

# Knowledge, attitude and behavior on utilizing suboptimal food related public health

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## ABSTRACT

Offering food products at lower prices approaching the expiration date, referred to as suboptimal food products, is considered to be able to encourage purchasing considerations by the public. It is based on knowledge of purchasing price-reduced food products by the public and the potential waste in the community focused. The study aimed to contribute to the evaluation of whether offering suboptimal foods at a lower price will reduce food waste in the supply chain. This study analyzes public knowledge, attitudes, and behavior toward suboptimal product price offers in retail stores. The research was conducted in three retail stores in Depok City by exploring research questions involving 274 retail store customers who were analyzed based on a questionnaire. The approach used is a quantitative approach with multiple linear analysis methods using SPSS software. The findings show that public knowledge, attitudes, and behaviors influence suboptimal product price offers in retail stores. This research is expected to be an effective solution to overcome excess food, which leads to food waste at the retail level in sustainable food management.

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## 1. INTRODUCTION

To support environmental health and sustainable practices, the consumption and purchase of suboptimal food products are significant in changing public behavior [1], [2]. People's reluctance to buy or consume suboptimal food products is one of the reasons for potential food waste that impacts the environment and natural resources [3], [4]. Suboptimal food products are often associated with products that deviate from the intended product based on appearance (weight, shape, or size), expiration date (near or past the best consumption date), or packaging without affecting quality or safety for consumption [5], [6]. In addition, another contributing factor is the difficulty of stock management in balancing supply and demand. Excessive demand makes food products pile up and sell less. It causes the product to lose its appearance. Therefore, traders took the initiative to sell suboptimal products at lower prices [7]. The physical appearance of food products is the main attraction for the public. Increased public satisfaction is essential to profitability for the food industry [8], [9].

Retailers are changing customary practices to allow individuals to act against food waste by purchasing suboptimal food products. In addition, retailers are implementing strategies in the form of food redistribution to charities and reduction of suboptimal food prices [10]–[12]. People do not want to risk buying suboptimal foods approaching their expiration date [13]. The public considers that the nutritional

value and quality of the suboptimal product will affect health. Likewise, with products that have packaging that is not up to standard, people tend to avoid them [14]. Hence, the right solution is needed to reduce and prevent continuous food waste by introducing the acceptance of suboptimal products to the public. However, to be sustainable, this must be supported by a pro-environment community. Concern, commitment, perception, and high public awareness positively influence suboptimal food acceptance attitudes [15]. Expert opinion also provides evidence that personal norms are strong predictors of behavioral control so that they have the same effect as attitudes and behavior [16]. This approach is expected to support the reduction of suboptimal products at retailers with pro-environmental values.

The rapid increase in urbanization has turned Depok City into one of the metropolitan cities with an increasing number of visitors. This is evident from the increasing amount of waste. Based on 2018 data obtained from the [17], the total waste generation of Depok City reaches 5,154.90 m<sup>3</sup>/day with per capita waste of 2,272.00 ml/person/day. Meanwhile, the amount of waste carried to the landfill is only 3,000.00 m<sup>3</sup>/day. Urbanization also encourages the growth of retail store outlets to support the public's daily activities, proven by 114 retail stores in operation in Depok. However, the increase in retail stores is not offset by proper waste management, especially food waste. Based on data collected from one of the food retailers in Margonda, Depok, the composition of organic waste reaches 57% of the total waste [18], with food waste as one of the contributors. Some food stores in Depok sell items close to the expiration limit but are consumable at lower prices to the public approaching the store closing time. Suboptimal food acceptance generally increases as prices drop, and discounts help promote products that sell less well [15], [19].

