

DETERMINATION MODEL OF WHITE-WATER INTAKE IN THE MOROSI MINE AREA, INDONESIA

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ABSTRACT

The availability of safe drinking water sources in the Morosi mining area, Konawe Regency is still a challenge. This is because the location does not allow for the provision of a safe source of drinking water. However, there are many more determining factors for adequate drinking water in mining areas. Therefore, the research aims to analyze the model for determining the level of adequacy of drinking water a day for communities in the Morosi mining area, Konawe Regency, Indonesia. This research uses quantitative methods with a cross-sectional study design. This study will be carried out in the mining village of Morosi District, Konawe Regency, Indonesia. This study will interview 100 people in mining villages in May-July 2024. Independent variables include income, knowledge, attitudes, perceived vulnerability, perceived seriousness of illness, beliefs, social norms, self-efficacy, maintenance, recovery and commitment. Meanwhile, the dependent variable is the level of adequate daily drinking of water in coastal and mining communities. Analysis of determination data using Structure Equation Modelling with Smarts version 3. The level of adequate drinking water for communities in the Morosi mining area is influenced by the individual's own knowledge and attitudes. In this study, individual attitudes had a greater influence on the level of adequacy of drinking water (chi-square=6.646), compared to individual knowledge (chi-square=3.699). In this study, the attitude variable is an intermediate variable between the influence of income and the knowledge variable on the level of adequacy of drinking water. Therefore, to increase the adequacy of drinking water in mining areas, what needs to be done is to increase community knowledge and attitudes.

INTRODUCTION

Adequate water intake is very important to prevent chronic diseases including chronic kidney disease. Limited infiltration land in the mining area of Morosi District, Konawe Regency, Southeast Sulawesi Indonesia makes it difficult to source adequate drinking water for the community. Provision of drinking water sources in the Morosi area is partly served by the existing Morosi Mining Company. However, several other villages in the Morosi sub-district area still pose big challenges. People use dug wells which may not meet community requirements as a source of drinking water. One alternative is for people to buy bottled water for their drinking water needs. This of course requires additional funding for families in the Morosi area. Several studies state that the level of adequate white-water intake in particular is a risk factor for chronic kidney disease (1–3). Drinking water is good for kidney health, namely at least 2 liters per day.(1,4–6) The mining location is a high area and it is difficult to find drinking water sources. One of the mining locations

in Southeast Sulawesi Province is Konawe Regency. The mining location in Konawe Regency is in Morosi District. The coverage of hypertension services at the Morosi Community Health Centre is also among the ten highest in Konawe Regency in 2021, namely 72.70%(7). Diabetes mellitus coverage is also the fifth highest at the Morosi Health Centre out of 26 Community Health Centres in Konawe Regency. Therefore, it is important to analyse the determining factors of the level of adequate drinking water intake of a value of 2 liters a day at mining sites in Morosi District.

By looking at the determining factors of adequate drinking water levels, control of chronic kidney disease can be overcome quickly in high-risk locations. Apart from family income level, previous studies stated that other determining factors for adequate daily drinking water include heat stress,(8–10) knowledge,(11) and attitudes about the benefits of drinking water.(12–14) Other factors related to safe drinking water consumption behaviour also include vulnerability, belief, norms, self-efficacy, maintenance, recovery, and commitment.(15–21) The question in this research is what are the determining factors for adequate drinking water intake in the mining area of Morosi District, Konawe Regency in Southeast Sulawesi Province. In this case it still needs to be analysed. The aim of this research is to analyse the determination of the level of adequacy of drinking water a day for people in the Morosi mining area, Konawe Regency, Southeast Sulawesi, Indonesia.

METHODOLOGY

Research design

This type of research uses quantitative methods with a cross-sectional study design. This Cross-Sectional Study design is an epidemiological study that studies the prevalence, distribution and relationship of disease and exposure by observing the status of exposure, disease or other outcomes simultaneously in individuals from the population at one time.

Research setting

This research was carried out in coastal villages in the Nambo Health Center area of Kendari City and mining villages in the Morosi Health Center area of Konawe Regency. This research was carried out in May-July 2024.

Population and Sampling

The population in this research is the community in the mining village in the Morosi Health Center area, Konawe Regency. The population in the mining village in the Morosi Health Center area, Konawe Regency is 339 families.(22) The sample size in the Morosi mining village was 184 people, calculated using the Slovin formula. The samples were drawn using the Cluster Random Sampling Technique. Where samples were taken from each mining area in Morosi District, Konawe Regency. Sample inclusion criteria are aged over 35 years; Domiciled in the Morosi Health Centre area for a minimum of 2 years, Willing to participate in this research, and can communicate well.

