

# Factors associated with food safety behavior of members in the Village Food Security Movement Program in Bolaang Mongondow Regency, Indonesia

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## Abstract

**Background:** Food safety is the aspect considered to prevent food poisoning worldwide. Food safety management is essential to prevent foodborne illness.

**Objective:** This study aimed to determine factors associated with the food safety behavior of members in the Village Food Security Movement Program in Bolaang Mongondow Regency, Indonesia.

**Methods:** Cross-sectional research was conducted on 100 participants through a purposive sampling technique in the last week of February 2022 with the COVID-19 protocol. Data were collected using validated questionnaires. Descriptive statistical tests, Chi-square test, and multi-logistic regression were employed for data analysis.

**Results:** The majority of the respondents were female (65%) and 15-59 years old. The Chi-square analysis found education, knowledge, and attitude were significant variables. After adjusting to the multi-logistic regression, the poor attitude and low cost of family food consumption were associated with poor food safety behavior ( $p < 0.05$ ).

**Conclusion:** The most significant factors related to poor food safety behavior are the low cost of family food consumption and low attitude. The program must be appropriately arranged to prevent poor food safety behavior in the households.

Keywords: food safety; food security; socio-demographic; Indonesia

## Background

Food safety may prevent food poisoning worldwide (Fung et al., 2018). However, an incredible number of food poisoning incidents occur in various countries

such as Italy (Guidi et al., 2018), India (Khare et al., 2018), Argentina (Manfredi & Rivas, 2019), Ethiopia (Kassahun & Wongiel, 2019), Japan (Suzuki et al., 2020), Francis (Velut et al., 2019), and Korea (Lee et al., 2020) causing severe pain and deaths. It is

estimated that 600 million people fall ill annually due to contaminated food, resulting in 420,000 deaths worldwide and 170,000 in the Southeast Asian regions (World Health Organization, 2020).

Food contamination is caused by various environmental factors such as toxic metals, chemicals, pesticides, veterinary drugs, natural poisons of food, and contaminants during the cooking process (Effendy et al., 2020; Oskarsson, 2012). Therefore, good food safety management is crucial to preventing foodborne illness (Effendy, 2009; Kamboj et al., 2020). In addition, the most important people to ensure the safety and healthy food for consumers are food handlers (Kwol et al., 2020). The government should invite the local community to maintain food safety in their residence (Fakfare & Wattanacharoensil, 2020).

Indonesia has currently been experiencing a double burden of food security (Hariyadi, 2018). Throughout 2013-2017, the National Agency of Drug and Food Control (Badan Pengawas Obat dan Makanan) received reports of 271 Extraordinary Food Safety Events, which are dominantly caused by household food (36-49%), followed by street food (17-36%), catering service food (13-28%) and the processed food (11-15%) (Badan Pengawas Obat dan Makanan, 2020).

An urgent problem related to food safety is the excessive use of food additives and the use of prohibited/dangerous chemicals for food (e.g., formalin, borax, non-food coloring agents), especially at the home industry level, catering services, and small and medium enterprises (Dewi et al., 2019; Sudrajat et al., 2018; Suryani, Sutomo, et al., 2021). Therefore, a policy is required to overcome food security problems in Indonesia. For example, the National Agency of Drug and Food Control has developed food-safe villages through the village food security movement called Gerakan Keamanan Pangan Desa (GKPD) since 2015 to increase the independence of rural communities in ensuring the fulfillment of food security needs at the individual level and strengthening the village economy.

This GKPD was carried out in Bolaang Mongondow Regency, North Sulawesi Province, by the Manado Drug and Food Agency. Therefore, this study aimed

to predict factors associated with the food safety behavior of members in the GKPD in this regency.

## Methods

### Study Design

This quantitative study used a cross-sectional design.