Although several studies have discussed food waste in developed countries, the discussion of food waste at retail stores is still little explored, especially in developing countries. This is very important since retail stores can affect the two sides involved, namely the public and sellers. This study analyzes public knowledge, attitudes, and behavior toward suboptimal product price offers in retail stores. The problem in this study is the high amount of food waste from retail stores that come from internal conditions that cannot be controlled. This triggers the significant costs incurred by the shop to process the waste produced by the local government. A consumer approach based on knowledge, attitudes, and behavior can certainly be a consideration for a speedy recovery. Knowledge of suboptimal products can influence consumer attitudes and behavior in considering price offers, which indirectly impacts reducing food waste in retail stores. Knowing consumers' knowledge, attitudes, and behavior regarding suboptimal products may help predict the strategies that the store can plan. Knowledge, attitude, and behavior surveys can also collect information about what a given population knows, believes, and does about food waste. The study is essential since it potentially encourages public consideration in buying these food products because disposed of suboptimal food products represents a significant quantity of food waste. This contributes to understanding the relationship between public knowledge, attitudes, and behaviors and the price offers set by retailers on suboptimal food products. It can also contribute as an initiative to reduce food waste through food with reduced prices available in the market. Therefore, this research can help retailers to obtain recommendations related to food selling and food product policymaking that can support the selling of food that is not wasted in retail stores because suboptimal food indirectly plays an essential role in the food supply chain [20].

## 2. RESEARCH METHOD

This quantitative research employed a questionnaire-based survey method that took place in retail areas. This method is relevant since it has been applied in previous research. Data collection was carried out between November 2021–January 2022. Quantitative data were analyzed using SPSS 25 software using multiple linear regression to identify whether free variables (knowledge, attitudes, and behaviors) influenced bound variables (price offers). Validity and reliability test were carried out beforehand as a pretesting stage using questionnaire questions with a minimum respondent target of 30 people. The list of statements in the questionnaire is presented in Table 1.

The retail stores involved in this study include store A (Beji District), store B (Sukmajaya District), and store C (Tapos District). The selection of store locations was considered suitable to answer the research questions. The population in this study was the average number of visitors in each food retail store for eight days. The number of visitors in each retail store was recorded based on observation. The observation was carried out by looking at visitor data for the previous seven days (based on the store's operational schedule) in advance. Subsequently, the average visitor number was multiplied by the number of sampling days (eight days) to determine the population. Population and total samples are presented in Table 2. Samples of visitors were selected by accidental sampling, in which respondents were selected based on random and coincidental encounters in retail stores. Target respondents without specific criteria only depend on the possibility and willingness of visitors to become research samples. The number of minimum samples of respondents was determined using the Slovin formula as follows:

$$n = \frac{N}{1+Ne^2} \quad (1)$$

Information:

n = number of samples (minimum)

N = population size

e = error (10%)

