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HOUSEHOLD DETERMINANTS AND BARRIERS TO ACHIEVING ZERO OPEN DEFECATION (ZOD) IN SELECTED MUNICIPALITIES IN ILOCOS SUR, PHILIPPINES

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Abstract. Achieving Zero Open Defecation (ZOD) status remains a critical public health concern, particularly in communities facing sanitation and resource-related challenges. This study examined the determinants and barriers influencing ZOD attainment among households in selected non-ZOD municipalities in Ilocos Sur, Philippines. Specifically, it assessed respondents' sociodemographic characteristics, sanitation-related knowledge, perceived barriers, and the relationships between selected profile variables and sanitation determinants and barriers. Using a quantitative descriptive-correlational design, the study gathered data from 399 household heads or authorized household representatives in Vigan City, Caoayan, Magsingal, Santo Domingo, San Vicente, and Santa Maria through a validated structured questionnaire translated into Ilocano. The analysis employed frequency counts, percentages, mean percentages, weighted means, and Pearson product-moment correlation. Findings showed that respondents had high levels of knowledge about the benefits of sanitary toilets and health beliefs, although awareness of social norms and community sanitation conditions was comparatively lower. Economic barriers emerged as the most prominent obstacle to achieving ZOD status, exceeding environmental/structural and behavioral/cultural barriers. Rising construction-material costs and insufficient household savings for toilet construction were identified as the primary concerns. Correlation analysis indicated significant but weak relationships between selected sociodemographic characteristics and sanitation determinants and barriers, particularly between water source and economic barriers ($r = .272$, $p < .001$), water source and social norms ($r = .225$, $p < .001$), and age and economic barriers ($r = .183$, $p < .001$). However, the overall barriers score was not significantly associated with respondents' profile characteristics. The study concludes that while sanitation awareness is generally high, economic constraints remain the primary challenge to achieving sustainable ZOD status, necessitating integrated financial, technical, educational, and monitoring interventions.

Keywords: *household barriers, Ilocos Sur, sanitation, zero open defecation*

Introduction

Open defecation remains a significant public health and environmental sanitation challenge worldwide, particularly in low- and middle-income countries where access to improved sanitation facilities remains inadequate. The practice exposes human feces to the environment, creating pathways for bacteria and other disease-causing microorganisms to contaminate domestic water supplies through surface runoff, agricultural flooding, and other environmental processes (Alemu et al., 2024; Sun & Han, 2020). Defecation in fields, bodies of water, bushes, forests, and other open spaces contributes to environmental degradation. It increases the transmission of fecal-oral

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Volume 2 | Issue 2 | November | 2026

and waterborne diseases, including diarrhea, cholera, dysentery, typhoid fever, and intestinal parasitic infections. A systematic review of cholera outbreaks in India identified open defecation as a major contributor to the contamination of drinking water sources and the transmission of *Vibrio cholerae*, particularly during seasonal flooding events (Muzembo & Kitahara, 2022). Similar evidence has shown that unmanaged fecal waste contributes to the persistence of dysentery and typhoid transmission, especially in rural communities with inadequate sanitation infrastructure and unsafe water sources (Ansari & Hoque, 2020; Mohammed et al., 2026). Beyond its adverse health effects, inadequate sanitation compromises human dignity, privacy, safety, and overall quality of life. Recognizing sanitation as a fundamental component of public health and sustainable development, governments and international organizations continue to prioritize initiatives to eliminate open defecation and ensure universal access to safe, equitable, and sustainable sanitation facilities (World Health Organization & UNICEF, 2025).

Recognizing sanitation's fundamental role in promoting health, human dignity, and sustainable development, the United Nations incorporated sanitation and hygiene targets into Sustainable Development Goal (SDG) 6, particularly Target 6.2, which aims to achieve access to adequate and equitable sanitation and hygiene for all and end open defecation. Despite substantial progress in sanitation coverage worldwide, significant disparities persist across rural, low-income, and marginalized communities. According to the World Health Organization and UNICEF (2025), millions of people continue to lack access to safely managed sanitation services, reflecting persistent inequalities in sanitation infrastructure and service delivery. Adugna (2023) and Pérard (2018) reported similar observations, emphasizing that economic constraints and limited household resources continue to hinder sanitation adoption in vulnerable communities. These challenges underscore the need to ensure that sanitation facilities are not only available but also affordable, functional, and socially acceptable to achieve and sustain Zero Open Defecation (ZOD) status.

