

Diarrhea Prevalence in East Java, Indonesia: Does Access to Sanitation and Health Behavior Ecologically Related?

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Abstract

Diarrhea is still a problem in East Java in Indonesia. The study aims to analyze the ecological relationship between sanitation access and health behavior with diarrhea prevalence in East Java, Indonesia. The research conducted the ecological analysis using secondary data from the Ministry of Health of the Republic of Indonesia report in 2018. The study takes all regencies/cities in East Java Provinces as samples. Apart from the diarrhea prevalence in children under five, four other variables analyzed as independent variables were access and clean water sources, the percentage of coverage of access to healthy latrines, the proportion of proper handwashing behavior, and the proportion of defecating behavior in healthy latrines. The study analyzed data using a scatter plot. The study results found that the higher the percentage of coverage of access and clean water source in regency/city, the lower the prevalence of diarrhea in children under five in that regency/city. The higher the percentage of access to healthy latrines in a region, the lower the majority of diarrhea in children under five. Meanwhile, the higher the proper handwashing behavior proportion in an area, the lower the prevalence of diarrhea in children under five in that area. Moreover, the higher the proportion of defecating behavior in healthy latrines in a region, the lower the prevalence of diarrhea in children under five. The study concluded that sanitation access and health behavior were related to the diarrhea prevalence in children under five.

Keywords: *diarrhea, sanitation access, health behavior, ecological analysis, secondary data.*

Background

Diarrhea is described as the passing of three or more loose or liquid stools per day, or more frequently than is typical for the person¹. East Java, as one of the provinces in Indonesia with the second largest population after DKI Jakarta Province, has a diarrhea prevalence rate that is close to the national prevalence rate, which is 6.5%². Based on the East Java Provincial Health Office data in 2019, the diarrhea service coverage from 2015-2019 experienced a downward trend, wherein 2019 the figure was 74.10%, indicating that people who had diarrhea

have not been fully served by health facilities³.

Diarrhea diseases are some of the major contributors to global child mortality, resulting in 8 per cent of all child deaths under 5 years of age⁴. Diarrhea diseases, such as cholera, may be endemic, with continuous transmission, or epidemic, like during an outbreak⁵. Research conducted by Baral et al in 2020, states that the average cost spent by patients suffering from diarrhea with outpatient is US \$ 36.56 and inpatient is US \$ 159.90. Another judgment from the study is direct medical costs for 79% (83% for inpatient and 74% for outpatient) of the total direct costs⁶.

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Access to clean water is an indicator of the Sustainable Development Goals (SDGs), which is also an effective way to prevent diarrhea cases⁷. Research conducted by

Otsuka in 2019, states that the management of drinking water at home and meaningful personal hygiene practices for children is essential for the sustainability and promotion of children's health in urban slum areas in Indonesia⁸. Other research conducted by Bidkhor in 2019 stated that the diarrhea-associated deaths in children under 5 years are influenced by factors such as Use of Improved Drinking-Water Sources (UIDWS) and Use of Improved Sanitation Facilities (UISF), and this rate can be reduced by making UISF and UIDWS available for people and especially people of rural areas⁹.

Behavioral aspects with behavior are closely related. Research conducted by Auliaailahi in 2020 states that there is a relationship between healthy life behavior and cases of diarrhea in Indonesia¹⁰. Another research conducted by Aftab et al in 2018, stated that many children may not receive prescribed medication for diarrhea and pneumonia on time. Taking into account the concerns of caregivers, an appropriate supply of medicines to lady health workers, enhanced facility-level care could strengthen care-seeking practices and child health outcomes¹¹. The study aimed to analyze the ecological relation between access to sanitation (clean water and latrines), health behavior (defecating and washing hands), and the prevalence of diarrhea in East Java, Indonesia.

Materials and Methods

The author designed the study using an ecological analysis approach. Ecological studies focus on comparisons between groups, not individuals. The data analyzed is aggregate data at a particular group or level, which in this study is the provincial level. An ecological analysis variable can be aggregate

measurements, environmental measurements, or global measurements^{12,13}.

The author conducted the study using secondary data from the 2018 Indonesia Basic Health Survey chapter of East Java Province. The study involved all regions in East Java (38 regencies/cities).

In this study, the dependent variable is the prevalence of diarrhea in children under five. Meanwhile, the study analyzed two groups of independent variables, namely sanitation access and health behavior. The sanitation access consists of two variables: the percentage of access and clean water sources and the percentage of coverage of access to healthy latrines. Healthy latrine is a type of latrine with a goose neck seat and uses a septic tank for disposal². The health behavior consists of two variables: The proportion of proper handwashing behavior and the proportion of defecating behavior in healthy latrines.