### Samples/Participants

The population in this study were the heads of families and family representatives who were participants in the village food security movement program, as many as 408 people. The samples were taken through a purposive sampling technique. A hundred participants were selected after it was calculated using Slovin's formula and adding 10% of sampling error. The inclusion criteria of the respondents were 1) members of the village food security movement program, 2) willing to be a respondent by signing informed consent forms on completing the questionnaires, and 4) being able to communicate in Indonesian. Meanwhile, the exclusion criteria were those with severe illness which was not a member of the program and had incomplete questionnaire answers.

### Instruments

Data were collected using questionnaires, and their validity and reliability were tested. The validity test of each variable showed food security behavior (0.696), level of knowledge (0.392), level of attitude (0.401), and facility and infrastructure (0.372). In addition, face-to-face interviews with closed-ended questions were conducted with respondents. The respondents and researchers followed COVID-19 health protocols in the data collection process. Based on the result, the *R-value* showed a more preponderant value than the *t-table*, and thus the questionnaires were valid. In addition, the reliability test showed food security behavior (0.771), level of knowledge (0.801), level of attitude (0.912), and facility infrastructure (0.756) according to the pre-test distributed to 40 respondents in Kotamobagu District, Indonesia. The total significance value is larger than 0.60, meaning the questionnaires were reliable.

Food security behavior as the dependent variable was asked through 11 questions, i.e., cleanliness of the location (two questions), food condition (two questions), preparation, cooking, and serving

processes (four questions), and hygiene (three questions). Food safety behavior was measured using questions seeking favorable/positive and unfavorable/negative actions. The highest score is given to the most correct answer. Then, the sum of all answers is categorized as "Good" if the respondent's answer scores 76 % to 100% and "Poor" if the respondent's answer scores 75% or less.

The independent variables consist of four parts: socio-demographic factors, knowledge, attitude, and facility and infrastructure. Socio-demographic factors include sex (male and female), age, level of education (low: under senior high school grade; high: senior high school above), working status (working and non-working), household members (good: four members and less; poor: more than four members in a household), cost of family food (high: Rp. 3,000,000 and more per month; low: <Rp. 3,000,000), ethnic group (Bolaang Mongondow and other), marital status (married and unmarried), and place of residence (plain and coastal areas).

There were 12 questions on level of knowledge about food safety, 18 questions on attitude (purchase, food condition, preparation stage, cleaning method, storage method, processing hygiene, hygiene, and handling of food poisoning), and 10 questions on facility infrastructure for food safety. The correct answers to the questions are scored "1", and the wrong answers are scored "0". The total scores of the questions are identified based on their cut-off points: good/yes if the total score is larger than the median and poor/no if the total score is equal to or less than the median.

### Data Collection

Data were collected using questionnaires in February 2021 in Bolaang Mongondow Regency, North Sulawesi Province, Indonesia.

### Data Analysis

The outcome measurement of food safety behavior is categorized as either good or poor. Descriptive statistics were used to show the frequency and percentage of all variables. In addition, the Chi-square test and multi-logistic regression were employed to examine associations between independent variables and food safety behavior. The IBM SPSS Statistics 21 software was used for data analysis.

### Ethical Considerations

The study was approved by the Postgraduate Data Collection Ethics Committee at Sam Ratulangi University, Manado, Indonesia (No. 415/UN12.12.1/KM/2022).

## Results

The general information of the respondents is described in **Table 1**. Most of the respondents were female (65%) and around 15-59 years old. About 83% of the respondents had a low education level, and most of the respondents were working (80%). About 53% of the respondents had four household members or less. More than half of the respondents spent a low cost on their family food consumption, and most of them were from Bolaang Mongondow ethnic groups, were married, and lived in the plain areas.

