Analysis of Household Sanitation and Community Behavior using the EHRA Method in the Working Area Kawangkoan Public Health Center

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Abstract. Household sanitation and community behavior are the main determinants of environmental health that contribute to the incidence of environmentally-based diseases. This study aims to analyze household sanitation conditions, community behavior, and their relationship to environmental health risks using the Environmental Health Risk Assessment (EHRA) method in the Kawangkoan Community Health Center (Puskesmas) working area. The study used a descriptive analytical design with a cross-sectional approach to 100 household respondents. Data were collected through the EHRA questionnaire and analyzed using the chi-square test and multivariate analysis. The results showed that the majority of respondents were in the risky sanitation and risky behavior categories. Statistical tests showed a significant relationship between household sanitation and environmental health risks, as well as between community behavior and environmental health risks. Household sanitation variables and behavior simultaneously influence the level of environmental health risks. This study emphasizes the importance of STBM-based promotive and preventive interventions to reduce environmental health risks at the household level. This study supports the achievement of the Sustainable Development Goals, particularly SDG 6 (ensuring availability and sustainable management of water and sanitation for all) and SDG 3 (promoting health and well-being), by providing evidence-based insights to strengthen sanitation improvement strategies and disease prevention efforts in community settings.

Keywords: Household Sanitation; Community Behavior; EHRA

1. Introduction

Sanitation remains a global environmental health issue that directly impacts public health, particularly in developing countries. The WHO notes that unsafe sanitation contributes to high rates of environmental-related diseases such as diarrhea and gastrointestinal infections (WHO, 2022). Health environment itself is defined as limitations. Health environment studying dynamics relationship between group resident with various type change maybe happen on component environment like life, material, substance, or strength in around man can cause threat or disturbance health society and efforts for prevent it (Pinontoan, 2023).

Environmental sanitation is a systematic effort to maintain and improve the physical environment by providing basic facilities such as clean water management, wastewater management, solid waste management, drainage, and individual and community hygiene practices. Poor sanitation has been shown to increase the risk of environmentally related diseases. Recent research shows that household sanitation, the quality of clean water facilities,

and hygiene behaviors play a significant role in preventing disease (Pinontoan & Sumampouw, 2020).

Adequate household sanitation and healthy community behavior are fundamental determinants of public health, particularly in preventing environmentally related diseases such as diarrhea, typhoid fever, and parasitic infections. In many developing regions, sanitation-related problems remain a significant challenge due to inadequate access to improved sanitation facilities, unsafe water sources, and persistent unhealthy hygiene practices. These conditions not only increase the burden of communicable diseases but also contribute to environmental degradation and reduced quality of life.

In Indonesia, sanitation issues are still unevenly distributed, especially in rural and semi-rural areas. Despite national efforts to promote Community-Based Total Sanitation, many households continue to practice unsafe sanitation behaviors, including open defecation, improper solid waste disposal, and inadequate wastewater management. Such practices are often influenced by socioeconomic conditions, limited infrastructure, and low levels of environmental health awareness. Therefore, understanding household sanitation conditions in conjunction with community behavior is essential for designing effective and context-specific public health interventions. In Indonesia, despite increasing access to adequate sanitation, a gap remains between adequate and safe sanitation. Ministry of Health data shows that most households do not have waste management systems that meet environmental health standards (Ministry of Health, 2022).

The Environmental Health Risk Assessment (EHRA) method is a participatory and systematic approach widely used to assess sanitation-related risks at the household and community levels. EHRA focuses on key environmental health components, including access to clean water, latrine ownership, solid and liquid waste management, and hygiene behavior. By integrating technical sanitation indicators with behavioral and social aspects, the EHRA method provides comprehensive data that support evidence-based planning and prioritization of sanitation programs at the local level.

North Sulawesi Province, including the Kawangkoan Community Health Center working area, faces complex sanitation challenges due to its geographic location, population density, and limited environmental infrastructure. This increases the community's vulnerability to environmental health risks.

