



# Correlation analysis of the achievements of the five-pillar community-based total sanitation program and its indicators with trends in diarrhea

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## ABSTRACT

**Background:** Diarrhea is a public health problem that remains a serious concern worldwide, including in Indonesia. Diarrhea can affect all age groups, both children and adults, but toddlers are the most vulnerable to this disease due to children's immature immune systems and their dependence on parents for personal and environmental hygiene. According to data from the Semarang City Health Office in 2023, the number of diarrhea cases showed a fluctuating trend from 2016 to 2023. In 2018, there were 50,021 cases recorded, decreasing to 21,765 cases in 2021, but increasing again to 36,534 cases in 2023, where 29.1% were cases in toddlers. This data indicates that children are still the most vulnerable group to diarrheal disease. **Method:** This study used a comparative descriptive design with secondary data. The data collection technique uses data sources derived from the Semarang City Health Office profile which includes 5 community-based total sanitation Pillars (Pillar 1: SBS, Pillar 2: CTPS, Pillar 3: PAMMRT, Pillar 4: PSRT, Pillar 5: PLCRT) as well as additional indicators (PKURT and Access to Healthy Homes) from 37 Community Health Centers and 16 Districts. Data is presented as a percentage of households from a total of 552,978 households, while data on total and toddler diarrhea cases (2018–2023) are presented in the form of bar charts. **Finding:** The achievement of community-based total sanitation in Pillar 1 (Stop Open Defecation) has reached 100%. This is followed by Pillar 2 (CTPS) at 94.02%, Pillar 3 (PAMM-RT) at 92.97%, Pillar 4 (PSRT) at 89.08%, and the lowest, Pillar 5 (PLCRT) at 88.50%. Additional indicators on Access to Healthy Homes reached 91.79%, while Household Air Quality Management (PKURT) had the lowest achievement at 67.2%. In 2018, diarrhea cases peaked at 50,021, drastically decreased in 2021 to 21,765, and then toddler diarrhea cases reached an average of around 27% to 35% of the total cases. **Conclusion:** The community-based total sanitation achievement in Semarang City shows that pillar 1 (SBS) has successfully reached 100% and is followed by pillar 2 (CTPS) and pillar 5 (PLCRT) which stopped the potential for control in diarrhea cases (especially seen in the 2020-2021 period). However, there was an increase in diarrhea cases in 2022-2023 followed by behavior in pillar 4 (PSRT) and additional indicators still being the weakest link in environmental-based disease prevention efforts. **Novelty/Originality of this article:** This research is a study that is still rarely conducted from previous research. This study includes the achievement of the five community-based total sanitation pillars and additional indicators with long-term diarrhea case trends starting from 2016–2023 and identifies the influence of behavioral and spatial factors (between health centers) on disease closure.

**KEYWORDS:** Sanitation, Diarrhea, STBM.

## 1. Introduction

Diarrhea is one of the problem health society that still become attention serious throughout the world, including in Indonesia. According to World Health Organization

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(WHO, 2017), diarrhea defined as defecate with consistency changed stool become liquid or soft, occurs three times or more in a day, and can accompanied by other symptoms such as nausea, vomiting, and dehydration. Diarrhea can attack all group, good children and adults, but group toddler is the most vulnerable groups to disease this. Vulnerability the caused by the system immunity body children who have not perfect as well as dependence child towards parents in guard cleanliness self and environment (Khasanah & Sari, 2016).

Globally, the disease diarrhea still be one of reason main morbidity and mortality in children under five years old. Based on WHO data (2017), in the region Europe in 2018 recorded as many as 182,338 cases diarrhea in children ages 12–60 months or around 6.2%. In the UK, the prevalence case diarrhea in the same year reached 13%. In the African region, figures incident diarrhea even more high. Several countries such as Burundi, Cameroon, Ethiopia, and Nigeria recorded prevalence of 12%, 20%, 17%, and 15% respectively. These data show that disease diarrhea still become significant global problems especially in developing countries with level low sanitation and access to clean water.

At the level national, disease diarrhea is one of the reason main death children in Indonesia. Based on data from the Ministry of Health of the Republic of Indonesia and Basic Health Research, the prevalence of diarrhea in toddlers in Indonesia is experiencing fluctuations in a number of year last. In the period before in 2013, the prevalence diarrhea tend decreased, but in 2018 there was improvement significant. Ministry of Health of the Republic of Indonesia reported that prevalence diarrhea increase from 40.90% to 62.93% of cases, with group ages 1–4 years show prevalence highest that is by 11.5%. Increase This show that although various effort has done through national programs like community-based total sanitation is still there is challenge big in control disease diarrhea, especially in groups prone to like toddlers.

Central Java Province is one of the area with amount case enough diarrhea high in Indonesia. Based on data from the Central Java Provincial Health Office, the disease diarrhea including in the top 10 disease most reported by the facility service health. Incidence rate diarrhea in Central Java shows pattern fluctuating from year to years. Environmental factors, such as availability of clean water, conditions sanitation House stairs, and behavior public in guard cleanliness environment, become factor determinant main in dynamics case diarrhea in this area (Dinas Kesehatan Kota Semarang, 2023).