The study used univariate and bivariate analysis to examine the data. The review uses a scatter plot to perform bivariate analysis. The analysis employs a fit-line to assess the relationship between diarrhea prevalence in children under five and independent variables. The research used SPSS 21 program in the entire review process.

Results

Table 1 shows the diarrhea prevalence in children under five and other variables in East Java, Indonesia, in 2018. Table 1 indicates a very high variation between regencies/cities. The diarrhea prevalence in children under five was the lowest, 1.2% (Kediri City), while the highest prevalence was 17.9% (Bondowoso Regency).

Table 1. Statistic descriptive of the diarrhea prevalence in children under five and other variables in East Java, Indonesia, in 2018

Variable	N	Minimum	Maximum	Mean	Std. Deviation
The prevalence of diarrhea in children under five	38	1.2	17.9	9.121	4.0220
Percentage of coverage of access and clean water sources	38	54.9	100.0	90.889	9.4529
Percentage of coverage of access to healthy latrines	38	34.4	92.1	72.561	14.4047
The proportion of proper handwashing behavior	38	33.7	79.1	54.074	11.8987
The proportion of defecating behavior in healthy latrines	38	51.2	99.6	87.426	11.2948

Sanitation Access

Figure 1 shows scatter plot of the prevalence of diarrhea in children under five and the percentage of coverage of access and clean water source in East Java Province in Indonesia in 2018. The figure indicates hubungan kedua variabel tersebut memiliki

kecenderungan yang negatif. It means bahwa semakin tinggi the percentage of coverage of access and clean water source in a regency/city, maka semakin turun the prevalence of diarrhea in children under five in that regency/city.

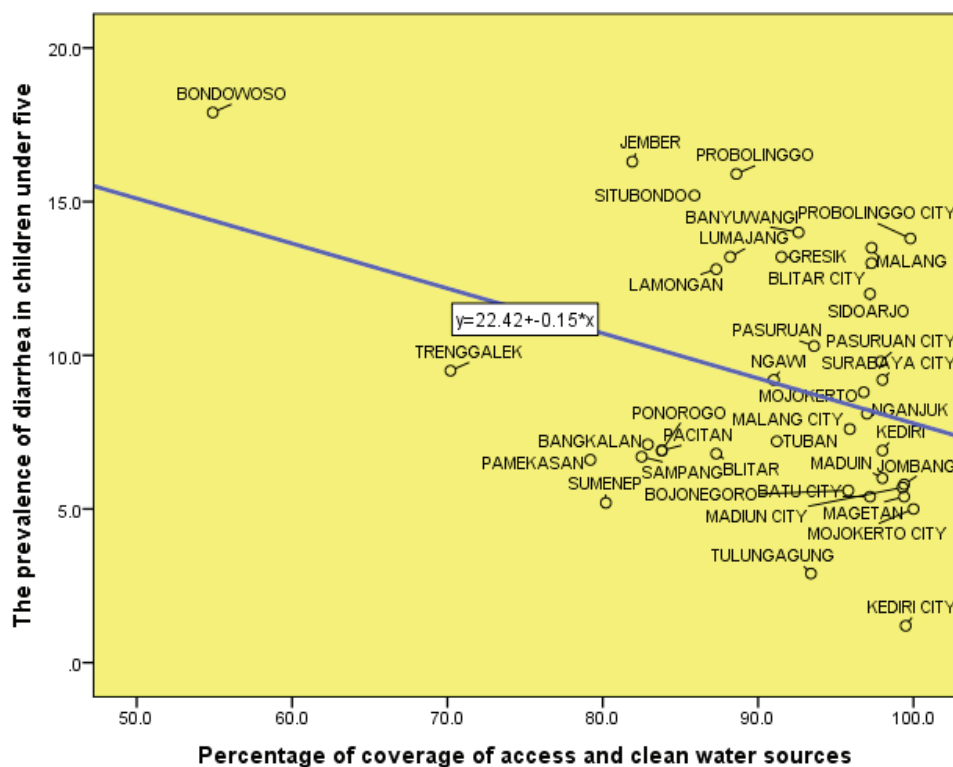


Figure 1. Scatter plot of the prevalence of diarrhea in children under five and the percentage of coverage of access and clean water source in East Java Province in Indonesia in 2018