Existing studies show that achieving ZOD status depends on a combination of socioeconomic, environmental, and behavioral factors. Economic constraints remain among the most frequently reported barriers to sanitation improvement, as households with limited financial resources often struggle to construct and maintain sanitary toilet facilities (Adugna, 2023; Pérard, 2018; Wallock et al., 2024). Poverty, competing household expenditures, and rising construction costs significantly affect sanitation investments and household decision-making regarding toilet ownership (Celeste, 2023; Njuguna, 2024; Thiora et al., 2025). Similarly, environmental conditions such as limited land availability, inadequate water supply, unfavorable soil conditions, and geographical constraints may hinder the development and sustainability of sanitation infrastructure (Foellmer et al., 2026; Mekonnen et al., 2024; Ulfa & Chandra, 2025). These findings suggest that sanitation challenges extend beyond knowledge and awareness and often involve structural and resource-related limitations.

Beyond economic and environmental factors, social and behavioral influences also shape sanitation outcomes. Social norms, community expectations, and collective perceptions can shape individual sanitation behaviors and influence the acceptance of improved sanitation practices. Research shows that community beliefs and established cultural practices may facilitate or impede the adoption of sanitary toilets, depending on prevailing social expectations and local contexts (Ahmad, 2022; Babbar et al., 2023). Similarly, in Nigeria, a study pointed out that a need for

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Volume 2 | Issue 2 | November | 2026

behavioral change intervention is a must to address the negative effects of open defecation (Abubakar, 2018). Consequently, understanding community-level influences is essential in developing effective sanitation interventions that encourage sustained behavioral change and promote collective responsibility for sanitation improvement.

In the Philippines, the Department of Health guides efforts to eliminate open defecation through the Philippine Approach to Sustainable Sanitation (PhATSS), which provides a framework for sanitation assessment, monitoring, and certification. Implementing ZOD programs across local government units has improved sanitation coverage and community health outcomes. Previous local studies reported that community participation, local government support, sanitation awareness, and household socioeconomic conditions significantly influence the successful implementation of ZOD initiatives (Kagayan, 2025; Latip et al., 2025; Migriño et al., 2026). However, despite these efforts, several municipalities and barangays in the country continue to face challenges in attaining and sustaining ZOD status, indicating the need for context-specific investigations into the factors affecting sanitation outcomes.

In Ilocos Sur, variations in sanitation conditions remain evident across municipalities and communities. Differences in household income, educational attainment, access to water resources, availability of construction materials, environmental conditions, and local support mechanisms may influence households' ability to construct, utilize, and maintain sanitary toilets. While studies have examined sanitation implementation and ZOD programs in other parts of the Philippines, limited empirical evidence exists regarding the specific determinants and barriers affecting the attainment of ZOD status among non-ZOD municipalities in Ilocos Sur. Moreover, few studies have simultaneously examined sanitation-related knowledge, perceived barriers, and sociodemographic characteristics to determine how these factors interact in influencing sanitation outcomes. This gap limits the availability of localized evidence needed to design targeted and effective sanitation interventions.

To address this gap, the present study investigated the determinants and barriers in achieving Zero Open Defecation status among selected non-ZOD municipalities in Ilocos Sur. Specifically, the study assessed respondents' sociodemographic characteristics, knowledge levels regarding sanitation determinants, perceived economic, environmental/structural, and behavioral/cultural barriers, and the relationships among these factors. By identifying the key determinants and barriers influencing sanitation practices, the study aims to provide evidence-based recommendations to help local government units, public health practitioners, and community stakeholders strengthen sanitation programs and accelerate progress toward sustainable ZOD achievement.

Methodology

Design

This study used a quantitative descriptive-correlational research design to examine the determinants and barriers to achieving Zero Open Defecation (ZOD) status among households in selected non-ZOD municipalities in Ilocos Sur. The descriptive component systematically characterized respondents' sociodemographic profiles, sanitation-related knowledge, and perceived barriers to ZOD attainment. Meanwhile, the correlational component examined the

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Volume 2 | Issue 2 | November | 2026

relationships between selected sociodemographic characteristics and identified sanitation determinants and barriers.

This design was deemed appropriate because the study sought to investigate naturally occurring conditions without manipulating any variables. Furthermore, the design generated empirical evidence on sanitation-related factors that may influence households' ability to achieve and sustain ZOD status. Such evidence is important for informing sanitation planning, policy formulation, and intervention development at the local government level.

