People Conditions from Socio-economic and Health Aspects on Access to Improved Drinking Water in East Nusa Tenggara Province

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ABSTRAK

Dinamika yang terjadi pada akses air minum layak di Provinsi Nusa Tenggara Timur dari tahun 2017 hingga tahun 2021, dapat juga terjadi pada kondisi masyarakat. Kajian ini bertujuan untuk mengetahui potensi dinamika yang mungkin terjadi pada kondisi masyarakat dari aspek sosial ekonomi (tingkat pendidikan dan kemiskinan) dan aspek kesehatan (tingkat penyakit diare), serta hubungannya dengan akses air minum yang layak. Dinamika kondisi masyarakat dianalisis berdasarkan perhitungan persentase rata-rata tahunan pada tingkat pendidikan, kemiskinan, dan penyakit diare dengan menggunakan metode analisis deskriptif komparatif. Kemudian kaitannya dengan akses terhadap air minum yang layak dihitung dan dianalisis dengan menggunakan metode analisis regresi linier. Hasil pertama, terjadi peningkatan tingkat pendidikan masyarakat seperti yang terjadi pada akses air minum yang layak, namun terjadi penurunan tingkat kemiskinan dan penyakit diare. Hasil lain juga menunjukkan bahwa terdapat hubungan yang signifikan dengan akses terhadap air minum yang layak, dibuktikan dengan nilai signifikansi F sebesar 0,0315. Hal ini menunjukkan terjadinya dinamika kondisi masyarakat, dan saling terkait/saling mempengaruhi satu sama lain dengan akses terhadap air minum yang layak..

Kata kunci: tingkat pendidikan, tingkat kemiskinan, tingkat kejadian penyakit diare, akses air minum layak, Provinsi Nusa Tenggara Timur

ABSTRACT

The dynamics in access to improved drinking water in East Nusa Tenggara province from 2017 to 2021 can also happen to the people's conditions. This study aims to determine the potential dynamics in people's conditions from socioeconomic (education and poverty rates) and health (diarrheal disease rate) aspects and their relationship with access to improved drinking water. The dynamics of people's conditions are analyzed based on the calculation of the annual average percentage of the education, poverty, and diarrheal disease rates using a comparative descriptive analysis method. Then to access improved drinking water, it is calculated and analyzed using the linear regression analysis method. The first result is an increase in the education rate of the people as has occurred in access to improved drinking water, but there has been a decrease in poverty and diarrheal disease rates. Other results also show a significant relationship with access to improved drinking water, as evidenced by a significance F-value of 0.0315. This shows the dynamics in people's conditions and interrelated/mutually impacting each other with access to improved drinking water.

Keywords: education rates, poverty rates, diarrheal disease rates, drinking water access, East Nusa Tenggara province

1. Introduction

Improved drinking water is a source that, by the nature of construction, adequately protects from outside contamination, particularly fecal matter (WHO and UNICEF, 2014). The implementation of improved drinking water includes piped water connection into the dwelling (yard or plot), public tap or standpipe, tube well or borehole, protected dug well, protected spring, and rainwater collection that are more than 10 meters from sewage disposal, waste

storage, and garbage disposal (Evans et al., 2013; WHO and UNICEF, 2014; Tamana, 2018). In other words, the management process also obtains improved drinking water that is needed and used by humans (Gusril, 2016). Apart from household consumption, this water is also needed and used for other activities such as health, agriculture, industry, mining, etc (Arnop et al., 2019; Mbarep et al., 2022). Until now, these activities have been growing and increasing rapidly. This also has the potential to increase the need for improved drinking water.