Source: The 2018 Indonesia Basic Health Survey chapter East Java

Water supply is basic sanitation that must be fulfilled properly. The fulfillment of basic sanitation remains the best protection against diarrhea¹⁴. Basic sanitation includes water supply, healthy latrine, waste and water disposal. Several previous studies at the individual level also found consistent results. Sources of clean water were found to be the factor that can reduce the incidence of diarrhea. Clean water supply continuously can reduce acute diarrhea among under-five children in slums¹⁵. Clean water supply is a crucial factor for life. Clean water is needed by each individual for drinking and daily activities. For this reason, the supply of clean water plays a decisive role both in the survival of life

and in preventing water-borne diseases such as diarrhea. The results showed that improvement in drinking water was associated with a decrease in the risk of diarrhea¹⁶. Water supply associate with the incidence of acute diarrhea among children under five¹⁷. The results show that improved water supply could reduce diarrhea in under-5 children by 11%¹⁸

Figure 2 shows scatter plot of the prevalence of diarrhea in children under five and the percentage of coverage of access to healthy latrines in East Java Province in Indonesia in 2018. The result shows the relationship between the two variables has a negative tendency. It informs that the higher the percentage of coverage of access to healthy latrines in a region, the lower the prevalence of diarrhea in children under five in that region.

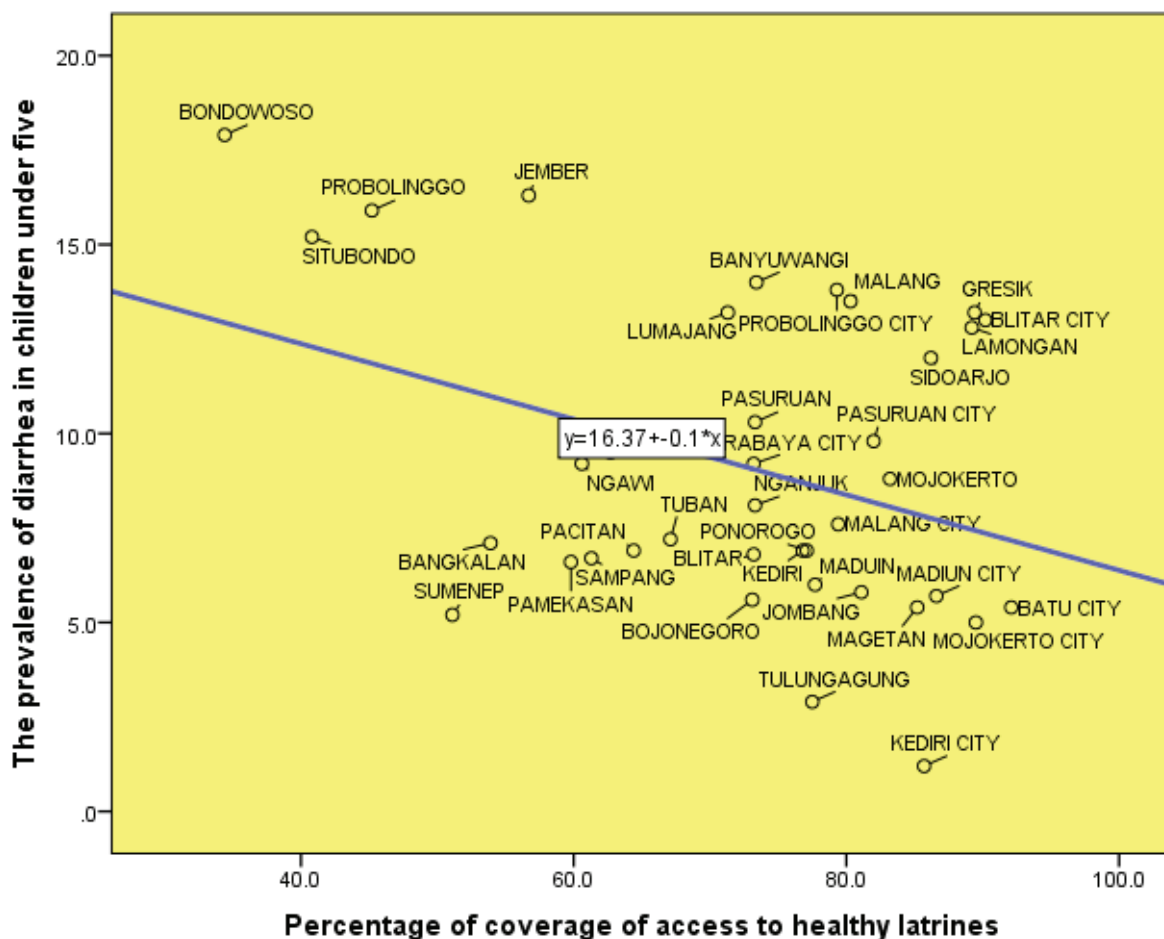


Figure 2. Scatter plot of the prevalence of diarrhea in children under five and the percentage of coverage of access to healthy latrines in East Java Province in Indonesia in 2018