Locale

The study was conducted in selected non-ZOD municipalities and barangays in the Province of Ilocos Sur, Philippines, namely Vigan City, Caoayan, Magsingal, Santo Domingo, Santa Maria, and San Vicente. These localities were purposively selected based on their sanitation status and the need to investigate further factors affecting the attainment of ZOD certification.

The selected municipalities represent varying geographic, socioeconomic, and environmental conditions, thereby providing a comprehensive context for examining sanitation-related practices and challenges. Conducting the study across multiple localities enhanced the representativeness of the findings and allowed the identification of common barriers experienced by households in different community settings.

Respondents

The study respondents were household heads or authorized household representatives residing in identified non-ZOD barangays within the selected municipalities. The study included both households with existing toilet facilities and those without sanitary toilets to ensure a more comprehensive assessment of sanitation determinants and barriers.

A total of 399 respondents participated in the study. The sample size was determined using Slovin's formula to ensure adequate representation of the target population while maintaining a manageable level of sampling error. Proportional allocation was employed to distribute respondents across the study areas according to their respective household populations. Consequently, respondents were drawn from Vigan City (121), Caoayan (44), Magsingal (71), Santo Domingo (65), San Vicente (30), and Santa Maria (68).

Proportional allocation strengthened the sample's representativeness by ensuring that larger populations contributed a correspondingly greater number of respondents, reducing sampling bias and improving the generalizability of the findings within the study area.

Instrument

Data were gathered using a structured questionnaire developed from the study objectives, relevant sanitation literature, and variables identified in previous studies. The instrument consisted of three major sections.

The first section elicited information on respondents' sociodemographic characteristics, including age, sex, educational attainment, household income, household size, and primary water source. The second section assessed determinants related to sanitation practices, specifically health beliefs, social norms, and perceived benefits of using sanitary toilets. The third section measured

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Volume 2 | Issue 2 | November | 2026

perceived barriers to achieving ZOD status, categorized into economic, environmental/structural, and behavioral/cultural barriers.

The questionnaire was translated into Ilocano to ensure comprehension among respondents and minimize potential language-related response errors. Using a locally translated instrument strengthened data quality by improving respondents' understanding of survey items and encouraging accurate responses.

Data Gathering Procedure

Prior to data collection, the researchers secured the necessary approvals from relevant authorities and coordinated with municipal and barangay officials, Rural Health Units, barangay health workers, and Purok Kalusugan representatives. These stakeholders helped identify eligible respondents and facilitate access to the community.

The purpose, significance, and procedures of the study were clearly explained to prospective participants. Informed consent was obtained before participation, and respondents were assured that their responses would be kept strictly confidential and used solely for research purposes.

Data collection was conducted through household visits using a face-to-face survey approach. Structured interviews were conducted when respondents needed assistance understanding the questionnaire. Upon completion, all questionnaires were reviewed for completeness, coded appropriately, and prepared for statistical analysis.

Face-to-face administration helped maximize response rates, minimize missing data, and ensure respondents accurately understood the survey items, improving the overall quality of the collected data.

Data Analysis

The collected data were analyzed using both descriptive and inferential statistical techniques.

Frequency counts and percentages described respondents' sociodemographic characteristics. Mean percentages were computed to determine the level of knowledge regarding sanitation determinants, while weighted means were used to assess the extent of perceived barriers to achieving ZOD status.

Pearson Product-Moment Correlation was employed to determine the magnitude and direction of relationships between selected sociodemographic characteristics and sanitation determinants and barriers. Statistical significance was tested at the 0.05 level**.**

The combined use of descriptive and inferential statistics enabled a comprehensive examination of sanitation-related conditions within the study area. Descriptive statistics provided an overview of existing conditions, while inferential statistics helped identify possible relationships among variables, producing evidence to inform local sanitation planning and intervention strategies.

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Advancing Research. Inspiring Innovation. Creating Impact.
Volume 2 | Issue 2 | November | 2026

Ethical Considerations

This study adhered strictly to established ethical principles governing research involving human participants. Prior to data collection, approval was obtained from the appropriate authorities, and participation was entirely voluntary.

All respondents received sufficient information about the study's purpose, data collection procedures, potential benefits, confidentiality safeguards, and their rights as research participants. Informed consent was obtained before participation, and respondents were told they could withdraw from the study at any stage without penalty.