In addition to the availability of sanitation facilities, community behavior such as open defecation, handwashing with soap, and waste and liquid waste management play an important role in determining the quality of environmental health (Kurniawan, 2021).

The Environmental Health Risk Assessment (EHRA) method is used as a comprehensive approach to identify environmental health risks at the household level, because it is able to systematically integrate aspects of sanitation facilities and community behavior (Ministry of Health of the Republic of Indonesia, 2021). The working area of Kawangkoan Public Health Center represents a setting where sanitation conditions and community behavior play a crucial role in determining population health outcomes. Local geographic characteristics, settlement patterns, and community practices may influence sanitation-related risks, yet empirical data using standardized assessment methods remain limited. Conducting an EHRA-based analysis in this area is therefore important to identify existing sanitation gaps, behavioral risk factors, and priority issues that require intervention.

This study aims to analyze household sanitation conditions and community behavior using the EHRA method in the working area of Kawangkoan Public Health Center. The

findings are expected to provide valuable insights for local health authorities and stakeholders in strengthening environmental health programs, supporting sanitation policy implementation, and improving community-based sanitation interventions tailored to local needs. Based on this background, the formulation of the research problem is how the condition of household sanitation and community behavior and its relationship with environmental health risks based on the EHRA method in the working area of the Kawangkoan Community Health Center.

2. Methods

This study used a descriptive analytical design with a cross-sectional approach. The study location was within the Kawangkoan Community Health Center (Puskesmas) working area, with a sample size of 100 households selected using stratified random sampling. The research instrument was the EHRA questionnaire, which measures household sanitation, community behavior, and environmental health risks. Data analysis was performed using the chi-square test and multivariate analysis with a significance level of 5%.

3. Results and Discussion

Data were obtained from 100 household respondents through interviews and observations, then analyzed univariately and bivariately to see the relationship with environmental health risks. The majority of respondents were of productive age (18–59 years), had primary to secondary education, owned their own homes with permanent structures, and had low to middle incomes. This reflects a relatively stable socioeconomic situation, yet they still face potential sanitation risks due to limited knowledge and facilities. The distribution of respondent characteristics among the study participants is shown in Table 1.

Table 1. Distribution of Respondent Characteristics

Characteristics	n	%
Age		
18–59 years	64	64
≥60 years	36	36
Education		
Elementary School	32	32
Junior High School	25	25
Senior High School	27	27
Vocational School	6	6
College	10	10
Home Ownership (Owned)	74	74
Permanent Building Types	68	68

Table 1 shows the distribution of respondent characteristics in the working area of the Kawangkoan Community Health Center. Most respondents were aged 18–59 years (64%), indicating that household sanitation decisions were largely influenced by the productive-age population, while 36% were aged 60 years or older. In terms of education, the majority of respondents had elementary to senior high school education, with elementary school being the most common level (32%). Only a small proportion had vocational (6%) or college education (10%), which may affect sanitation-related knowledge and practices. Regarding

housing characteristics, most respondents lived in owner-occupied houses (74%) and resided in permanent buildings (68%). These characteristics provide important context for interpreting household sanitation conditions and environmental health risks in the study area. The distribution of Clean Water to Households is shown in Table 2.

Table 2. Distribution of Clean Water to Households

Variables	n	%
Refill water	39	39
Boreholes	22	22
Protected springs	32	32
PDAM	6	6
Bottled water	1	1

Table 2 presents the distribution of clean water sources used by households in the study area. The most commonly used source was refill water (39%), followed by protected springs (32%) and boreholes (22%). Only a small proportion of households relied on piped water from the municipal water supply (PDAM) (6%) or bottled water (1%). These findings indicate that the majority of households depended on non-piped water sources, which may pose potential risks to water quality and environmental health if not properly managed. The limited use of PDAM suggests challenges in access to centralized clean water services within the study area. Table 3 presents the distribution of household toilet ownership and sanitation facilities among respondents in the study area.