Source: The 2018 Indonesia Basic Health Survey chapter East Java

The high level of access to healthy latrines in society makes feces as a polluting factor more easily localized. Feces is the main polluting factor that is often found in the environment. The distribution of feces in the environment needs to be controlled because it can become a medium for transmitting fecal-oral diseases such as diarrhea. Several studies have stated that the *e coli* bacteria from feces often contaminate the environment like water sources. The data shows that there are 14% of countries in Europe and 52% of countries in Africa faecally contaminated¹⁹. Several water sources in Indonesia are also proven to be contaminated. *E. coli* that comes from feces^{20, 21}. *Escherichia coli* is a germ that exists in the digestive tract, so if the environment contains *Escherichia coli*, it can indicate that environmental contamination has occurred. Latrine cleanness must be build up. Latrine can significantly reduce the incidence of diarrhea²². One of the factors that influence the localization of feces depends on the type of toilet. Latrine type that is close with wastewater disposal, hand washing, and storage of water has a risk of diarrhea incidence ($p < 0.05$)²³. The presence of healthy latrine, water shortage in household consumption/water access at the individual level, water shortage in households

had a statistically significant association with diarrhea occurrence in the Dangla district²⁴. Healthy latrine, include the availability of handwashing facilities around latrine, hand washing practice at the critical time for handwashing, storage of water were the determinant factors of diarrheal diseases²⁵.

Health Behavior (Hand Washing)

Figure 3 shows a scatter plot of the prevalence of diarrhea in children under five and the proportion of proper handwashing behavior in East Java Province in Indonesia in 2018. The scatter plot informs the relationship between the two variables has a negative tendency. It concludes that the higher the proportion of proper handwashing behavior in an area, the lower the prevalence of diarrhea in children under five in that area.

These findings further reinforce the results of previous studies that examined the same themes at the individual level. The habit of handwashing using soap in running water can reduce the risk of diarrhea. This is in line with previous research which said that The main sources of drinking water, domestic waste disposal place, and use of soap for handwashing were the most important factors for the prevention of childhood diarrhea.²⁶ Hand washing practice have sig associate with diarrhea²⁷.

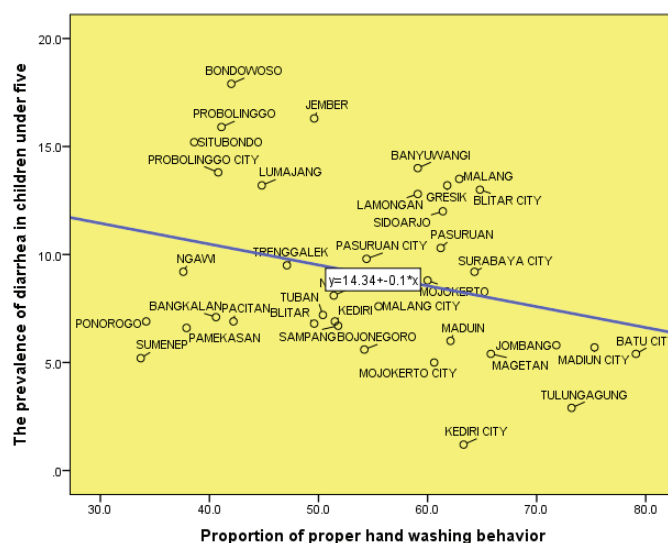


Figure 3. Scatter plot of the prevalence of diarrhea in children under five and the proportion of proper hand washing behavior in East Java Province in Indonesia in 2018

Source: The 2018 Indonesia Basic Health Survey chapter East Java

Figure 4 shows the bivariate analysis of the prevalence of diarrhea in children under five and the proportion of defecating behavior in healthy latrines in East Java Province in Indonesia in 2018. The figure informs that the relationship between these two factors

has a negative tendency. It concludes that the higher the proportion of defecating behavior in healthy latrines in a regulation/city, the lower the prevalence of diarrhea in children under five in that regulation/city. In line with handwashing behavior, defecating behavior in healthy latrines is also a protective factor from the incidence of diarrhea.