To protect privacy and confidentiality, no personally identifying information was disclosed in any report or publication generated from the study. Data were reported only in aggregate form, ensuring that individual responses could not be traced to specific participants. Furthermore, the researcher handled sanitation-related issues sensitively to avoid stigmatization and maintain respect for all respondents' dignity.

These ethical safeguards promoted trust between the researcher and participants, enhanced the validity of responses, and ensured compliance with accepted standards for social and public health research.

Results and Discussions

Respondents' Sociodemographic Profile

Understanding respondents' sociodemographic characteristics is essential in sanitation research because household attributes may influence sanitation knowledge, access to resources, decision-making, and the capacity to construct and maintain adequate sanitation facilities.

Table 1.
Selected Sociodemographic Characteristics of Respondents (n = 399)

Characteristic	Most represented category	n	%
Age	30–39 years	163	41
Sex	Female	298	75
Educational attainment	High school	228	57
Monthly household income	PHP 10,001–30,000	196	49
Household size	4–6 members	162	40
Primary water source	Manual Jetmatic pump	172	43

Table 1 presents the selected sociodemographic characteristics of the respondents from the identified non-ZOD municipalities in Ilocos Sur. The findings reveal that the largest proportion of respondents belonged to the 30-39 age group (41%), indicating that the respondents were predominantly within the economically productive stage of adulthood. Female respondents comprised 75% of the sample, suggesting that women were more available or more actively involved in household sanitation concerns during data collection. More than half of the

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Volume 2 | Issue 2 | November | 2026

respondents were high school graduates (57%), while nearly half reported a monthly household income ranging from PHP 10,001 to PHP 30,000. Furthermore, households with four to six members were the largest group, and the manual Jetmatic pump was the most common primary water source.

These findings suggest that the respondents generally represent low- to middle-income households with moderate educational attainment and varying access to water resources. These characteristics matter because previous studies show that socioeconomic conditions influence sanitation behaviors, access to sanitation facilities, and participation in sanitation improvement programs. For instance, Dizli et al. (2026) emphasized that age, gender, and education shape water, sanitation, and hygiene (WASH) behaviors among people living in Pakistan, underscoring the need for context-sensitive interventions to address the problem. Regarding gender and socioeconomic status, a study reported that women's sanitation choices are linked to wealth and residential context, indicating that urban women use better facilities than rural women in Ghana (Tawiah et al., 2025).

From a programmatic perspective, the respondents' profiles suggest that sanitation interventions should be responsive to household economic capacity, educational backgrounds, and available water resources. Understanding these contextual characteristics may help local government units design targeted, sustainable sanitation programs that address the specific needs of vulnerable households.

Knowledge of Sanitation Determinants

Knowledge plays a critical role in influencing sanitation-related attitudes and behaviors. Individuals who understand the health benefits of sanitation and the consequences of open defecation are more likely to adopt practices that promote public health and environmental cleanliness.

Table 2

Mean Percentage of Knowledge Across Sanitation Determinants

Dimension	Mean percentage	Interpretation in thesis
Health beliefs	84.79%	High knowledge
Social norms	69.80%	Knowledgeable
Benefits of sanitary toilets	95.52%	High knowledge

Table 2 presents respondents' knowledge levels across selected sanitation determinants. The findings indicate that respondents generally demonstrated a high level of knowledge regarding sanitation-related matters. Knowledge was highest on the benefits of sanitary toilets (95.52%), followed by health beliefs (84.79%). Conversely, social norms obtained the lowest mean percentage (69.80%), although respondents were still considered knowledgeable in this dimension.

The high level of awareness regarding the benefits of sanitary toilets suggests that respondents recognize the importance of proper sanitation in maintaining health, dignity, privacy, and environmental cleanliness. Similarly, the high score for health beliefs indicates that respondents understand the health risks associated with poor sanitation practices. These findings are encouraging because knowledge has been consistently recognized as a foundational factor influencing positive sanitation behavior and community participation in sanitation programs.

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Volume 2 | Issue 2 | November | 2026

However, the relatively lower score in social norms reveals a gap between general sanitation awareness and knowledge of actual sanitation conditions within the community. While respondents understood the benefits of sanitary toilet use, only a small proportion reported knowing whether open defecation was still practiced in their locality. This finding suggests that residents may possess individual knowledge about sanitation but have limited awareness of community sanitation realities and collective behavioral patterns.