One of the regions in Indonesia that has experienced development in various sectors, including the people's access to improved drinking water, is East Nusa Tenggara province. From 2012 to 2016, the percentage of access to improved drinking water in East Nusa Tenggara province was below 63% (BPS-Statistics Indonesia, 2017). Based on these data sources, it is also seen that East Nusa Tenggara province is in the top 6 lowest in terms of people's access to improved drinking water from all regions in Indonesia. One effort to overcome this problem is to launch a strategy to fulfill access to improved drinking water up to 100% into the national medium-term development plan (RPJMN), which must be implemented from 2015 to 2019. The results of implementing the program can be seen in **Figure 1**. From the programs, it appears that there has been an increase in access to improved drinking water consistently in the last 5 years (2017-2021), with an average percentage increase of 5.072% per year. This is better than the previous period, but this increase also didn't meet the target of the established program. Because until 2021, there are still 14.6% of the people who don't have access to improved drinking water in East Nusa Tenggara province.
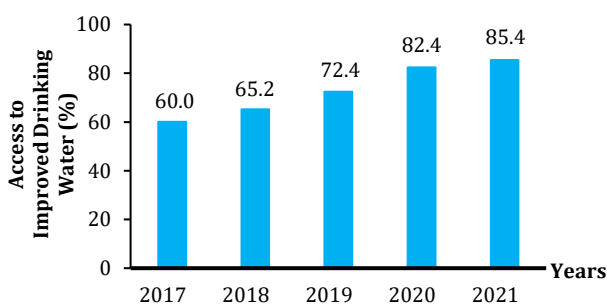

Figure 1. Percentage of access to improved drinking water in East Nusa Tenggara province *(BPS-Statistics Indonesia, 2022)*

There are several factors related to access to improved drinking water. In addition to the availability of natural resources (regional characteristics) and infrastructure readiness, other factors related to access to improved drinking water are the conditions of the people (people growth, socio-economic, health). According to Sukartini and Saleh (2016), trends in health conditions (morbidity) and socio-economic development of the people in a region are closely related to trends in access to improved drinking water. In Bengkulu and Central Java provinces, the socio-economic conditions of the people, namely trends in education and poverty rates, have impacted access to improved drinking water (Alihar, 2018; Rahim and Muchlisoh, 2021). In East Java Province, a more significant number of poor people results in lower access to improved drinking water than fewer poor people (Tamana, 2018). In Maluku Province, the condition, namely the trend of the people's education rate, is one factor that impacts access to improved drinking water (Adicita et al., 2021).

Based on previous research, the people's conditions in East Nusa Tenggara province also have the potential to experience dynamics from time to time, like the dynamics that occur in access to improved drinking water. The people's conditions in East Nusa Tenggara province also have the potential to have a relationship with access to improved drinking water. Therefore, a study will be carried out regarding information or data related to people's conditions from the socio-economic and health aspects to determine the dynamics that might occur. Data regarding socio-economic and health aspects will also be processed and analyzed to obtain an overview of access to improved drinking water.