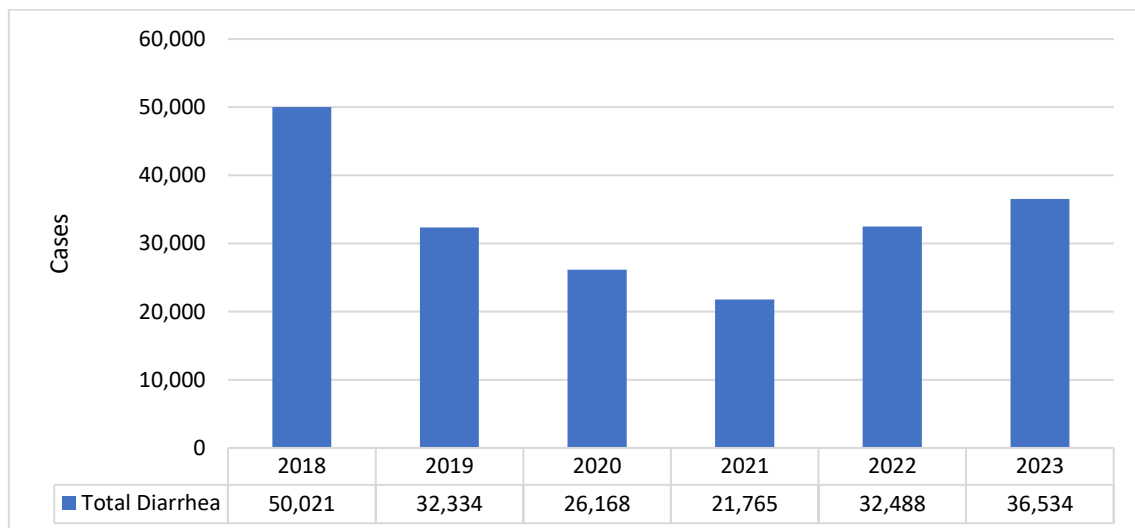


Fig. 1. Bar chart of total diarrhea data 2018-2023

Semarang City, as Mother city Central Java Province, reflects urban conditions with density high population and variety condition sanitation significant inter-regional differences. Based on data from the Semarang City Health Service, it shows that in 2018 it was recorded as many as 50,021 cases, then decrease to 32,334 cases in 2019, 26,168 cases in 2020, and 21,765 cases in 2021. However, in 2022 the number case return increase to

32,488 cases and rising again to 36,534 cases in 2023. Of the total cases in 2023, as much as 29.1% or around 10,617 cases is case diarrhea in toddlers. This data show that children Still become most vulnerable groups to disease diarrhea in Semarang City.

Based on the bar chart above, shows that has happen fluctuations case diarrhea in Semarang City from year to year. This phenomenon reflect vulnerability public to disease based close environment relation with behavior life clean and healthy as well as condition environment. During 2017–2018 period, cases diarrhea in toddlers occupy sufficient proportion big, namely between 27% to 35% of total cases reported diarrhea. This figure show that group toddler is highly vulnerable populations to disease diarrhea, which is generally transmitte through contaminated water and environment. The high proportion case diarrhea in toddlers this also indicates that effort education and coaching Clean and Healthy Living Behavior/*Perilaku Hidup Bersih dan Sehat* (PHBS) at the community level House ladder Still need improved. Research results from various regions in Indonesia show existence significant relationship between implementation of Clean and Healthy Living Behavior and incidents diarrhea, especially in toddlers. Research conducted by Azaria & Rayhana (2016) in the work area Community Health Center Sword Beans show that behavior mothers who implement PHBS with Good like wash hand with soap, use toilet healthy, and use of clean water relate close with low incident diarrhea in toddlers.

Apart from the factors behavior, condition the environment also holds role big in determine level incident diarrhea. Water and sanitation is factor the most influential environment, because poor water quality and inadequate sanitation adequate can become a medium of transmission various microorganisms reason diarrhea. Research conducted by Hamijah (2022) showed that availability of clean water that meets conditions and existence toilet Healthy own connection strong with decline risk diarrhea in toddlers. A similar study by Wijayati & Kartini (2019) in West Sulawesi showed that sanitation bad environment, such as lack of access to toilet healthy, disposal waste that is not right, and low quality of clean water, contributing significant to height number incident diarrhea in the community rural areas. Interaction between factor behavior and environment show that fluctuations case diarrhea is results from combination complex between habit society and conditions physique environment.