The result is consistent with studies highlighting the importance of social norms in shaping sanitation behaviors. Novotný et al. (2017) noted that perceived social norms positively influence sanitation safety, acting as a "social filter" because outcomes depend on the capacity of social influences and community-level sanitation practices. The study also emphasized that social norms are a key factor affecting sanitation preferences. Therefore, sanitation promotion should not only focus on increasing individual knowledge but also on strengthening community awareness, collective responsibility, and participation in monitoring sanitation conditions.

From a practical standpoint, local sanitation campaigns may benefit from incorporating community sanitation mapping, public monitoring activities, and community-led sanitation discussions to improve residents' awareness of local sanitation challenges and progress toward ZOD attainment.

Barriers to Achieving ZOD Status

Identifying barriers to achieving Zero Open Defecation status is essential for developing evidence-based interventions that address the underlying challenges households face. Understanding these barriers provides valuable insights into the socioeconomic, environmental, and behavioral factors that may hinder sanitation improvements.

Table 3.
Average Weighted Mean of Barriers to Achieving ZOD

Barrier category	Average Weighted Mean	Interpretation
Economic	2.99	Moderate barrier
Environmental/structural	2.07	Low barrier
Behavioral/cultural	1.64	Very low barrier

Table 3 presents respondents' perceived barriers to achieving ZOD status. The results reveal that economic barriers constitute the most significant challenge to achieving Zero Open Defecation status among households in the study areas. Economic barriers obtained the highest average weighted mean (2.99), followed by environmental/structural barriers (2.07), while behavioral/cultural barriers registered the lowest average weighted mean (1.64).

Among the economic barriers, rising construction-material prices emerged as the most serious concern, followed by lack of savings for toilet construction, competing household expenditures, inability to afford construction materials, and the financial burden of toilet construction. These findings indicate that although respondents recognize the importance of sanitary toilets, financial limitations continue to restrict their ability to invest in sanitation infrastructure.

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Volume 2 | Issue 2 | November | 2026

The findings align with previous research emphasizing the importance of economic resources in sanitation adoption. In fact, Tefera et al. (2024) found that economics, knowledge, and attitudes were determinants of improved latrine adoption in Ethiopia. Also, VerKuilen et al. (2023) and Osumanu et al. (2019) identified financial constraints as a significant factor in achieving open defecation-free status. The present findings suggest that affordability remains a fundamental issue even when awareness and willingness to adopt improved sanitation practices are present.

Environmental and structural barriers were generally perceived as less problematic. Nevertheless, limited household space for toilet construction emerged as a notable concern. This suggests that some households may face physical constraints that complicate installing sanitation facilities despite their willingness to comply with sanitation standards. Mekonnen et al. (2024) noted similar findings, reporting that environmental and infrastructural conditions influence the accessibility and sustainability of sanitation facilities.

Behavioral and cultural barriers obtained the lowest ratings, indicating that open defecation is generally not maintained because of preference or cultural attachment. The relatively low means for items related to comfort with open defecation and long-standing sanitation habits suggest that cultural resistance is not a major obstacle in the study area. Instead, respondents appeared more concerned with practical issues related to toilet construction and maintenance. This finding supports the view that structural and economic barriers may be more influential than behavioral resistance in communities that already understand the benefits of improved sanitation.

These findings imply that sanitation programs should prioritize financial assistance, subsidies, affordable toilet technologies, livelihood support initiatives, and technical guidance on locally appropriate toilet designs. Addressing economic barriers may yield greater improvements in ZOD attainment than interventions solely focused on behavioral change.

Relationships Between Sociodemographic Characteristics, Determinants, and Barriers

Understanding the relationships between respondents' sociodemographic characteristics and sanitation determinants and barriers helps identify population groups that may require targeted sanitation interventions. Examining these relationships also improves understanding of the factors influencing sanitation-related knowledge and perceived barriers.