Research variables

The independent variables in this research include income, knowledge, attitudes, vulnerability, emergency, beliefs, norms, self-efficacy, maintenance, recovery and commitment. The dependent variable in this research is the level of adequacy of drinking water a day in coastal and mining areas.

Data analysis

Data were analyzed using SEM-PLS analysis using SMASRPLS software version 3.0.

Construct Reliability dan validity instrument

The table below states that this research instrument is valid and reliable.

Table 1. Construct Reliability and validity of the research instrument for determining the adequacy of water intake in the Morosi mining area

	Cronbach's Alpha	rho_A	Composite Reliability	Average Variance Extracted (AV...
EFIKASI DIRI	0.837	0.841	0.880	0.549
KECUKUPAN MINUM AIR PUTIH	1.000	1.000	1.000	1.000
KEPERCAYAAN	0.752	0.754	0.843	0.574
KOMITMEN	1.000	1.000	1.000	1.000
NORMA SUBJEKTIF	0.625	0.634	0.841	0.726
PEMELIHARAAN	1.000	1.000	1.000	1.000
PEMULIHAN	1.000	1.000	1.000	1.000
PENDAPATAN	1.000	1.000	1.000	1.000
PENGETAHUAN	0.619	0.619	0.840	0.724
PERSEPSI KERENTANAN	1.000	1.000	1.000	1.000
PERSEPSI KESERIOUSAN PENYAKIT	0.613	0.626	0.837	0.719
SIKAP	0.602	0.670	0.828	0.709

The table above shows that the Croncach's alpha value shows that each variable is reliable (> 0.6). and each indicator shows validity, namely as shown by the Average Variance Extracted (AVE) value > 0.5. The model used to analyze determination is also declared fit, as shown in the following table.

Table 2. Fit model for determining the level of adequacy of water intake in the Morosi mining area

	Saturated Model	Estimated Model
SRMR	0.082	0.115
d_ULS	1.999	3.982
d_G	0.910	1.155
Chi-Square	498.005	595.769
NFI	0.524	0.431

The table above shows that the SRMR value is <0.10 and the NFI value is close to 1, which means that the model is declared fit.

Model of determinants of adequate water intake in the Morosi Mining area

Figure 1 below explains the determinants of adequate water intake at the Morosi mine site. In this case, there are 2 variables as direct determinants of adequate water intake, namely attitude and knowledge variables. Knowledge encourages individuals to recognize and feel the seriousness of the disease they are suffering from. Attitudes are formed determined by knowledge. Knowledge is closely related to the level of family income. Where family income also influences maintenance and restoration practices, apart from being related to the individual's level of knowledge. Meanwhile, attitudes encourage the emergence of trust which then gives rise to feelings of vulnerability and the seriousness of the illness he is currently experiencing. Where the emergence of a perception of vulnerability then encourages the emergence of commitment in the individual, including fulfilling the intake of water to maintain health.

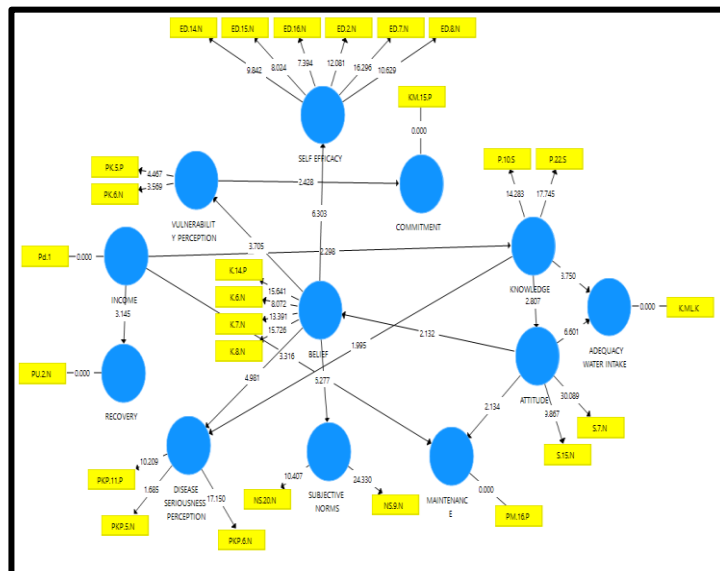


Figure 1. Model of determinants of adequate water intake in the Morosi Mining area in 2024