Based on the data obtained from the profile of the Semarang City Health Service shows existence relatedness close between condition environment and behavior life clean and healthy society. Although has The Community-Based Total Sanitation/*Sanitasi Total Berbasis Masyarakat* (STBM) program is implemented with five main pillars. namely stop defecating carelessly/*Stop Buang Air Besar Sembarangan* (SBS), wash hand use soap/*Cuci Tangan Pakai Sabun* (CTPS), drinking water and food management House stairs/*Pengelolaan Manajemen air minum dan makanan* (PAMMRT), management rubbish house household/*Pengelolaan Sampah Rumah Tangga* (PSRT), and management waste liquid House stairs/*Pengamanan Limbah Cair Rumah Tangga* (PLCRT) but achievement each pillar in various areas of Semarang City is still varies. This is cause risk transmission disease based environment, including diarrhea, still high. Behavior society that has not consistent in implementing CTPS, use water sources are not worthy, and management waste domestic which is not yet optimal factor main reason survival case diarrhea in the community (Dinas Kesehatan Kota Semarang, 2023).

Apart from the factors environment and behavior, aspects social the economy also affects incident diarrhea. Communities with level education and income low tend own access limited to clean water and facilities sanitation worthy. Insufficient knowledge about method guard cleanliness food, drinks, and importance wash hand with soap contribute to height number incident diarrhea (Ministry of Health of the Republic of Indonesia, 2019). Research by Soviana & Mufarokhah (2026) shows that there is significant relationship between level education mother and incident diarrhea in toddlers. Mothers with education low tend own poor behavior Good in matter cleanliness and maintenance child, who in the end increase risk transmission diarrhea. Condition the show that control disease diarrhea No only need intervention medical, but also a therapeutic approach behavior and social community. Promotive and preventive efforts through education health, improvement

community-based total sanitation coverage, as well as improvement access to clean water and sanitation worthy become very important thing.

Semarang City as one of the metropolitan areas in Central Java is facing challenge big in field health environment. Based on Health Profile of Semarang City Health Office in 2023, cases diarrhea show fluctuations from year to year, with trend improvement back in 2022 and 2023 after had time decrease during the COVID-19 pandemic. The phenomenon This signify existence inconsistency in implementation behavior life clean and healthy in the community, which is possible big related with the achievement of the STBM program is not optimal in all areas of the city.

Fluctuation cases that occur from 2016 to 2023 shows that repair behavior life clean and healthy, improvement quality environment, as well as equal distribution of community-based total sanitation programs is necessary get attention special. Considering part big case occurs in toddlers, then the role of parents and power health in give education, doing monitoring health children, and guard cleanliness environment house become factor important in prevention disease diarrhea. Analysis to trend case diarrhea and the factors that influence it are very necessary For formulate intervention strategies health a more diverse society effective and sustainable in the future.

Urgency study this also lies in reality that toddler is most vulnerable groups to disease diarrhea. Approximately 29.1% of total cases diarrhea in Semarang in 2023 is cases in toddlers, showing that transmission disease based environment still high in level house stairs. This condition reflect that intervention based community like community-based total sanitation yet fully reach out and change behavior community at the level family, especially in matter drinking water management, waste domestic, as well as practice cleanliness personal like wash hand use soap.

More continue, from side development Sustainable Development Goals (SDGs), Indonesia is committed to reach objective namely clean water and adequate sanitation. However, the achievement of this target still face obstacles at the level area consequence inequality in access and behavior sanitation. This is show existence gap between availability facilities and changes expected behavior. Condition the make analysis connection between community-based total sanitation five pillars achievement with indicator health environment and events diarrhea become important and urgent. With understand to what extent is the implementation each pillar contributes to decline case diarrhea, then government area can do repair policy based evidence (evidence-based policy) for increase effectiveness intervention health environment.

In addition, there are fact that still there is gap in monitoring and evaluation of the community-based total sanitation program at the village level area. Report Semarang City Health Service's annual report (2023) states that a number of ward show achievements high on the pillar stops defecation carelessly, however achievements in the management pillars waste liquid household and management rubbish house stairs still low. Imbalance this can lower effectiveness the whole program, because community-based total sanitation is integrative inter -pillar.

Finally, the urgency study mo only nature local, but also contributory in a way national and global. As part from effort achieving the 2030 Universal Access target for clean water and sanitation worthy, result study This can strengthen Semarang City's position as a learning model for other areas in integrating community-based total sanitation programs with prevention strategies disease based environment. With thus, this research expected capable give contribution scientific, policy, and practical in support achievement health sustainable and quality society.

## 2. Methods

This is study analysis descriptive research, use design descriptive comparative with secondary data. Data sources obtained from Semarang City Health Office profile in 2023 which includes community-based total sanitation achievement data: achievement of the 5 Pillars of community-based total sanitation (Pillar 1: SBS, Pillar 2: CTPS, Pillar 3: PAMMRT,

Pillar 4: PSRT, Pillar 5: PLCRT) and indicator additional (PKURT and Healthy Home Access) from 37 Community Health Centers and 16 Sub-districts and case data diarrhea which includes case total diarrhea and diarrhea toddlers per year from 2016 to 2023, presented in bar chart form. Number population amounting to 552,978 families.

Taking technique sample in study where amount sample the same with population (Syahrizal, 2018). Data analysis in this research using analyzed community-based total sanitation data in a way descriptive for count percentage family achievements and identify community health center with achievements low. Then, analyzed diarrhea data for identify trend annual, period peak/lowest, and proportion case toddler to the total. Analysis correlation based on comparison trend case diarrhea to community-based total sanitation pillars achievements. This research conducted in the Semarang City area. The research done based on the results of the data obtained from Profile of the Semarang City Health Service, namely in 2016-2023.