Table 3. Distribution of Toilets

Variables	n	%
Have a toilet	98	98
Doesn't have a toilet	2	2
Drainage system to infiltration wells	97	97
Discharge into water bodies	1	1

Table 3 describes the distribution of toilet ownership and wastewater disposal systems among households in the study area. The majority of respondents reported having a household toilet (98%), while only a small proportion did not have access to a toilet (2%). Regarding wastewater disposal, most households discharged wastewater into infiltration wells (97%), whereas a very small proportion discharged directly into water bodies (1%). Although toilet ownership was high, improper wastewater disposal practices, even in small proportions, may still pose environmental and public health risks. Table 4 describes the distribution of household liquid waste disposal systems used by respondents.

Table 4. Liquid Waste Disposal System

Exhaust System	n	%
Infiltration wells	65	65
Road/yard/garden	22	22
Open channel	10	10
SPAL/IPAL	2	2

Table 4 describes the distribution of household wastewater disposal systems shows that most households used infiltration wells (65%) as their primary exhaust system. Other disposal methods included discharge to roads, yards, or gardens (22%) and open channels (10%). Only a small proportion of households utilized proper wastewater management systems such as SPAL or IPAL (2%). These findings indicate that although infiltration wells were commonly used, a considerable proportion of households relied on inadequate wastewater disposal practices, which may increase the risk of environmental contamination and negatively affect public health. Table 5 shows the distribution of household solid waste management practices among respondents.

Table 5. Household Waste Management System

Waste Management	n	%
Thrown into empty land/garden	71	71
Burned	9	9
Brought to the polling station	9	9
Thrown into the river	6	6

The distribution of household waste management practices shows that the majority of households disposed of waste by throwing it into empty land or gardens (71%). Other practices included burning waste (9%) and bringing waste to designated collection points (polling stations) (9%). A smaller proportion of households disposed of waste directly into rivers (6%). These findings indicate that most households practiced improper waste disposal methods, which may contribute to environmental pollution and increase environmental health risks. Based on the results of the analysis of household sanitation distribution, it was found that of all respondents studied, the majority were in the risky sanitation category , namely 56 respondents (56%) **,** while the remaining 44 respondents (44%) were included in the less risky sanitation category . This finding indicates that more than half of households still have sanitation conditions that do not meet optimal environmental health standards. Table 6 summarizes the classification of household sanitation conditions based on the EHRA sanitation risk categories.

Table 6. Sanitation Categories

Category	n	%
Sanitation at risk	56	56
Less risky sanitation	44	44

These risky sanitation conditions are primarily influenced by several factors, including inadequate household waste management systems, the continued disposal of liquid waste into the open environment, and public ignorance about the safe distance between clean water sources and fecal disposal sites. Although most households have access to latrines, other supporting sanitation aspects are still not managed in an integrated manner. This distribution of household sanitation facilities illustrates that the availability of sanitation facilities has not been fully accompanied by the implementation of a safe and sustainable sanitation management system. Therefore, this situation has the potential to increase the risk of environmental pollution and environmental-related diseases in the study area. Behavioral

analysis shows that risky behavior related to defecation, hand washing with soap, drinking water management, garbage, and household liquid waste is still found.

Table 7 presents the distribution of public health–related behaviors among respondents.

Table 7. Public Health Behavior

Behavior Category	n	%
Risky behavior	58	58
Less risky behavior	42	42

The results of the distribution of community behavior show that the majority of respondents are in the risky behavior category , namely 58 respondents (58%) , while 42 respondents (42%) are included in the less risky behavior category . This finding indicates that more than half of the community still engages in behavior that has the potential to pose a risk to environmental health. Risky behaviors identified in this study included defecation habits that did not fully meet sanitation standards, handwashing with soap that was not performed at key times, and household waste and wastewater management that did not comply with environmental health principles. Furthermore, the low level of waste sorting and safe drinking water treatment practices also contributed to the high risk behavior category. This distribution of community behaviors indicates that behavior change remains a major challenge in efforts to improve environmental health. This situation underscores the importance of strengthening health education, promoting Clean and Healthy Living Behaviors, and implementing Community-Based Total Sanitation sustainably to reduce environmental health risks at the household level. Table 8 presents the results of the chi-square analysis examining the relationship between household sanitation, public health behavior, and environmental health risks.

