrine adoption. For some, the added spending that comes with building a sanitation facility is not something they want. In many situations, the inability to pay for labor and materials deter families from building new latrines or rebuilding old ones.[28] Despite Ethiopia's sanitation policy, which states that residential latrines receive no subsidy; evidence suggests that public subsidies have worked in other countries.[29] This suggests that in Ethiopia, some latrine subsidy flexibility may be required.

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Researchers have argued, however, that building or subsidizing toilet construction is ineffective and unsustainable without behavior change; that many people around the world prefer open defecation to the use of latrines; and that more efforts are needed to build demand through education, awareness, and peer pressure.[30,31] Until recently, however, the social and structural factors that influence latrine use and disuse were overlooked.[32]

The Low uptake and use of new sanitation technologies in several settings have underscored our current limited understanding of the complex attitudinal factors that influence a household's decision to adopt and use new sanitation technologies.[31] In the present study, respondents who had a favorable attitude were more likely to adopt improved sanitation facilities in Gedeb than those who did not [AOR = 2.81, 95% CI (1.67, 4.74)]. Similarly, households with a positive attitude were more likely to utilize their home latrines [AOR = 6.71, 95% CI (2.28, 19.75)]. Identifying and measuring these latent attitudinal components that influence behavior can aid programing efforts in the future by giving quantifiable intermediate results that can be included in program monitoring and evaluation.

When it came to the characteristics that influence how well-improved sanitation facilities are used, households without children under the age of 5 were more likely than those with children to do so properly [AOR = 6.78, 95% CI (2.27, 20.22)]. Past research has also shown that for some parents, beliefs of a minor health risk from a child's feces, as well as fears of children contracting the flu from the malodorous latrines or sliding and falling into the pit of the latrines, extenuates their young children's open defecation.[33-35]

Preventive behavior is responsive to disease knowledge and risk perception, according to past studies.[36] Behavioral practice is frequently studied in conjunction with knowledge and risk perception through "knowledge, attitude, and practice" (KAP) surveys in the public health discipline, and this study was no exception; the appropriate use of improved sanitation facilities was also linked to respondents' knowledge and attitudes. Respondents with good knowledge were more likely to utilize their facility appropriately than those with poor knowledge [AOR = 11.48, 95% CI (3.62, 36.43)]. Previous research has found that an individual's level of awareness of the necessity for sanitation facilities has a significant impact on defecation patterns.[37,38]

Our research has a few limitations. First and foremost, it should be noted that the research was carried out in a racially homogeneous area with a comparable ethnic mix. The study's conclusions can be generalized for a predominantly rural setting, except for elements relating to environmental conditions, which may apply to equivalent contextual settings. During this inquiry, the use of improved sanitation facilities was also investigated using self-reported data and observation (proxy indicators). As a result, there's a chance of social desirability bias, as well as observation bias, leading to under- and over-reporting of use. Furthermore, the study only looked at household level utilization, thus it didn't take into account changes in household members or seasonal variations. That said, this is the first study of its kind to look at not just the level of latrine adoption, but also the progression of households up the sanitation ladder from simple latrines to more complex latrines.

## Conclusion

The availability and use of improved sanitation facilities in rural Gedeb Kebeles were not encouraging, with both coverage and use falling significantly short of the country's National Hygiene and Environmental Health Strategy targets (2016-2020). District health experts should focus on sensitization and awareness creation about the importance of improved sanitation facilities in their communities to close the apparent knowledge and attitude gaps.

Community mobilization actions engaging community leaders, women's groups, and others in advocating for improved sanitation at community engagements, in addition to such a strategy of giving continuous education, could strengthen future projects. Training sessions should also be designed to encourage a diverse variety of user types and levels of preparedness to build and/or use improved sanitation facilities, as well as to provide social support for such behaviors. Sanitation coverage and use can also be improved by giving financial opportunities for the poor and training on engineering skills of latrine construction at the community level, depending on the situation.

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## Author Contributions

AA was the study's principal investigator, overseeing everything from the study's inception, through to the final analysis and paper production. HB and AE was involved in the study's design. AT was involved in the study's design and manuscript production. The final manuscript was approved by all authors.

## Data Availability

All the data supporting the findings are included in this paper

## Ethics Approval and Consent to Participate

Hawassa University's College of Medicine and Health Sciences' institutional review board granted ethical approval and clearance. Permission letters were provided by the Southern Nations Nationalities and Peoples' Regional Health Bureau, as well as the Gedeb District Health Office. Each respondent was given a clear explanation of the study's goal before each interview. All interviews were conducted after the interviewee gave written consent.

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## Supplemental Material

Supplemental material for this article is available online.

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