### 3. Results and Discussion

#### 3.1 Community-based total sanitation program achievements

Based on secondary data obtained from the profile of the Semarang City Health Service in 2023 shows that the achievement of community-based total sanitation in Pillar 1, namely Stop Open Defecation has been reached 100%. Then in the sequence highest second namely in pillar 2 washing hands with soap reached 94.02%, in the order third namely pillar 3 of Management Household Food and Beverages amounted to 92.97%, next in order fourth namely in pillar 4 of Security Household Waste is 89.08%, and in the order lowest namely in pillar 5 management waste household liquidity of 88.50 %. Based on the results of the data so can categorized that pillar 5 is the weakest pillar of the 5 main pillars of community-based total sanitation. This indicates challenge in management waste liquid in scale House stairs in Semarang City where channel wastewater disposal has not been all of it closed and smooth. The following data is presented in bar chart below.

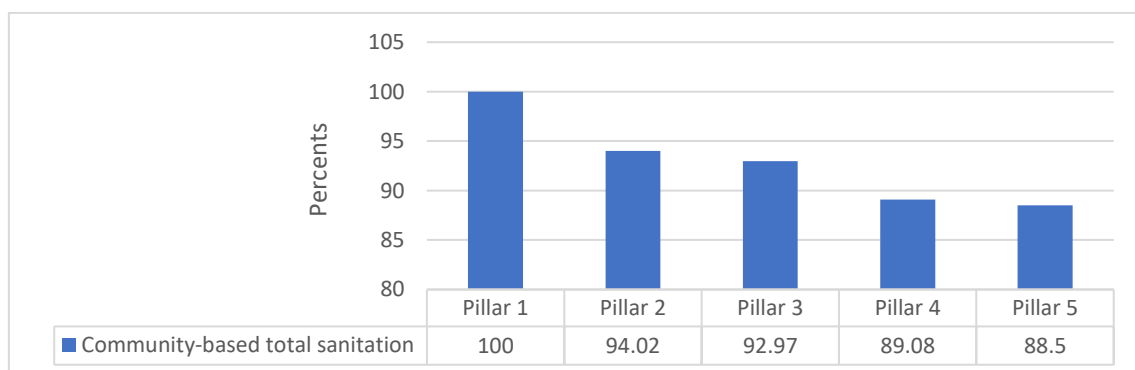


Fig. 2. Bar chart coverage of community-based total sanitation in Semarang City 2023 (%) (Dinas Kesehatan Kota Semarang, 2023)

In addition, it was also found that there is health centers are still very low in report achievement that is community health center Pandanaran (South Semarang) where number reporting only reached 10.41% in each pillar, both in the main pillar and indicator additional. This is show existence problem structural or serious reporting in the region. The following data is presented in table Attachment to the profile of the Semarang City Health Service in 2023

Based on secondary data obtained from Profile of the Semarang City Health Service in 2023, it is known that the achievements of the community-based total sanitation program in Semarang City show relative results good in part big pillars. The first pillar, namely Stop open defecation, has reach 100 % achievement. This signify all over the people of Semarang City that have own access to facility toilet healthy and not again do practice defecate

carelessly. This results is from various health program interventions environmental management carried out by the government areas, health centers, and support an increasingly diverse society aware will importance proper sanitation.

Second pillar, namely washing hands with soap, is in position achievements highest next with percentage of 94.02%. A sufficient achievement tall of this show that awareness public in guard cleanliness self especially through habit wash hand with soap already enough good. Meanwhile that, the third pillar, namely management household food and beverage, reached 92.97 %, which shows that public has enough understand importance processing and storage hygienic food For prevent contamination and disease.

Fourth pillar, namely security household waste, reached 89.08%. Although achievements this classified as good, but still there is challenge in system collection and management rubbish house stairs on the level environment. Finally, the fifth pillar that is management waste household liquidity, occupying position lowest with achievement of 88.50%. Although number this still above 85%, however compared to with other pillars, Pillar 5 can categorized as the weakest pillar in implementation of community-based total sanitation in Semarang City.

More achievements low on this Pillar 5 indicates Still existence challenge in management waste liquid House ladder in society. Based on observation field and reports health center, it is known that part big channel waste water disposal has not been all of it closed and not yet flow with good. Besides that, still lots house stairs that have not been own system management waste adequate fluids, such as well infiltration or installation wastewater treatment simple. Some public still dispose of washing water, bath water and waste kitchen to channel open without processing moreover before. Condition this can increase risk pollution environment and potential distribution disease water based.

The achievements of Pillar 5 are lack of knowledge public about importance management waste liquid. Society tends to prioritize facility sanitation solid (like toilet) compared system wastewater management, because the impact no seen in a way directly. The same thing was also found in research by Utama et al. (2023) in Bandar Lampung, which stated that implementation of Pillars 4 and 5 is still low Because lack of awareness society and its limitations means management waste House ladder.