Table 4.
Significant Correlations Reported in Chapter IV

Variables	r	p	Direction
Age and health beliefs	−.123	.014	Negative
Water source and social norms	.225	< .001	Positive
Water source and benefits of sanitary toilets	−.108	.031	Negative
Household size and overall determinants	−.108	.031	Negative

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Volume 2 | Issue 2 | November | 2026

Age and economic barriers	.183	< .001	Positive
Educational attainment and economic barriers	.106	.035	Positive
Water source and economic barriers	.272	< .001	Positive
Age and environmental/structural barriers	−.106	.035	Negative
Water source and environmental/structural barriers	−.157	.002	Negative
Age and behavioral/cultural barriers	−.124	.013	Negative

The results in Table 4 show that several sociodemographic characteristics had statistically significant relationships with sanitation determinants and barriers, although these relationships were generally weak. Nonetheless, these findings provide valuable insights into how household characteristics influence sanitation-related knowledge and perceived barriers.

Age showed a significant but weak negative relationship with health beliefs ($r = -0.123$, $p = .014$), indicating that health-related sanitation beliefs tended to decrease slightly as respondents got older. However, the very small coefficient suggests that age explains only a minimal variation in health beliefs. This finding may imply that sanitation-related knowledge and beliefs are shaped more by educational exposure, health promotion activities, and access to information than by age alone.

Water source demonstrated a weak positive relationship with social norms ($r = 0.225$, $p < .001$), suggesting that households with certain types of water access were more likely to exhibit stronger awareness of sanitation-related social expectations and community practices. Conversely, water source showed a weak negative relationship with perceived benefits of sanitary toilets ($r = -0.108$, $p = .031$). Although statistically significant, the effect size remains small, indicating that water source contributes only marginally to variations in respondents' perceptions of sanitation benefits.

Household size was also negatively associated with the overall determinants score ($r = -0.108$, $p = .031$). This finding indicates that larger households tended to report slightly lower levels of positive sanitation determinants. One possible explanation is that larger households face greater financial and resource demands, which may limit their capacity to prioritize sanitation-related improvements.

Regarding sanitation barriers, age exhibited a weak positive relationship with economic barriers ($r = 0.183$, $p < .001$), suggesting that older respondents perceived greater financial difficulties related to toilet construction and maintenance. Educational attainment likewise showed a weak positive association with economic barriers ($r = 0.106$, $p = .035$), indicating that

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Volume 2 | Issue 2 | November | 2026

respondents with higher educational attainment may have greater awareness of the actual costs and financial requirements of achieving improved sanitation conditions.

The strongest relationship identified in the study was between water source and economic barriers (r = 0.272, p < .001), although the correlation remains weak according to conventional interpretations. This finding suggests that households with certain water sources may experience greater economic constraints related to sanitation access and facility maintenance. Since water availability and sanitation are closely interconnected, challenges in one area often affect conditions in the other.

Age was negatively correlated with environmental and structural barriers (r = −0.106, p = .035) and behavioral and cultural barriers (r = −0.124, p = .013). Similarly, water source was negatively associated with environmental and structural barriers (r = −0.157, p = .002). These findings indicate that older respondents and households with particular water sources tended to perceive fewer environmental and behavioral challenges to achieving ZOD status. However, the relatively small coefficients suggest that these relationships should be interpreted with caution.

Overall, the statistically significant correlations observed in the study were weak, with coefficients ranging from −0.157 to 0.272. This indicates that while certain sociodemographic characteristics are associated with sanitation determinants and barriers, they explain only a small proportion of the variation in respondents' perceptions and experiences. Therefore, achieving Zero Open Defecation (ZOD) status likely depends on a broader mix of economic conditions, environmental circumstances, institutional support, and community-level factors, not demographic characteristics alone.

These findings align with studies showing that multiple interconnected factors, including household resources, water accessibility, community context, and local support mechanisms shape sanitation outcomes. In fact, higher household income, wealth quintiles, and secondary or tertiary education consistently predict toilet ownership and latrine adoption (Afework et al., 2022; Duku et al., 2025; Harap et al., 2026; Legge et al., 2021). Similarly, sanitation functionality relies heavily on reliable water supplies and environmental resilience (Adane et al., 2026; Demoze et al., 2025; Miller-Petrie et al., 2026). Consequently, sanitation interventions should adopt a holistic, context-specific approach that integrates financial assistance, technical support, behavior change communication, and continuous monitoring to accelerate progress toward sustainable ZOD attainment.

Conclusion

This study examined the determinants and barriers to achieving Zero Open Defecation (ZOD) status among households in selected non-ZOD municipalities in Ilocos Sur. The findings revealed that respondents were predominantly female, aged 30-39, had attained high school education, and generally belonged to low- to middle-income households with four to six family members. The manual Jetmatic pump was identified as the most common household water source. These characteristics provide important context on the sanitation conditions and resource capacities of households in the study areas.