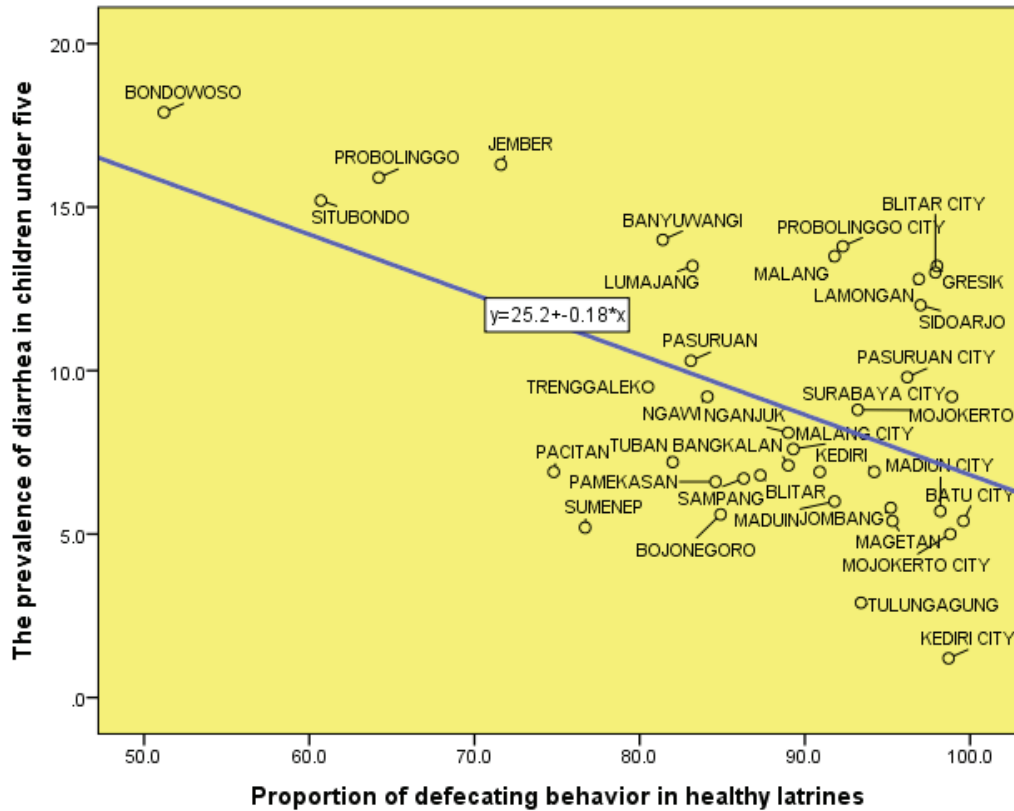


Figure 4. Scatter plot of the prevalence of diarrhea in children under five and the proportion of defecating behavior in healthy latrines in East Java Province in Indonesia in 2018

Source: The 2018 Indonesia Basic Health Survey chapter East Java

Policymakers in East Java Province can use the results of this study to determine the target regency/city to be accelerated to reduce the prevalence of diarrhea in children under five. This regency/city is an area with low coverage in four respects, namely access and clean water sources, access to healthy latrines, proper handwashing behavior, and defecating behavior in the healthy latrine. The behavior of diarrhea prevention associated with knowledge (28) so the level of knowledge in diarrhea

prevention should be increasing to behavioral change.

The author conducted a study with an ecological analysis approach to capture the superficial phenomena needed by policymakers to reduce the prevalence of diarrhea in children under five in East Java, Indonesia. On the other hand, this study cannot capture specific local phenomena related to others' behaviors. Some of them are behaviors that relate to the habit of feeding

practices in children under five that was informed in previous studies²⁹⁻³¹.

Conclusions

Based on the research results, the study concluded that sanitation access and health behavior were related to the diarrhea prevalence in children under five. The percentage of access to clean water sources, the rate of coverage of access to healthy latrines, the proportion of proper handwashing behavior, and the proportion of defecating behavior in healthy latrines, were negatively related to the diarrhea prevalence in children under five.

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Ethical Clearance: The study was conducted by utilizing secondary data from published reports. For this reason, the study not required ethical clearance in the implementation.

Conflicting Interests: Nil

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