2. Methodology
2.1. Research Location
East Nusa Tenggara province has a land area of 47,931.54 km² and comprises 22 administrative regions, namely 21 regencies and 1 city (BPS-Statistics of Nusa Tenggara Timur Province, 2022). East Nusa Tenggara province is bordered by the Flores Sea in the north, the State of Timor Leste in the east, the Indian Ocean in the south, and West Nusa Tenggara province in the west. In 2021, the total population was 5,387,740 people, with an average growth rate of 1.25% per year and an average number of household members of 4 to 5 people (BPS-Statistics of Nusa Tenggara Timur Province, 2022). The scope of this study area can be seen in **Figure 2**.
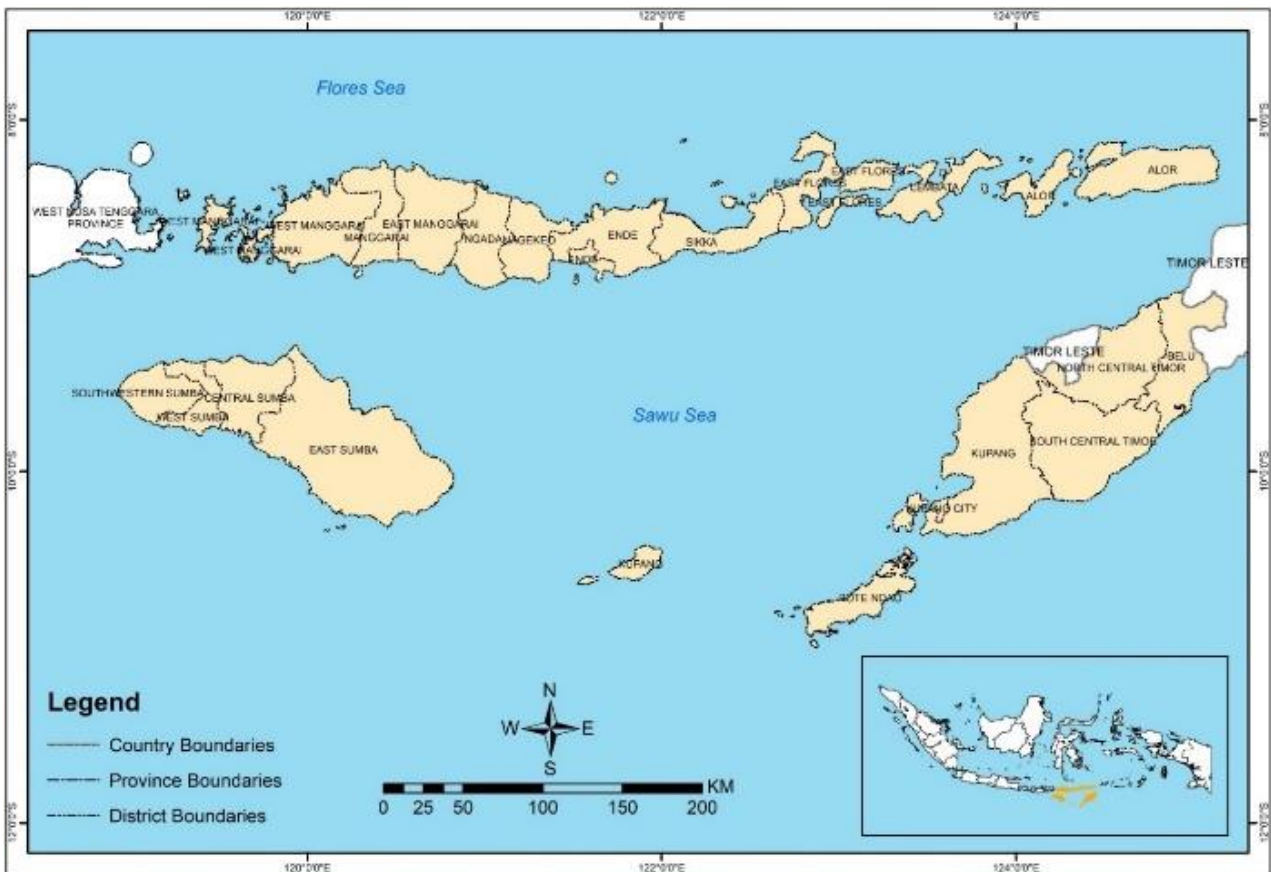
Figure 2. Map of East Nusa Tenggara province

2.2. Data Collection Methods

The data collected to answer the objectives of this research is the education and poverty rates which represent the people's conditions from a socio-economic aspect. Other data collected is the diarrheal disease rate which represents the people's conditions from a health aspect (morbidity) because diarrhea is one of the waterborne diseases. All data collected is data for a period of 5 years, 2017 to 2021. The data collection technique examines documents from online media, books, and journals, which are then processed/calculated to get the right results.