Apart from the factors knowledge, aspects infrastructure and funding also become obstacle main. Management waste liquid need investment early, such as construction of closed SPAL, watertight septic tank, or home biofilter stairs. This is no always easy realized by the community earning low. According to study from Makassar Polytechnic of Health, costs manufacturing system management waste liquid often become barrier for poor families to fulfil criteria total sanitation. With thus, the factors economy play a role big in gap achievements inter-regional.

On the other hand, the aspect institutions also become attention important. Based on Semarang City Health Service report, there are health centers that have reporting community-based total sanitation achievement is very low, such as community health center Pandanaran which only reported 10.41% on each pillar, including additional pillars. Conditions This show existence possibility problem in system reporting and monitoring at the level facility service health. Low reporting can so no solely reflect condition bad field, but rather existence limitations capacity source Power human, constraints administration, or lack of commitment in data entry periodically.

The low Pillar 5 achievements have implications Serious to health community. Waste liquid that is not managed with good can pollute land and water, as well as increase risk disease based environment like diarrhea, worms, and infections skin. Although a research in Kalongan Village, Semarang Regency, shows that variables management waste liquid No influential direct to incident diarrhea ( $t$ -count = 0.040), the same study also found that incident diarrhea own connection significant with stunting incidents ( $t$ -count = 3.125). This means that suboptimal sanitation remains contribute no direct to problem health and nutrition children. With thus, the increase management waste liquid house ladder can contribute to the decline stunting rates and increase quality environment.

In the context of Semarang City, efforts strengthening Pillar 5 in fact Already done through various innovation. The Semarang City Government has develop System Wastewater Management Domestic Centralized (SPAL-DT) in several areas as solution scale area. This program be one of innovation praised by the team community-based total sanitation Award 2024 assessor, because show commitment area in repair sanitation environment. However, the challenges still there is sustainability operations and maintenance systems, especially in the environment settlement dense and society earning low.

For strengthen implementation of Pillar 5, several step strategic can done. First, strengthen monitoring and reporting system at the level health centers and sub-districts so that achievement data more accurate and reflective condition field. Second, it is necessary done socialization and education sustainable to public about importance management waste liquid as well as the impact to health. This education can done through cadre health, figures society, as well as activity cross sector. Third, the government area can give help technical or subsidy development simple SPAL system for family not enough capable.

In addition, the approach cross sector between the health department, the environmental department, and the public works department is also very necessary for ensure that management waste liquid no only become not quite enough answer society, but also part of from spatial planning and development policies infrastructure city. Strengthening regulations about minimum standards for SPAL for homes ladder as well as giving incentive for public or successful RW reach criteria sanitation worthy also can speed up Pillar 5 achievements. In a way overall, although community-based total sanitation achievements in Semarang City have show results positive in part big pillars, but still required attention specifically on Pillar 5 as point weak in program implementation. Inequality between regions, especially in several health centers that are still low in reporting, necessary handled through strengthening system administration and supervision. With strengthening Pillar 5, it is hoped implementation of community-based total sanitation in Semarang City will become more comprehensive, sustainable, and capable give impact real to improvement health environment and welfare public.

### *3.2 Achievements indicator addition health management indoor air quality and family points access healthy homes*

In the Semarang City area at point indicator improvements in Healthy Home Access reached 91.79% and in Health Management Indoor Air Quality/*Pengelolaan Kualitas Udara Dalam Ruangan (PKURT)* has achievements lowest (67.2%). This is in accordance with delivery report from a number of community health center with the figure of 0.00% in the PKURT points, namely at the Miroto Health Center, Health Center Tlogosari Wetan, Community Health Center Gunungpati, and Ngaliyan Health Center. This show that need existence evaluation and review direct For know problems that occur, so that can repair number achievements for the future. Following data presentation that can displayed in below.

Based on secondary data sourced from Profile of the Semarang City Health Service in 2023, it is known that indicator addition from the community-based total sanitation program shows sufficient achievement varies. In the healthy home access indicator, the achievement has reached 91.79%, indicating that part big the people of Semarang City have own House with condition environment that meets criteria health basic. However, the indicator Management Indoor Air Quality shows relative achievement low that is only by 67.2%. Condition This show existence gap between success development physique House Healthy with aspect quality air inside House ladder.

Achievements high on the healthy home access indicator indicates that part big the people of Semarang City have own access to a house that fulfills standard health environment, including the availability of clean water facilities, toilets family, floor and walls decent housing, as well as adequate lighting. According to research by Maulana & Fitria (2021) in UNAR Public Health Journal, home healthy is factor protective important in

prevent disease based environment like diarrhea, infection channel breathing and disease skin. Although achievements access house healthy in a word high, low achievements in the health management indoor air quality indicators show that dimensions quality air in house ladder not yet fully noticed by the public and institution program implementer. Quality air in house relate direct with aspect ventilation, humidity, lighting, and exposure to smoke from various source like cigarettes, kitchen traditional, or activity House another ladder. Based on Oktaviani et al. (2025) from STIKKU Journal, poor ventilation contribute big to improvement risk of ISPA, especially in densely populated areas resident.