Table 1. The list of statements in the questionnaire

Questionnaire	Answer				
	1	2	3	4	5
<b>A. Knowledge</b>					
1. Food products that are less than standard/near the expiration date are not harmful to health					
2. Food products that are less than standard/close to expiration can still be eaten					
3. Food products that are less than standard/close to expiration indicate their declining nutritional quality					
4. Products that are less than standard/close to expiration give a taste that is still delicious when eaten					
5. The number of food products that are less than standard/near the expiration date that is not sold results in an increase in food waste in stores					
6. The purchase of food products that are less than standard/near the expiration date can help reduce food waste in retail stores					
7. Food products that are less than standard/close to expiration may occur in inappropriate storage areas (refrigerators/warehouses).					
8. Food products that are less than standard/near the expiration date can occur when shipping by car to the store					
9. Food products that are less than standard/nearing the expiration date can occur because some foods are placed in the front position randomly/messily (not sorted according to new or old items) on the display window/display					
10. Products that are less than standard/nearing the expiration date occur due to incorrect product placement and storage that are not suitable					
11. Products that are less than standard/nearing the expiration date are caused by ordering food stocks that are excessive/in large quantities					
<b>B. Attitude</b>					
1. I am willing to consume less than standard food products or have slight defects in appearance					
2. I am willing to consume food products that are close to expiration					
3. I intend to consume less than standard food products/close to expiration					
4. I will try to consume food products that are less than standard/close to expiration if available					
5. I plan to consume less than standard food/near expiry date if available					
6. I consider buying food products that are almost expired even though they are still okay to eat					
7. I buy food products that are less than standard/close to expiration because it has become my habit to consume them					
8. I will suggest to my relatives/relatives to buy and consume food products that are less than standard/near the expiration date					
<b>C. Consumer's Behavior</b>					
1. I buy products that are less than standard/close to expiration at a lower price more than once in 1 month					
2. I pay attention to the expiration date of every food product sold in the store					
3. I pay attention to the quality of a food product in the store					
4. I compare the written price with the quality of the food product					
5. I prefer the appearance of good food products over those that are not good or have defects in the product					
<b>D. Price Offer</b>					
1. I buy food products less than standard/near expiration due to lower prices.					
2. I am sure that the price offered is still following the product quality is less than standard/nearing the expiration date					
3. The price offered for products that are less than standard/nearing the expiration date is still relatively affordable					
4. I feel that the price offer given to food products that are less than standard/nearing the expiration date helps me to be able to consume food that was previously sold at a reasonably high price					
Description: 1= strongly disagree; 2= disagree; 3= doubtful; 4= agree; 5= strongly agree					

Table 2. Population and total samples

	Retail A	Retail B	Retail C
Population (individual)	904	1168	1104
Minimum samples (individual)	90	92	92
Total of samples (individual)	274 respondents		

### 3. RESULTS AND DISCUSSION

The study involved 274 respondents whose characteristics included gender, age, marital status, occupation, education, income, and household size. The study respondents were visitors who visited the three stores mentioned above. The male and female respondents were 32.8% and 67.2% dominated with

productive age (26-35 years). Among the respondents, 62.8% were married, 31.4% was private employee, 60.2% was senior high school or diploma. More than 61.0% of respondents were living in a household size of family member 3-5 person, and 42.0% were living in the middle class (income 3-5 million IDR/month). Data on the demography characteristics of respondents are presented in Table 3.

Table 3. Characteristics of demography

Parameter	Frequency	Percentage
Gender		
Male	90	32.8%
Female	184	67.2%
Age (years)		
20-25	67	24.5%
26-35	159	58.0%
>35	48	17.5%
Marital status		
Single	102	37.2%
Married	172	62.8%
Occupation		
Government employee	30	10.9%
Private employee	86	31.4%
Entrepreneur	48	17.5%
Housewife	76	27.7%
Student	34	12.4%
Education		
Junior high school	20	7.3%
Senior high school/Diploma	165	60.2%
Graduation	89	32.5%
Income/month		
<1 million IDR	16	5.8%
1-3 million IDR	67	24.4%
3-5 million IDR	115	42.0%
>5 million IDR	76	27.7%
Household size		
<3 person	43	15.7%
3-5 person	167	61.0%
>5 person	64	23.4%

Before multiple linear regression testing, one of the conditions that must be carried out was to test the classical assumptions to observe the best results from the data. A classical assumption test generally consists of normality, multicollinearity, and heteroscedasticity tests. The data normality test can be carried out using the Kolmogorov Smirnov one sample, namely with the provision that if the significant value is above 0.05, the data is normally distributed. Meanwhile, if the one sample Kolmogorov Smirnov results show a significant value below 0.05, then the data is not normally distributed. Based on Table 4, the normality test was carried out through the Kolmogorov–Smirnov test resulting in Asymp. Sig. (2-tailed) value of 0.200, suggesting that the data of this study were generally distributed since the significance value was  $0.200 > 0.05$ . The results of the inner normality test are presented in Table 4.