2.2.1. Data Collection for Education Rates

Data regarding the education rates obtained are in percentage form (%). This percentage is obtained by calculating the people aged 10 years and over who have high school diplomas to doctorates, divided by the total of people population. The result of the division is then multiplied by 100%. Data on the total of people population with high school diplomas up to doctorate and the total of people population comes from initial data calculations in the East Nusa Tenggara province BPS report book for 2018 to 2022. The formula for the explanation regarding acquiring education rates data can be seen below.

$$ER = \frac{PEn}{Pn} \times 100\% \qquad (1)$$

Information:
ER = Education Rates (%)

PEn = Amount of the people population with high school diplomas up to Doctorate in year (n)
Pn = The total of people population in year (n)

2.2.2. Data Collection for Poverty Rates

Data on poverty rates are also obtained in percentage form (%). The result is obtained by calculating the average amount of poor people divided by the total of people population. After the calculation process is complete, the result is multiplied by 100%. Data regarding the number of poor people and the total population comes from preliminary data calculations in the East Nusa Tenggara province BPS report book for 2018 to 2022. An explanation regarding the acquisition of poverty rates data is formulated below.

$$PR = \frac{PPn}{Pn} \times 100\% \qquad (2)$$

Information:
PR = Poverty Rates (%)
PPn = Amount of poor people in year (n)
Pn = The total of people population in year (n)

2.2.3. Data Collection for Diarrheal Disease Rates

Obtain data regarding the level of diarrheal disease also in percentage form (%). The data is obtained by calculating the number of cases of diarrheal divided by the total population, then multiplied by 100%. Just like the data on people's population, data on the number of diarrheal diseases

were also obtained from preliminary data calculations in the East Nusa Tenggara province BPS report book for 2018 to 2022. The formula for an explanation regarding acquiring data on diarrheal disease rates can be seen below.

$$DDR = \frac{PDn}{Pn} \times 100\% \qquad (3)$$

Information:
DDR = Diarrheal Disease Rates (%)
PDn = Amount of diarrheal disease cases in year (n)
Pn = The total of people population in year (n)

2.3 Data Analysis Methods

This research uses the descriptive comparative analysis method and multiple linear regression analysis methods. The comparative descriptive analysis method provides an overview of a phenomenon under study by comparing the data generated from one or more different samples/objects (Sugiyono, 2017). Data of the average percentage in education, poverty, and diarrheal disease rate per year, compared to the average percentage in access to improved drinking water per year. The method of multiple linear regression analysis in this paper is used to see the relationship between variables (Sugiyono, 2010). The relationship is between education, poverty, and diarrheal disease rate with access to improved drinking water. The process of linear regression analysis was also carried out using the Microsoft Excel program. The dependent variable (y) is improved drinking water, and the independent variable (x) is education, poverty, and diarrheal disease rate. Decision-making is done by looking at the significant value in the Coefficients table. Usually, the basis for testing the regression results is usually carried out with a confidence level of 95% or a significance level of 5% ($\alpha = 0.05$). The criteria for the statistical t-test (Ghozali, 2016) :

1) If the significance value of the t-test> 0.05, then H_0 is accepted and Ha is rejected. This means there is no influence between the independent variables on the dependent variable.
2) If the significance value of the t-test <0.05 then H_0 is rejected and Ha is accepted. This means that there is an influence between the independent variables on the dependent variable.

3. Results
3.1. Education Rates

The data collection and processing results show that the education rate of the people in East Nusa Tenggara province who have high school diplomas to doctorates was 21.91% in 2017. In 2018 this rate decreased by 0.48% from the previous year, so it became 21.43%. Then there was an increase of 4.77% from 2018, with 26.2% in 2019. In 2020, this rate experienced a slight decrease of 0.05% from the previous year, so it became 26.15%. Then, the percentage of education rates from those with a high

school diploma to a doctorate increased by 0.94% from the previous year, so it became 27.09% in 2021. Data trends from explanations regarding education rates can be seen in **Figure 3.**