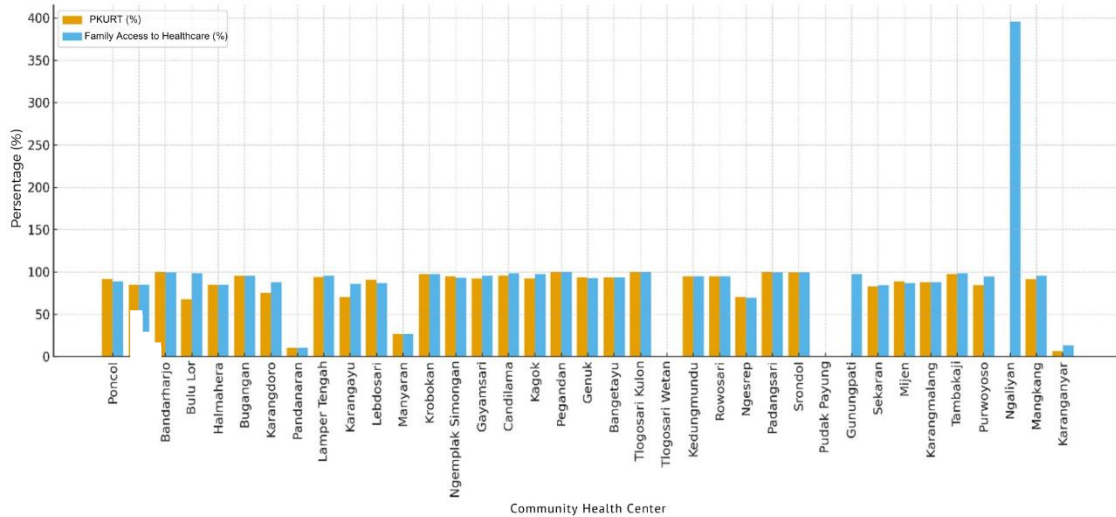


Fig. 3. Bar chart indicator additional points on health management indoor air quality and family healthy home access based community health centers in Semarang City in 2023

Findings 0.00% achievement in several community health center like Miroto, Tlogosari Wetan, Gunungpati, and Ngaliyan cause a number of possibility problem fundamental. First, the unavailability of data or constraint in mechanism reporting can cause mark achievements zero, even in the field Possible there is House the stairs that have been do effort repair quality air. Second, the low achievements can due to the lack of socialization and lack of understanding public about importance management quality air in House ladder. In addition, the density settlement urban areas in Semarang, especially in the central and northern regions, are worsening condition air in House Because limited room open and high pollution from outside. Many houses were built close together without ventilation good cross, so that flow air No smoothly. According to Rahmania & Yudhastuti (2023) from Journal Yogyakarta Polytechnic of Health, home with ventilation not enough from 10% of wide floor own risk more tall to disturbance breathing compared to House with ventilation adequate.

Quality air in bad house own implications Serious to health community. House with inadequate ventilation adequate or with exposure to cigarette smoke and other materials burn congested increase risk the occurrence of ISPA, asthma, allergies, and pneumonia, especially in children and the elderly. Based on studies Laliyanto et al. (2022) in Journal Sanitation and Environment Yogyakarta Polytechnic of Health, exposure to kitchen smoke and ventilation closed increase the risk of pneumonia doubles compared to House with circulation air Good.

Besides having an impact direct to health, low health management indoor air quality achievements also have an impact to quality life and productivity society. Air in a room that is not Healthy cause discomfort, lowering concentration, as well as increase fatigue. In the context of the community-based total sanitation program, the low indicator This means that although public has own healthy home in a way physical condition environment micro inside house not yet fully support life Healthy.

A number of factors that can explain low health management indoor air quality achievements in Semarang City include: lack of education public about importance ventilation and house smoke management stairs; imitations land and density settlements that make house difficult modified For repair circulation air; behavior house ladder like habit smoking inside House or close meeting window For avoid dust; minimal monitoring by officers community health center to indicator quality air in house.

For repair achievements health management indoor air quality indicators, several strategies can applied. First, it is necessary done regional mapping with achievements low For Then done survey field as well as evaluation directly to find reason specific. Second, the increase education public through outreach programs about importance ventilation, reduction of cigarette smoke inside house, and utilization material burn more friendly environment. Third, strengthening system reporting health center so that indicator data addition can recorded with accurate.

In addition, the government city can push regulation area about standard House healthy which includes aspect quality air, minimal ventilation, and prohibition smoking inside home. Approach cross sectors are also needed, involving the Health Service, Housing Service, and Environmental Service, to ensure comprehensive intervention. Empowerment program public based on RT/RW, such as "Healthy Village and Free from Household Smoke" competition, can used as a motivational medium For increase awareness public.