**Table 1** Distribution of respondents by socio-demographic factors (*n* = 100)

Socio-demographic factors	f	%
<b>Sex</b>		
Male	35	35
Female	65	65
<b>Age (years), <i>n</i> = 100</b>		
Mean ± SD (min-max)	37.07 ± 10.65 (15-59)	
<b>Education</b>		
Low	83	83
High	17	17
<b>Working status</b>		
Working	80	80
Non-working	20	20
<b>Household members (person)</b>		
Four or less than	53	53
More than four	47	47
<b>Cost of family food consumption</b>		
High	46	46
Low	54	54
<b>Ethnic group</b>		
Bolaang Mongondow	78	78
Other	22	22
<b>Marital status</b>		
Married	82	82
Unmarried	18	18
<b>Place of residence</b>		
Plain areas	54	54
Coastal areas	46	46

**Table 2** Characteristics of respondents' knowledge and attitude ( $n = 100$ )

Variables	f	%
<b>Level of food security</b>		
Good	58	58
Poor	42	42
<b>Level of knowledge</b>		
Good	69	69
Poor	31	31
<b>Attitude</b>		
Good	22	22
Poor	78	78
<b>Facility and infrastructure</b>		
Good	90	90
Poor	10	10

**Table 2** shows that more than half of them had a good level of security (58%), and 69% had a good level of knowledge and extremely poor level of attitude. The facility and infrastructure were also in very good condition (98%). In addition, **Table 3** shows the variables that have a significant correlation with food safety behavior. These include education level, level of knowledge, and attitude. Education level was significantly associated with food safety behavior ( $p = 0.035$ ). The Chi-square test results also revealed that level of knowledge and attitude were significantly associated with food safety behavior ( $p = <0.031$ ;  $p = <0.003$ , respectively).

**Table 3** Association between each independent variable and food safety behavior

Independent Variables	Food Security Behavior		Crude OR (95% CI)	p-value
	Good	Poor		
<b>Sex</b>				0.470
Male	22	13	1	0.471
Female	36	29	1.363 (0.587-3.165)	
<b>Education</b>				<b>0.026*</b>
High	14	12	1	<b>0.035*</b>
Low	44	30	4.136 (1.106-15.474)	
<b>Working status</b>				0.418
Working	48	32	1	0.419
Not working	10	10	0.667 (0.249-1.784)	
<b>Household members (person)</b>				0.609
Four or less than	32	21	1	0.609
More than four	26	21	0.813 (0.367-1.801)	
<b>Cost of family food consumption</b>				0.079
High	31	15	1	0.081
Low	27	27	2.067 (0.915-4.670)	
<b>Ethnic group</b>				0.907
Bolaang Mongondow	45	33	1	0.907
Other	13	9	1.059 (0.405-2.770)	
<b>Marital status</b>				0.768
Married	47	35	1	0.768
Unmarried	11	7	1.170 (0.412-3.323)	
<b>Place of Residence</b>				0.177
Plain areas	28	26	1	0.179
Coast areas	30	16	1.741 (0.776-3.906)	
<b>Education</b>				0.026
Low	44	30	1	0.035
High	14	12	4.136 (1.106 - 15.474)	
<b>Level of knowledge</b>				<b>0.029*</b>
Good	45	24	1	<b>0.031*</b>
Poor	13	18	0.385 (0.162-0.918)	
<b>Attitude</b>				<b>0.0001***</b>
Good	21	11	1	<b>0.003**</b>
Poor	37	30	0.043 (0.060-0.335)	
<b>Facility and infrastructure</b>				1.000
Good	40	30	1	0.818
Poor	18	11	0.719 (0.440 -11.837)	

\* $p$ -value  $<0.05$ , \*\* $p$ -value  $<0.01$ , \*\*\* $p$ -value  $<0.001$

The result of multiple logistic regression is described in **Table 4**. After being adjusted to all the independent variables, the test showed only two variables had a significant correlation with food consumption behavior. The cost of food consumption had a moderate correlation with food safety behavior. In detail, compared to those who had a high cost of food consumption, the respondents who had low food consumption costs

were 4.5 times more likely to have poor food safety behavior. In addition to other correlating factors, the attitude had a strong correlation with food safety behavior. In detail, the respondents who had a poor attitude were 1.5 times more likely to have poor food safety behavior than those with a good attitude. However, the other independent variables did not have any association with food safety behavior.