Significant changes in data on education rates occurred between 2018 and 2019, with the most significant increase and meanwhile, the biggest decline occurred between 2017 and 2018. The data in **Figure 3** also shows that the trend in education rates has increased from 2017 to 2021, although this trend has also experienced ups and downs every year. So until now (in 2021), it is estimated that around 1,459,539 of the total population of 5,387,740 people (BPS-Statistics of East Nusa Tenggara Province, 2022) have completed their education from high school to doctoral levels. Thus, 3,928,201 people still have high school education levels and below in East Nusa Tenggara province.
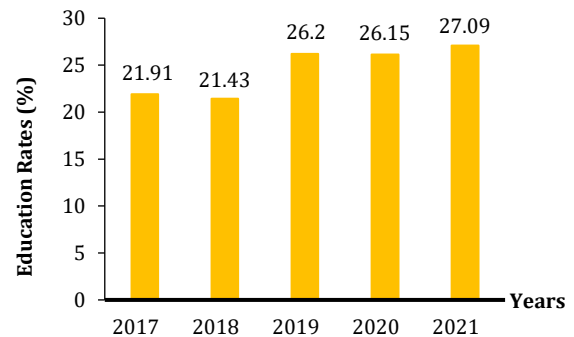
Figure 3. Percentage of education rates in East Nusa Tenggara province

3.2 Poverty Rates

In 2017, data regarding the poverty rate in East Nusa Tenggara Province was 22.1%. This rate decreased by 0.48% from 2017, becoming 21.62% in 2018. In 2019, the poverty rates again decreased by 0.77% from the previous year, so it became 20.85%. However, there was an increase of 0.2% from 2019, bringing the poverty rate to 21.05% in 2020. However, this figure decreased again by 0.33% from the previous year, reaching 20.72% in 2021. The data trend regarding the poverty rates in East Nusa Tenggara province described previously, can be seen in **Figure 4.**

From 2017 to 2021, the poverty rate is on a downward trend. This is because the highest poverty rates data occurred in 2017 and the lowest occurred in the following five years (2021). Even though there had been an increase between 2019 and 2020, the number of declines dominated. The most significant decrease in the poverty rates occurred between 2018 and 2019. Based on these data trends, it is estimated that there are still 1,116,340 poor people in East Nusa Tenggara province out of the current total of people population (in 2021), which is 5,387,740 people (BPS-Statistics of East Nusa Tenggara Province, 2022).
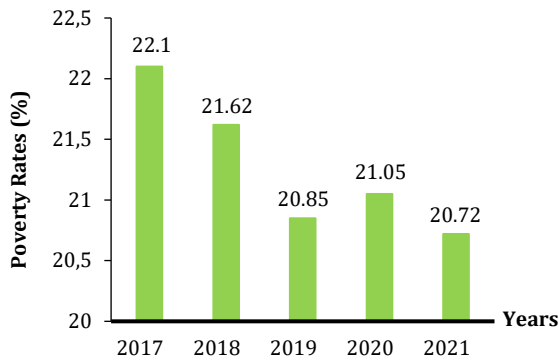
Figure 4. Percentage of poverty rates in East Nusa Tenggara province

3.3 Diarrheal Disease Rates

Based on data collection and processing that has been carried out, the diarrheal disease rate in East Nusa Tenggara province was 2.13% in 2017. In 2018 this rate decreased by 0.46% from the previous year, so it became 1.67%. The diarrheal disease rates decreased again by 0.41% in 2018, changing to 1.26% in 2019. In 2020, the decline occurred again by 0.31% from the previous year, bringing the value of the diarrheal disease rates to 0.95%. Another decline occurred by 0.2% in 2020, which became 0.75% in 2021. The trend of data regarding the level of diarrheal disease in East Nusa Tenggara province, which has been described previously, can be seen in **Figure 5.**