According to Rozi & Arida (2023) in *Journal Pengabdian Masyarakat Bangsa*, activities mentoring House Healthy with focus on ventilation and lighting proven can increase understanding public as well as repair condition House by 23% in six month implementation. This means that changes behavior public can achieved through continuous education and mentoring. In a way general, achievements indicator additional community-based total sanitation program in Semarang City shows progress in the aspect of access to healthy homes, however still there is weakness significant in aspects management indoor air quality (HQQ). Inequality This reflect that attention community and workforce health Still focused on aspects physique home, while aspect environment micro in home like circulation air and smoke control not yet become priority.

### *3.3 Epidemiological trends case diarrhea (2016–2023)*

Based on the 2023 Health Profile data from the Semarang City Health Office, that case diarrhea show pattern fluctuations that reflect vulnerability public to disease based environment that is happen peak cases in 2018 amounted to 50,021 cases and decreased sharp increase in 2021 reaching 21,765 cases remember that in 2020-2022 there will be the COVID-19 pandemic that can change clean and healthy lifestyle behavior from every individuals. Of the total cases existing diarrhea, there is case diarrhea toddlers account for an average of 27% to 35% of the total cases that reach reach proportion highest in the period peak the 2017–2018 epidemic. Then case total diarrhea returns increase sharply in 2023 (around 36,534 cases) considering easing protocol health where public negligent for still implementing a clean and healthy lifestyle which can result in combination between change environment (water and sanitation), behavior society, events outside normal local, as well as repair or decline system surveillance and intervention health (Amirinnisa et al., 2023).

Based on the 2023 Health Profile data from the Semarang City Health Service, cases diarrhea show pattern quite a fluctuation significant from year to year. This phenomenon reflect vulnerability public to disease based close environment relation with behavior life clean and healthy as well as condition environment. Peak case occurred in 2018 with a total of 50,021 cases, then experience decline sharp in 2021 to reached 21,765 cases. The decrease the allegedly strong related with change behavior public during the COVID-19 pandemic, where clean and healthy lifestyle habits became attention main in effort prevention transmission disease. However, after the end of the pandemic and easing of restrictions protocol health, cases diarrhea return experience increase in 2023 to reach around 36,534 cases. This condition show that behavior society and conditions

environment play a role important in dynamics incident diarrhea in urban areas such as Semarang City.

During 2017–2018 period, cases diarrhea in toddlers occupy sufficient proportion big, namely between 27% to 35% of total cases reported diarrhea. This figure show that group toddler is highly vulnerable populations to disease diarrhea, which is generally transmitted through contaminated water and environment. The high proportion case diarrhea in toddlers this also indicates that effort education and coaching behavior clean and healthy at the level House ladder Still need reinforced.

Research result from various regions in Indonesia show existence significant relationship between implementation of clean and healthy living behavior and incidents diarrhea, especially in toddlers. Research conducted by Azaria & Rayhana (2016) in the work area Community Health Center Sword Beans show that behavior mothers who implement clean and healthy living behavior with good—like wash hand with soap, use toilet healthy, and the use of clean water—related close with low incident diarrhea in toddlers. Findings Similar results were also obtained by Kartika (2022) in the Regency Sukabumi, which discovered that implementation of family clean and healthy living behavior influential significant to decline case diarrhea ( $p$  value = 0.005). Research another by Hutasoit et al. (2019) strengthens that habit family in guard cleanliness environment home and food is factor protective to incident diarrhea. Results This emphasize importance intervention behavior through clean and healthy living behavior approach to control disease diarrhea.

The COVID-19 pandemic that occurred in 2020–2022 brought big impact to change behavior communities in various aspect life, including in guard cleanliness self and environment. Society becomes more discipline in wash hand use soap, maintain cleanliness house, and notice water and food sanitation. A study conducted by Supinganto et al. (2022) explain that improvement knowledge about clean and healthy living behavior during pandemic contribute to change positive behavior public in prevent disease contagious. Increased This clean and healthy living behavior practice is what is estimated participate play a role in decline case diarrhea in Semarang City during period pandemic, as seen from 2020–2021 data.

However, after pandemic subside and policy easing protocol health enforced, attention public to cleanliness self and environment start decreased. Society tends to back to old habits, such as seldom wash hand with soap, less notice cleanliness of drinking water, as well as management waste House suboptimal ladder. As a result, in 2023 it was recorded improvement return case diarrhea until reach more from 36 thousand case. Phenomenon This in line with theory behavior health which states that change inappropriate behavior accompanied by with habituation term long tend nature while and will return like back to the beginning after factor driver (in matter this pandemic) ends. With thus, strengthening clean and healthy living behavior behavior in general sustainable become it is very important that habits clean and healthy can become culture society, not just response situational (Freya et al., 2022).

Apart from the factors behavior, condition the environment also holds role big in determine level incident diarrhea. Water and sanitation is factor the most influential environment. Research conducted by Hamijah (2022) showed that availability of clean water that meets conditions and existence toilet Healthy own connection strong with decline risk diarrhea in toddlers. A similar study by Wijayati & Kartini (2019) in West Sulawesi showed that sanitation bad environment, such as disposal waste House stairs that are not fulfil conditions and contamination of well water, increasing risk diarrhea in a way significant. In the context of Semarang City, most of which its territory Still own challenge related system drainage, sanitation congested residents, as well as vulnerability flood seasonal factors environment this is very relevant in explain height case diarrhea in the years certain periods, including 2018 and 2023.