Respondents demonstrated high levels of knowledge about the health benefits and advantages of sanitary toilet use, indicating that awareness of proper sanitation practices was generally present. However, comparatively lower knowledge of social norms and the actual

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Volume 2 | Issue 2 | November | 2026

prevalence of open defecation in their communities suggests a need to strengthen community-level awareness and collective responsibility for sanitation improvement.

Among the identified barriers, economic constraints emerged as the most significant obstacle to achieving ZOD status. Respondents cited rising construction-material costs, insufficient household savings, and competing financial priorities as the primary concerns. In contrast, environmental/structural and behavioral/cultural barriers were perceived to be less influential. These findings indicate that affordability and access to financial resources remain more critical challenges than cultural resistance or misconceptions about sanitation.

The correlation analysis further revealed that selected sociodemographic characteristics were significantly associated with specific sanitation determinants and barrier dimensions. However, the generally weak relationships and the lack of a significant association between respondents' profile characteristics and the overall barriers score suggest that ZOD attainment is shaped by a complex interaction of economic, environmental, and contextual factors rather than demographic characteristics alone.

Overall, the study concludes that while sanitation awareness among households is relatively high, achieving Zero Open Defecation status remains largely constrained by economic limitations. Therefore, sustainable progress toward ZOD achievement requires integrated interventions that combine financial and material assistance, sanitation education, technical support, and continuous household monitoring. Such strategies may enable local government units and public health authorities to address household-specific needs more effectively and accelerate the attainment and sustainability of Zero Open Defecation status in vulnerable communities.

Recommendations

Based on the findings and conclusions of the study, the following recommendations are proposed:

Local Government Units (LGUs) should strengthen sanitation assistance programs by providing financial support, subsidies, construction materials, or other appropriate incentives to households that are unable to construct or maintain functional sanitary toilets. Priority should be given to households without adequate sanitation facilities, particularly those experiencing economic constraints identified in the study. Such interventions may help address affordability issues, the most prominent barrier to achieving Zero Open Defecation (ZOD) status.

Municipal Health Offices, Barangay Officials, and Barangay Health Workers should intensify sanitation education and advocacy campaigns focused on the health risks of open defecation, the benefits of sanitary toilet use, proper toilet maintenance, and the requirements for achieving and sustaining ZOD status. Community-based information activities should also strengthen awareness of local sanitation conditions to enhance collective responsibility and community participation in sanitation improvement efforts.

Local Government Units and Water Service Providers should regularly assess the adequacy, accessibility, and reliability of water supplies in communities with sanitation challenges. Water supply improvement initiatives should be integrated with sanitation programs, since access to water remains a key factor influencing sanitation practices and facility utilization.

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Volume 2 | Issue 2 | November | 2026

Sanitary Inspectors, Rural Health Units, and Environmental Health Personnel should provide technical assistance to households experiencing environmental or structural constraints, particularly those with limited space, flooding concerns, poor soil conditions, or other site-specific challenges. Technical guidance should promote affordable, context-appropriate, and environmentally sound toilet designs that comply with public health standards.

Barangay and Municipal Health Authorities should establish a regular monitoring and evaluation mechanism to identify households that remain without functional sanitary toilets, document the barriers they encounter, and track progress toward ZOD attainment. Continuous monitoring will support evidence-based decision-making and ensure interventions target households with the greatest need.

Community stakeholders and local leaders should encourage greater community participation in sanitation-related activities through community-led sanitation initiatives, household visits, sanitation mapping, and public recognition programs for compliant households. These approaches may strengthen community ownership and support the sustainability of ZOD achievements.

Future researchers should conduct similar investigations in other municipalities, provinces, or regions to determine whether the determinants and barriers identified in this study are consistent across different contexts. Future studies may also employ mixed-methods or qualitative approaches to gain deeper insights into household sanitation behaviors, decision-making processes, and community perceptions. Additionally, intervention studies evaluating the effectiveness of financial assistance, sanitation education programs, and technical support mechanisms are recommended to generate stronger evidence for policy and program development.

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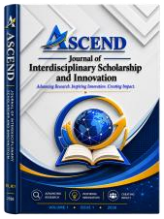

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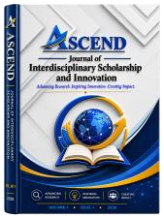

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