Table 8. Chi Square Test Results

Variables	p-value	Information
Sanitation ↔ KL Risk	0.031	Significant
Behavior ↔ KL Risk	0.248	Significant
Sanitation + Behavior ↔ KL Risk	0.030	Significant

The results of statistical tests using SPSS with the chi-square test obtained a p-value of 0.031. A p-value of less than 0.05 means that there is a significant relationship between family sanitation and the level of environmental health risks in the Kawangkoan Community Health Center work area in 2025. The results of the statistical test using the statistical test obtained a p-value = 0.248 > 0.05 so it can be concluded that behavior is not related to environmental health risks in the community in the Kawangkoan Community Health Center work area. Based on the data in the table, the p-value obtained is 0.030 <0.05, so it can be concluded that the variables of household behavior and sanitation are simultaneously related to the level of environmental health risks in the community in the work area of the Kawangkoan Health Center. The R-Square value = 0.125, which means that household behavior and sanitation have an influence of 12.5% on the level of environmental health risks.

Formal education is closely related to the ability to understand information, including information related to sanitation and environmental health. Nutbeam states that the higher a person's education level, the easier it is for them to receive and process health information, which impacts health behaviors (Nutbeam, 2023). Home ownership status and building type are structural factors that influence sanitation risk. Respondents who own their own homes and live in permanent buildings tend to have better access to sanitation compared to those living in semi-permanent or unowned homes. The physical condition of the building is directly related to the availability of sanitary latrines, wastewater disposal systems, and environmental drainage. (Ministry of Health of the Republic of Indonesia, 2022; Pinontoan et al., 2024)

From a socioeconomic perspective, the majority of respondents were in the low- to middle-income groups. This situation impacts households' ability to provide and maintain sanitation facilities according to health standards. Research shows that economic constraints are often a major barrier to constructing watertight septic tanks, repairing wastewater pipes, and managing household waste safely (UNICEF, 2020). The majority of household expenditure categories fall within the middle-level, indicating that most respondents have relatively sufficient economic capacity, but sanitation is not necessarily a top priority. Several studies have shown that middle-income households often prioritize consumption needs over long-term investment in sanitation, thus maintaining sanitation risks in this group (Pinontoan et al., 2024). This study mapped sanitation risk in a densely populated sub-district of Central Jakarta based on hazard, exposure, vulnerability, and capacity indicators. It highlights the spatial variations in sanitation risk and underscores the importance of focused sanitation infrastructure prioritization in urban settings (Ali et al., 2024).

Ownership of a Certificate of Poverty reflects a household's level of socioeconomic vulnerability. Households generally have limited access to proper sanitation and are more dependent on government assistance programs. Studies show that economically vulnerable groups face higher sanitation risks and require subsidy-based sanitation interventions and community empowerment (Pinontoan, 2023)

Overall, the results of this study indicate that household sanitation risk is a multidimensional phenomenon influenced by age, education, physical condition of the home, and socioeconomic status. This finding aligns with the EHRA approach, which emphasizes the importance of comprehensive analysis in assessing environmental health risks. Therefore, efforts to reduce sanitation risk in the Kawangkoan Community Health Center work area need to be implemented through increased environmental health education, strengthening household finances, and supporting sustainable sanitation policies based on community needs (WHO, 2022; Ministry of Health of the Republic of Indonesia, 2023).