Table 3 shows that the relationship between variables is very significant. First, attitude is significantly related to adequate water intake (p value=0.000<0.05). Attitude is also significantly related to trust (p value=0.034<0.05) and related to maintenance (p value=0.033<0.05). Meanwhile, beliefs are significantly related to the perception of the seriousness of the illness (p value=0.000<0.05), related to self-efficacy (p value=0.000<0.05), significantly related to subjective norms (p value=0.000<0.05), and significant with perceived vulnerability (p value=0.000<0.05). Furthermore, income is significantly related to knowledge (p value=0.022<0.05), related to maintenance (p value=0.001<0.05), and significantly related to recovery (p value=0.002<0.05). Moreover, individual knowledge is closely related to adequate water intake (p value=0.000<0.05), related to attitude (p value=0.005<0.05), and closely related to the perception of the seriousness of the illness (p value=0.047<0.05). Lastly, perceived vulnerability is also closely related to commitment (p value=0.016<0.05).

Table 3. Path Coefficients model for determining of adequacy of water intake in the Morosi mining area in 2024

	Original Sample (O)	Sample Mean (M)	Standard Deviation (STDEV)	T Statistics (O /STDE...)	P Values
ATTITUDE -> ADEQUACY WATER INTAKE	-0.482	-0.480	0.073	6.601	0.000
ATTITUDE -> BELIEF	0.229	0.230	0.107	2.132	0.034
ATTITUDE -> MAINTENANCE	0.211	0.209	0.099	2.134	0.033
BELIEF -> DISEASE SERIOUSNESS PERCEPTION	0.530	0.525	0.106	4.981	0.000
BELIEF -> SELF EFFICACY	0.566	0.574	0.090	6.303	0.000
BELIEF -> SUBJECTIVE NORMS	0.560	0.560	0.089	6.277	0.000
BELIEF -> VULNERABILITY PERCEPTION	0.457	0.451	0.123	3.705	0.000
INCOME -> KNOWLEDGE	-0.232	-0.230	0.101	2.298	0.022
INCOME -> MAINTENANCE	-0.293	-0.293	0.088	3.316	0.001
INCOME -> RECOVERY	-0.285	-0.285	0.091	3.145	0.002
KNOWLEDGE -> ADEQUACY WATER INTAKE	0.328	0.329	0.087	3.750	0.000
KNOWLEDGE -> ATTITUDE	0.265	0.266	0.094	2.807	0.005
KNOWLEDGE -> DISEASE SERIOUSNESS PERC...	0.189	0.200	0.095	1.995	0.047
VULNERABILITY PERCEPTION -> COMMITMENT	0.349	0.343	0.144	2.428	0.016

The table 4 shows that the magnitude of the influence of each variable shows the highest of disease seriousness perception ($R^2=0.342$), compared to the variables of self-efficacy, belief,

commitment, subjective norms, maintenance, recovery, awareness, vulnerable perception, disease seriousness perception, knowledge, attitude, and adequacy water intake.

Table 4. R Square and R Square Adjusted Model Determination of adequacy of water intake in the Morosi mining area in 2024

	R Square	R Square Adjusted
ADEQUACY WATER INTAKE	0.256	0.241
ATTITUDE	0.070	0.061
BELIEF	0.052	0.043
COMMITMENT	0.122	0.113
DISEASE SERIOUSNESS PERCEPTION	0.342	0.328
KNOWLEDGE	0.054	0.044
MAINTENANCE	0.137	0.119
RECOVERY	0.081	0.072
SELF EFFICACY	0.320	0.313
SUBJECTIVE NORMS	0.314	0.307
VULNERABILITY PERCEPTION	0.209	0.201

Discussion

The level of water intake that is very significantly different in the Morosi mining area is water intake at night, compared to morning and afternoon. There are several phenomena that can be seen in the Morosi mining area. Firstly, it can be said that nighttime activities are no longer finished for most mine workers compared to mornings and afternoons. Mining workers have several shifts to replace their workforce. There are those who work from morning to evening, and there are those who work from afternoon to evening, and there are also those who work from evening to morning. Apart from that, the phenomenon of people living around the mining location is interesting to observe. With the existence of the mining industry, almost all surrounding communities have opened small and medium businesses or entrepreneurs in the form of food stalls or shops that provide various types of needs for mining workers. Several mining companies in Southeast Sulawesi, including in Morosi, manage corporate social responsibility programs or what is called CSR. CSR programs in environmental conservation and mitigation communities also include socio-economic improvement for communities around mining companies. The results of this CSR have also been used for the community around the Morosi Mine.(23) This phenomenon is unique in terms of water intake that occurs in mining areas. The community businesses or entrepreneurs including shops or stalls is open from morning to evening. Therefore, it is possible that there are two different conditions, namely that the majority of people rest after working in the mine, and the majority also actively work independently in their shops or stalls. This is what causes significant differences in water intake at night in the Morosi Mine area.