Data regarding diarrheal disease rates show a consistent downward trend. This shows that there has been no increase in cases of diarrheal disease from 2017 to 2021. Then it can be seen from the diarrheal disease rates that occurred the most in 2017, and in the next five years (2021), it will be the least. Even though the diarrheal disease rates in 2021 were the lowest, the most significant number of declines occurred between 2017 and 2018. Based on this data, until now (2021), it is estimated that about 40,408 people in East Nusa Tenggara Province have been affected by the diarrheal disease out of a total population of 5,387,740 people (BPS-Statistics of East Nusa Tenggara Province, 2022).
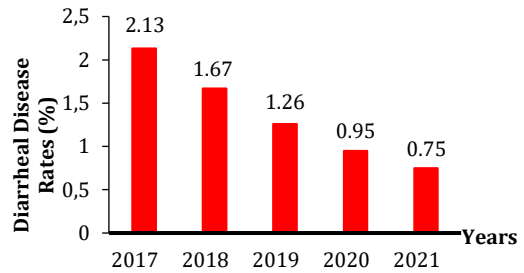

Figure 5. Percentage of diarrheal disease rates in East Nusa Tenggara province

3.4 People Conditions and Access to Improved Drinking Water

The data obtained shows that there has been an increase in the average percentage of people's education rate every year in the last 5 years (2017-2021) in East Nusa Tenggara province. However, there has been a decrease in the average percentage of poverty and diarrheal disease rates experienced by people each year. All the data obtained and explained can be seen and proven in **Table 1**. This data also shows that the increase in the number of people completing high school education up to doctoral degrees is in line with the increase in the number of people whose having access to improved drinking water every year. Then the trend of decreasing poverty rate in the people is not in line with access to improved drinking water which is experiencing an increasing trend. Similar to the poverty rates, the rate of diarrheal disease that occurred has also decreased in the last 5 years and is not in line with the people whose having access to improved drinking water which has increased.

This study also found a linear regression relationship between people's conditions from socio-economic aspects (education and poverty rates) and health (diarrheal disease rate) with access to improved drinking water, which can be seen in **Tables 2 and 3.** The analysis can be described in the model equation $y = 178.128 + 1.28X_1 + 11.93X_2 - 25.306X_3$, where y is access to safe drinking water, X2 is the poverty rates, and X3 is the diarrheal disease rates. The calculation results in **Table 2** show that the overall significance value of F value is <0.05, with a value of 0.0315. This means, there is an influence from the three variables above on improved drinking water.

Table 1. Average Value Analysis

No.	Variables	Years (%)					Average of Increase (+) or Decrease (-) per Year (%)
		2017	2018	2019	2020	2021	
I	**Access to Improved Drinking Water**	60.04	65.20	72.41	82.35	85.40	+ 5.072
II	**People Conditions**						
1	Socio-economic						
	Education Rates	21.91	21.43	26.20	26.15	27.09	+ 1.036
	Poverty Rates	22.10	21.62	20.85	21.05	20.72	- 0.276
2	Health						
	Diarrhea Disease Rates	2.13	1.67	1.26	0.95	0.75	- 0.276

Table 2. F-value analysis

Source of Variation	df	Number of Quadrants	Middle Quadrant	F	Significance F
Regression	3	470.0122922	156.6708	544.1699	0.0315
Residual	1	0.287907813	0.287908		
Total	4	470,3002			

The explanation of the effect of each variable can be seen in **Table 3**. When the sig. > α (0.05), the variable is less significant in influencing the y-variable. The result shows that there is a significant relationship between diarrheal disease rates with access to improved drinking water. As for the relationship between education and poverty, it has less effect on improved drinking water, which can be seen from the results sig. > 0.05. When viewed from the sig. value of each variable, the incidence of diarrheal disease is the variable that most influences/is influenced by the access to improved drinking water.