Table 4. Normality test

One-Sample Kolmogorov-Smirnov test		
		Unstandardized residual
N		274
Normal Parameters <sup>b</sup>	Mean	.0000000
	Std. Deviation	2.09627528
Most extreme differences	Absolute	.048
	Positive	.048
	Negative	-.045
Test statistic		.048
Asymp. Sig. (2-tailed)		.200 <sup>c,d</sup>

a. Test distribution is Normal.

b. Calculated from data.

c. Lilliefors Significance Correction.

d. This is a lower bound of the true significance.

The multicollinearity test aims to test whether the regression model finds a correlation between the independent variables. The effect of this multicollinearity is to cause high variables in the sample. It means that the standard error is significant, as a result, when the coefficients are tested, the t-count will have a smaller value than the t-table. This shows that there is no linear relationship between the independent variables affected by the dependent variable. To find whether or not multicollinearity exists in the regression model, it can be seen from the tolerance value and the variance inflation factor (VIF) value. Tolerance measures the variability of the selected independent variables, which other independent variables cannot explain. So a low tolerance value is the same as a high VIF value ( $VIF=1/\text{tolerance}$ ) and indicates high collinearity. The commonly used cut-off value is a tolerance value of 0.10 or the same as a VIF value above 10. From Table 5, it can be seen that the tolerance value is higher than 0.10 in all variables. Likewise, the VIF value is below 10 in all variables, suggesting that this study found no multicollinearity.

This test aims to test whether there is variance discomfort in a regression model from one residual observation to another. If the variants are different, it is called heteroscedasticity. One way to determine whether there is heteroscedasticity in a multiple linear regression model is to look at the scatterplot graph or the predicted value of the dependent variable, namely SRESID (studentized residuals) is a standardized residual value, with a residual error ZPRED (standardized residual) is a standardized residual value. If there is no specific pattern and it does not spread above and below zero on the y-axis, then there is no heteroscedasticity. A good model does not have heteroscedasticity. Figure 1 demonstrates that specific patterns and plot points are evenly spread. Hence, it can be concluded that there was no heteroscedasticity in this study.

Table 5. Multicollinearity test

Model	Coefficients Collinearity statistics	
	Tolerance	VIF
1 Knowledge	.420	2.381
Attitude	.476	2.100
Behavior	.592	1.688

a. Dependent Variable: Price offer

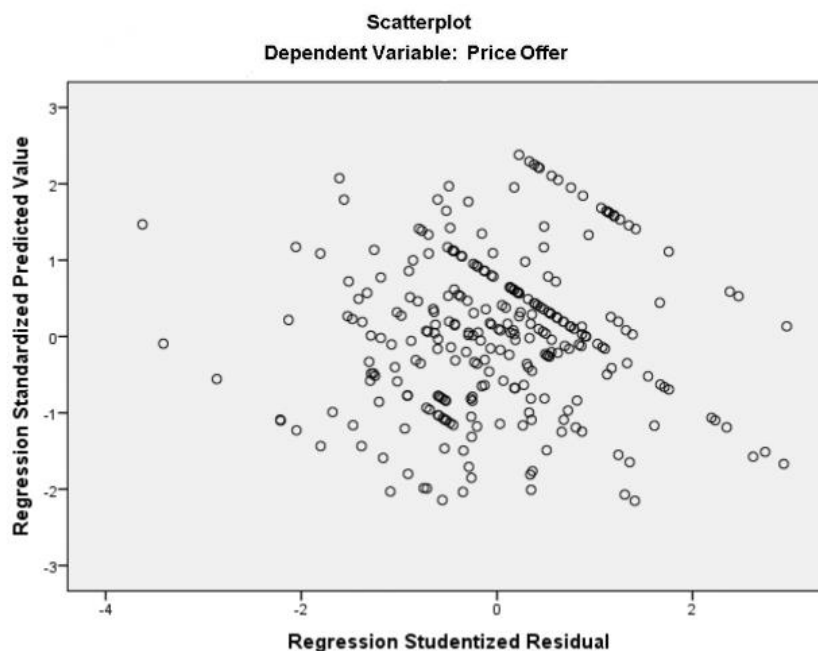


Figure 1. Heteroscedasticity test

The multiple linear regression test equations resulted in an equation:  $Y = -0.386 + 0.235X_1 + 0.114X_2 + 0.130X_3 + e$ . The constant -0.386 suggests that if there is no change or zero value in the variables  $X_1$  (knowledge),  $X_2$  (attitude), and  $X_3$  (behavior), the variable  $Y$  (price offer) will