The level of adequate water intake of communities in the Morosi mining area is influenced by the individual's own knowledge and attitudes. In this study, individual attitudes had a greater influence on the level of adequacy of drinking water (chi-square = 6.646), compared to individual knowledge (chi-square = 3.699). The results of this study are consistent with previous research, where the ability of attitudes to influence behaviour is greater than knowledge. In a study by Dehghan et.al (2021), it was stated that the ability of attitudes to predict behaviour was 54%, compared to knowledge which was only 31%.(21)

Furthermore, in the current study it was shown that the attitude variable is the intermediate variable between the influence of income and the knowledge variable on the level of adequacy of drinking

water. Individual income has a significant effect on individual knowledge about the benefits of drinking enough water on muscle fatigue and skin health. This means that individual income greatly influences individual access to obtain information about the benefits of water. In the end, it creates a positive attitude about the benefits of sufficient water on muscle strength and body tissue. Furthermore, other study states that the family or parent income has been stated in other studies to influence children's attitudes towards using finances.(24) This means that the adequacy of parental income can influence a child's attitude in using his pocket money. In this case, it could be spending on food and drinks, which has an impact on nutritional adequacy in food and drinks.

Moreover, the individuals' attitude also mediates between the income and knowledge variables on the level of maintenance. although the influence of income can directly influence an individual's level of maintenance. Maintenance in this case is the fulfilment of drinking water only when the individual is dizzy. The direct influence of income on maintenance actions is greater when compared to the mediation of individual knowledge and attitudes. Besides that, individual income has also influenced the behaviour of drinking water towards restoring health, namely by drinking water after eating. Although the recovery variable does not directly and significantly influence the level of adequate drinking water per day, namely a minimum of 2000 ml per day. Attitude influence individual beliefs, which then increase the efficacy of the treatment and the emergence of perceptions of subjective norms, perceptions of vulnerability and perceptions of the seriousness of the disease. The influence of individual beliefs is much greater on subjective norm perceptions than on perceptions of vulnerability and perceived seriousness of illness. The belief that people in this region have regarding the adequacy of drinking water is related to increasing body temperature, providing energy to muscles, lubricating joints and cushioning the spinal cord. The emergence of this belief can occur because the weather in the Morosi mining environment is quite hot, muscle conditions and problems with the joints and spine. However, the biggest indicator of confidence regarding the adequacy of drinking water is the health of the joints and spine.

The indicator of the subjective norm which is very influential is belief in the surrounding environment regarding the fulfilment of drinking water for fluid balance in the body and repair of the spinal cord. The individual's subjective norm variable greatly influences his or her level of self-efficacy. Individuals really believe that they are healthy, strong, have healthy joints, healthy eye tissue, are not dehydrated and are not dizzy, even though they don't drink enough water a day. Perceptions of subjective norms, including children's perceptions of their parents' social norms, were also found in other studies to be a strong behavioural change factor towards adequate water intake.(25) Individual beliefs about the benefits of drinking water on body temperature, muscle energy, joint and spinal cord health encourage the perception of vulnerability to their health condition when their kidneys feel sick. Finally, the individual's perception of self-vulnerability leads to a commitment to drinking water, especially when he feels cold. Individual beliefs also influence the perception of the seriousness of the disease when it comes to fever and skin disease. The emergence of this perception of seriousness was also due to the knowledge he had gained about the link between the benefits of drinking water and fever and skin aches.

CONCLUSION

The level of adequate water intake of communities in the Morosi mining area is influenced by the individual's own knowledge and attitudes. In this study, individual attitudes had a greater influence on the level of adequacy of drinking water, compared to individual knowledge. Individual attitudes act as a mediator between income and knowledge on the level of adequate water intake. Therefore, to increase adequate water intake in mining areas, what needs to be done is to increase community knowledge and attitudes. Increasing knowledge can be formal and informal. formally through health education both directly and indirectly. Directly, this can take the form of training, individual or group counselling, and seminars. Indirect education can be done through social media. Knowledge that needs to be increased is the importance of drinking enough water on muscle strength and skin health. Thus, increasing attitudes in a positive direction is carried out by increasing public knowledge first.

Furthermore, changes in attitude need to be directed at the importance of drinking enough water on muscle health and the health of sensitive tissues such as the eyes.

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