Table 3. T-value Analysis

	t Stat	Sig.
Intercept	-4.6894	0.133754
Education Rate	4.619499	0.135717
Poverty Rate	7.247571	0.087288
Diarrhea Disease Rate	-16.8841	0.037661

4. Discussion

Education is a place for giving and obtaining knowledge to produce conditions for individuals or people who are intelligent and wise and who can build civilization properly. In Indonesia, one of the efforts made to create a civilized society is the 12-year compulsory education program, in which people must study at least up to senior high school level (Rofiah and Kurniawan, 2017). Efforts were made in one of the regions, namely East Nusa Tenggara province, and increased by people who implement and obtain a proper education. Increasing individuals or communities who receive proper education can create a better-ordered living ecosystem. On the other hand, if many people do not get a proper education, it will cause underdevelopment and hinder various aspects of life from developing. Education is also an investment effort to earn a decent living (Hasanah and Jabar, 2017).

A decent living is also synonymous with individual and/or community socio-economic conditions, namely poverty. Until now, all countries in the world have been trying to eradicate poverty, especially all regions in Indonesia. The results of these efforts, one of which was carried out in East Nusa Tenggara province, show a trend of decreasing the poverty rate so that currently, the percentage of people living decent lives has increased to 79.28%. Poverty is a condition of the inability of individuals and/or people to meet various needs for life, so that it can also have an impact on the development of civilization (Saragih, 2015; Pratiwi et al., 2020). If

poverty is not overcome and even increases in an area, paralysis will occur in almost all aspects of life, including health conditions.

Health is essential for humans to maintain productivity to support survival (Sulistiarini and Hargono, 2018). Health conditions can be affected by diseases whose causes come from various sources, including water. There are several waterborne diseases, one of which is diarrheal, a significant health problem in several regions in Indonesia. Handling efforts continue to be carried out, and one of them is in East Nusa Tenggara province, which has shown a decrease in the incidence of diarrheal disease in the people in the last 5 years (2017-2021). The decreasing trend in the incidence of diarrheal diseases is a positive thing because diarrhea is the leading cause that hinders growth and development, even causing high individual or people mortality (Rahman et al., 2016). An increase in the incidence of diarrheal diseases may indicate problems with the socio-economic conditions of the people in an area.

From the results of this study, there is the latest information regarding the relationship between people's conditions and access to improved drinking water. Based on the overall calculations in **Table 2**, people's conditions from socio-economic aspects (education and poverty rates) and health (diarrheal disease rates) with access to improved drinking water in East Nusa Tenggara province have an interrelated relationship. However, from the results of a review of each variable in **Table 3**, only the incidence of diarrheal disease has a strong relationship with access to improved drinking water, and this is in line with research conducted by Sukartini and Saleh (2016). Then the poverty rate is less related to access to proper drinking water, and this is not in line with research conducted by Tamana (2018) and also Rahim and Muchlisoh (2021). The educational conditions of the people are also not related with access to proper drinking water, and this is not in line with research conducted by Alihar (2018) and Adicita et al. (2021).

5. Conclusion

The people's conditions from socio-economic and health aspects in East Nusa Tenggara province are also experiencing dynamics, the same as what happened to access to improved drinking water. The dynamics between population conditions from socio-economic aspects (education and poverty rates) and health (diarrheal disease rates) with access to improved drinking water produce relationships that are interrelated/impact one another. In particular, the

health aspect (diarrheal disease rates) has the strongest relationship than other aspects with access to improved drinking water. The results of this study also show that there are still people who are poor, suffer from diarrhea, do not have proper education, and certainly do not have access to improved drinking water. Therefore, it is necessary to carry out further research to create interrelated, holistic and sustainable strategies for overcoming the lack of access to improved drinking water, educational problems, poverty alleviation, and diarrheal disease management.

CONFLICT OF INTEREST
All of authors declares that there is no conflict of interest in this publication.

CONTRIBUTIONSHIP
All of authors in this paper equally as the main contributors. All authors prepared and finished this research together.

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