have a value of -0.386. The coefficient of 0.235 of the variable X1 (knowledge) suggests that any increase in the knowledge variable will affect the price offered by 0.235 assuming other variables are constant. The coefficient of 0.114 of the X2 (attitude) suggests that any increase in the attitude variable will affect the price offered by 0.114 assuming other variables are constant. Lastly, the coefficient of 0.130 of the variable X3 (behavior) suggests that any increase in the behavior variable will affect the price offered by 0.130 assuming other variables are constant. The results of the multiple linear regression test equations are presented in Table 6.

Table 6. Multiple linear regression test equations

Model	Unstandardized coefficients		Standardized coefficients	T	Sig.
	B	Std. Error	Beta		
(Constant)	-.386	.621		-.622	.535
1 Knowledge	.235	.027	.521	8.695	.000
Attitude	.114	.035	.182	3.231	.001
Behavior	.130	.043	.154	3.054	.002

a. Dependent variable: price offer

The coefficient of determination R square essentially measures how far the model can explain the dependent variables. The coefficient of determination is zero and one. The small value of R square means that the ability of the independent variables to explain the variation in the dependent variable is minimal. A value close to one means that the independent variables provide almost all the information needed to predict the interpretation of the dependent variable. Based on Table 7, the analysis of the coefficient of determination (R-square) resulted in a value of 0.593 (59.3%). This shows that 59.3% of the influence on the bound variables (price offers) originates from the free variables (knowledge, attitudes, and behaviors), while other variables outside the study influenced 40.7%.

Table 7. Coefficient of determination

Model	Model summary			
	R	R-square	Adjusted R-square	Std. Error of the estimate
1	.770 <sup>a</sup>	.593	.588	2.10789

a. Predictors: (constant), behavior, attitude, knowledge

The F test shows whether all the independent variables included in the model have a simultaneous effect on the dependent variable. The F test is carried out by comparing the calculated F value with the F table and seeing a significance value of 0.05. F table was obtained from the results of 5% probability and  $df_1=3$ ,  $df_2=274-2=272$  with 2.638. Based on Table 8, the F test (simultaneous significance) resulted in an F count of 131.120 and a significance value (p-value) of 0.000. Following the interpretation of F count > F table (131.120 > 2.638) and the significance value of  $0.000 < 0.05$ ,  $H_0$  was therefore rejected, and  $H_a$  was accepted. Consequently, variables X1 (knowledge), X2 (attitude), and X3 (behavior) simultaneously had a significant effect on variable Y (price offer).

Table 8. F test

Model	ANOVA				Sig.
	Sum of Squares	Df	Mean Square	F	
1 Regression	1747.778	3	582.593	131.120	.000 <sup>b</sup>
Residual	1199.663	270	4.443		
Total	2947.441	273			

a. Dependent variable: price offer

b. Predictors: (constant), behavior, attitude, knowledge

The T test used a significance level of 0.05 (5%). T table of 1.969 was obtained through a probability of 5% and  $df=274-2=272$ . Based on Table 9, the T-test (partial significance) indicated that in variable X1 (knowledge) against variable Y (price offer), a T count of 8.695 was obtained with a significance value (p-value) of 0.000. Since T count > T-table (8.695 > 1.969) and the significance value (p-value) of  $0.000 < 0.05$ ,  $H_0$  was rejected, and  $H_a$  was accepted. Therefore, variable X1 (knowledge) partially significantly affects variable Y (price offer). In variable X2 (attitude) against variable Y (price offer), a T count of 3.231 was obtained with a significance value (p-value) of 0.000. Since T count > T table (3.231 > 1.969) and the significance value (p-value) of  $0.001 < 0.05$ ,  $H_0$  was rejected, and  $H_a$  was accepted. Therefore, variable X2 (attitude) partially affects variable Y (price offer). Lastly, in variable X3 (behavior)