**Table 4** The complete model of binary logistic regression of food safety behavior

Independent Variables	Adj. OR	Adj. OR (95% CI)		p-values
		Lower	Upper	
<b>Sex</b>				
Male	1			0.262
Female	1.877	0.625	5.635	
<b>Education</b>				
High	1			0.077
Low	4.001	0.859	18.631	
<b>Working status</b>				
Working	1			0.217
Unworking	0.376	0.080	1.775	
<b>Household members (person)</b>				
Four or less	1			0.233
More than four	0.499	0.159	1.563	
<b>Cost of family food consumption</b>				
High	1			<b>0.008**</b>
Low	4.525	1.487	13.773	
<b>Ethnic group</b>				
Bolaang Mongondow	1			0.564
Other	1.511	0.371	6.144	
<b>Marital status</b>				
Married	1			0.803
Unmarried	1.197	0.291	4.922	
<b>Place of residence</b>				
Plain areas	1			0.344
Coast areas	1.699	0.567	5.089	
<b>Level of knowledge</b>				
Good	1			0.069
Poor	0.340	0.106	1.086	
<b>Attitude</b>				
Good	1			<b>0.0001***</b>
Poor	1.512	0.010	0.144	
<b>Facility of infrastructure</b>				
Good	1			0.704
Poor	0.460	0.080	12.169	

\*p-value <0.05, \*\*p-value <0.01, \*\*\*p-value <0.001

## Discussion

The participants in this study were members of the Village Food Security Program. About 46% of them had poor food safety behavior, indicating the

program was still not effectively run yet in the Bolaang Mongondow regency. However, the continuance of the program is essential until the village community is able to carry out food safety behavior independently or modify the program.

Besides that, this study found that members in the program with a poor attitude significantly had poor food safety behavior (Adj. OR = 1.512, 95% CI = 0.010-0.144). These results align with previous research in Taiwan, which showed that the attitude variable has a significant relationship to food safety behavior (Kuo & Weng, 2021). Another study in Bangladesh showed that attitude is likely unrelated to food safety behavior (Siddiky et al., 2022). Therefore, some training interventions such as the provision of booklets, short films, lectures, and poster displays are beneficial in creating positive attitudes and improving food safety practices among food handlers (Dudeja et al., 2017)

Participants whose food costs were low were likely 4.5 times at risk of having poor food safety behavior (Adj. OR = 4.525, 95% CI = 1.487-13.773). The results of this study showed empirical evidence that the cost of family food consumption depends on household income. Meanwhile, research in Tehran, Iran, shows that family income is significantly associated with household food security (Fami et al., 2021). In the context of food security behavior, household purchasing power determines the quality of food purchased. In the market, in fact, the lower the price of basic household needs, the worse the quality. The purchasing power during the current COVID-19 pandemic has decreased since many people have lost their jobs and have low incomes (Irningsih et al., 2021; Siwi et al., 2022; Suryani, Suyitno, et al., 2021; Tantrakarnapa et al., 2020). Therefore, it is necessary to provide government subsidies for basic household items to encourage people to have reasonably affordable prices.

### Recommendation

Based on the results, improvement in attitude could be made through different interventions such as booklets, short films, lectures, posters, and others. In addition, the cost of family food consumption may be reduced by government subsidies for household staples.

### Conclusion

In sum, a low cost of family food consumption and poor attitude are associated with poor food security behavior. Therefore, the most influencing factors on food safety behavior are the cost of family food consumption and attitude.

### Declaration of Conflicting Interest

The authors declare no conflict of interest in this study.

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### Author Contribution

DSK wrote the article, conducted the study, and supervised all the data collection. NHK and GSSD supervised the research protocol design. All of the authors checked the paper before submitting it to be published.

### Author Biographies

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