Interaction between factor behavior and environment show that fluctuations case diarrhea is results from combination complex between habit society and conditions physique environment. When society implementing clean and healthy living behavior with

good, effect less than ideal environment can pressed, and vice versa, if behavior public decreases, then factor environment will make things worse situation. In addition, it is necessary factors also need to be taken into account institutional like effectiveness system surveillance disease, intervention health society, as well as preparedness face incident outside ordinary. During the pandemic, some big source power health focused For dealing with COVID-19, which has caused activity monitoring disease based environment like diarrhea reduce intensity. Condition This Can impact on delays detection early and response to surge case.

Ascension case diarrhea in 2023 can interpreted as combination from a number of factor main: first, the decline compliance public towards clean and healthy living behavior post-pandemic; second, the decline quality sanitation and clean water consequence weakness maintenance infrastructure environment; third, not yet recovery fully system surveillance disease and intervention health society; and fourth, factor external like weather extreme and events outside normal local that can make things worse water quality and the environment. With Thus, the approach is of a nature multisectoral required For overcome problem diarrhea in a way comprehensive — no only from side behavior.

### *3.4 Correlation between community-based total sanitation and diarrhea*

Decline drastic case diarrhea in 2020–2021, especially case diarrhea in toddlers namely 6,000 cases in 2021 are highly correlated positive with improvement behavior massive hygiene during the COVID-19 pandemic in line with Pillar 2 CTPS (94.02%). This shows that intervention behavior wash hand use soap give significant impact to disease diarrhea. However has happen improvement case diarrhea in 2022–2023, although pillar 1 (SBS) has reached 100% followed with decline awareness behavior life clean and healthy post pandemic. According to The Indonesian Ministry of Health (2012) stated that matter This indicates that risk improvement occurrence case diarrhea now more dominated by factors environment that is including

Security household waste as factor risk; in 5 main pillars magement rubbish house household achievements are weakest achievement which is 88.50%. This is can become source vector disease and pollution environment. Vector -borne diseases from flies that land on garbage then fly and perch to food, next food the eaten by humans resulting in occurrence disease digestion like diarrhea. Polluted environment consequence from management bad trash invite Lots vector disease No only fly but also rats, cockroaches, and so on. Management rubbish House stairs that are not optimal can become source vector disease. The magement rubbish house household achievement of 88.50% shows existence possible gaps flies, rats, cockroaches, and vectors other transmit pathogen reason diarrhea. Flies, for example, can perched on contaminated waste Then move to food, so that pathogen can enter to body man through consumption food said. Research by Amir et al. (2023) confirms that management good trash can lower incident diarrhea, especially in toddlers. Therefore that, the increase quality management rubbish House ladder become an important strategy in control diarrhea.

Home air quality and environment, on indicators addition to the household air quality management points which only reached 67.2% is lowest achievement if compared to with the other pillars. This is show environment House stairs that have not been fully healthy that can make things worse condition sanitation in a way overall so that can trigger occurrence disease like diarrhea, dysentery, and so on. Research by Maiyasaq et al. (2025) found that quality environment House bad stairs contribute to improvement case diarrhea, so that repair condition physique adequate house and ventilation be one of intervention important. Challenge disparity, extreme disparities found in Community Health Centers Pandanaran become point critical, where failure implementation of STBM, namely only reached 10.41% on the main pillar and indicator almost total addition can be become source transmission disease persistent infection at the level local. This is need traced what causes low implementation of community-based total sanitation whether condition environment sanitation that is still bad or lack of communication and collaboration cross sectors that

result in lack of integration of the community-based total sanitation program with control disease diarrhea. In addition factor external like rainfall heavy rain, poor quality drinking water guaranteed cleanliness and safety as well as density settlements can also influence or contribute to fluctuations incident diarrhea. Barus et al. (2020) showed that success implementation of community-based total sanitation in general comprehensive own correlation significant with decline incident diarrhea in the community.

#### **4. Conclusions**

Community-based total sanitation achievements have been succeed overcome sanitation basic, but has happen improvement case diarrhea in 2022–2023 which shows Still There is gap in implementation cleanliness environment and behavior hygienic public Still need improved. Required collaboration cross sector in improvement water quality, management waste liquid, management waste and clean and healthy living behavior education, as well as synchronization between community-based total sanitation and control programs disease based environment that needs improved For guard decline case diarrhea can sustainable. Improvement magement rubbish house household and health management indoor air quality achievements are necessary prioritized through 3R (*Reduce, Reuse, Recycle*) socialization and education importance ventilation as well as cigarette smoke control/kitchen. The need for audit and intervention soon in some health centers that experience failure extreme implementation so as not to become source distribution an incurable disease controlled.

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#### **Author Contribution**

Z.T.S.H., contributed fully to all stages of the research, including the formulation of the research idea and objectives, data collection and analysis, and preparation of the final manuscript. The author has read, reviewed, and approved this manuscript for publication.

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