Household sanitation is a crucial determinant of environmental health, directly related to a community's quality of life. In the context of public health studies, sanitation conditions within and around the home, including access to clean water, fecal disposal facilities, domestic wastewater disposal systems, and household waste management, play a significant role in preventing environmentally transmitted diseases (Apriliyanti et al., 2024). Poor sanitation creates exposure pathways for pathogens (bacteria, viruses, parasites) and vectors (flies, mosquitoes), which then increase the risk of diseases such as diarrhea, worms, stunting, and other infections (Firdaus et al., 2023). The dominant factor influences on stunting is the drinking water quality in biological terms and water sources for sanitation (Zahtamal et al., 2024). This systematic review synthesizes evidence linking safe water access and

environmental sanitation with diarrhea outcomes in children. It reinforces the need for integrated water, sanitation, and hygiene (WASH) interventions to reduce diarrheal diseases (Siregar et al., 2023). Implementation of household clean and healthy behavior lower the risk of diarrhea (Febriawan et al., 2024).

This significant relationship indicates that the sanitation conditions of the community in the working area of the Kawangkoan Community Health Center are still below standard, potentially causing health problems related to the environment. Household sanitation assessment indicators in this study include access to clean water, access to healthy latrines, household wastewater management, and household waste management systems. Poor sanitation conditions will have a negative impact on human life, ranging from a decline in the quality of the community's living environment to contamination of drinking water sources, which can lead to an increase in cases of diarrhea and other diseases. Clean water sources, healthy latrines, and standardized Wastewater Treatment Systems are very important (Asriani, et al., 2024). The Environmental Health Risk Assessment (EHRA) framework , environmental health risks result from interactions between hazards , exposure pathways , and exposed individuals (receptors) (Wahyudi & Zaman, 2021). Hygiene behavior plays a crucial role in interrupting or shortening these exposure pathways. For example, properly disposing of liquid waste, washing hands with soap, and maintaining clean water channels can reduce the likelihood of contact with pathogenic microorganisms found in domestic wastewater (Firdaus et al., 2022).

The Environmental Health Risk Assessment *(EHRA)* study is a primary study that provides scientific and factual data on sanitation service availability and household behavior. The EHRA study focuses on sanitation facilities and community behavior, such as drinking water, waste disposal services, latrines, and household drainage (Wahyudi and Zaman, 2021). Behavior and sanitation are closely related in preventing disease in the community, which is the goal of public and environmental health (Yarmaliza and Rinaldy, 2020). Prior research has shown that the proximity of on-site sanitation systems to groundwater sources significantly influences fecal contamination risk, with rainfall patterns further modifying contamination dynamics (Putri et al., 2025).

This is in line with research findings that found that household sanitation and behavior jointly influence environmental health risks in the community in the Kawangkoan Community Health Center work area. These results indicate that behavior and household sanitation simultaneously play a significant role in determining the level of environmental health risk (Nabila et al., 2023), in accordance with the principles of Environmental Health Risk Assessment (EHRA), which emphasizes the interaction between human behavioral factors and physical environmental conditions in the formation of public health risks (Setyawati et al., 2021; Wahyudi & Zaman, 2021).

Conclusions

Household sanitation in the working area of the Kawangkoan Community Health Center is still largely categorized as risky, particularly in solid and liquid waste management, which contributes to potential domestic environmental pollution despite adequate access to latrines and water sources. Community environmental health behaviors also remain at risk, especially in handwashing practices, drinking water management, and household waste handling, although open defecation has been successfully reduced. Household sanitation shows a significant relationship with environmental health risks, indicating its role as a key

enabling factor, whereas community behavior does not show a statistically significant association but functions as a reinforcing factor that can influence risk conditions. Collectively, household sanitation and community behavior significantly affect environmental health risks, although their overall contribution is limited, confirming that environmental health risks are influenced by multiple factors beyond sanitation and behavior.

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Conflicts of Interest

The authors declare no conflict of interest.

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