against variable Y (price offer), a T count of 3.054 was obtained with a significance value (p-value) of 0.000. Since T count > T table (3.054 > 1.969) and the significance value (p-value) of 0.002 < 0.05,  $H_0$  was rejected, and  $H_a$  was accepted. Therefore, variable X3 (behavior) partially affects variable Y (price offer).

Table 9. T-test

Model	Unstandardized coefficients		Standardized coefficients	T	Sig.
	B	Std. Error	Beta		
1 (Constant)	-.386	.621		-.622	.535
Knowledge	.235	.027	.521	8.695	.000
Attitude	.114	.035	.182	3.231	.001
Behavior	.130	.043	.154	3.054	.002

a. Dependent variable: price offer

In reducing food waste, the retail stores presented price offers on products approaching the expiration limit and those with less than perfect physical appearance. Consumers assess the risk of suboptimal product hazard by looking for label information criteria related to its safety. Suboptimal products are more risky, consumers tend to decide longer to accept the product. If the shelf life of food decreases, consumer perceptions of food quality and safety will also decrease. Knowledge and attitudes can increase behavioral control of awareness and importance of the dangers of disposing of food waste [21], [22]. Each of the three stores studied made a price offer by displaying cheaper price tags to attract the attention of visitors and the public. The strategy is the easiest and quickest to implement, although it may trigger financial losses and create a bad image for the stores [23]. Its support this research, which states that price offers are sometimes needed to encourage suboptimal food acceptance by society [24]. This also mentions that price offers to encourage people to purchase suboptimal products. Therefore, retailers adjust the prices of suboptimal food products to attract public attention [15]. Consumers perceive that if the retail store motive behind this strategy is positive, consumers will show a better attitude towards retail stores. It highlighted those public choices, price offers, and wasteful behaviors on suboptimal products are influenced by demographic characteristics, personality, and public perceptions. There is a different public reaction to the practice of price bidding [25]. Price offers at retailers can cause positive and negative reactions based on the internal influence of individuals (knowledge, attitudes, and behaviors).

This research is dominated by female, productive age (26-35 years) and have income between 3-5 million IDR/month. The analysis shows that there is a significant and positive influence between public knowledge, attitudes, behavior, and price offer. This shows that the higher the public knowledge, attitudes, and behavior, the more it will lead to the public interest in the price offers presented by retail stores. Thus, it can be concluded that public knowledge, attitudes, and behaviors impact reducing food waste in stores. This strategy also increases knowledge about the problems that affect the environment from food waste, especially expired food which is immediately disposed of without prior processing, even though it is still edible. This is also to increase consumer interest through their personal norms to pay more attention to suboptimal foods. [26]. Although consumers make purchasing decisions by considering all offerings as a whole, price-related offers have the strongest influence, especially in developing countries. Therefore, offerings have a very important role in conveying and informing consumers about suboptimal product characteristics, in the process of product acceptance and making purchasing decisions [27], [28]. Purchasing less than optimal food will not cause harm, including product safety, but also the quality of money. Uncertain knowledge and attitudes can encourage or inhibit purchasing behavior towards suboptimal food even though the store has tried to lower prices [29]. The store must strengthen the condition of the internal storage that is still worth selling to get a positive attitude from consumers so that consumers can get feedback and knowledge to buy essential foods that are less than optimal. Stores are prohibited from hiding anything when consumers choose suboptimal foods and must display them to consumers practically and realistically. It was suspected that the public has experienced or is beginning to understand that the practice of offering prices can accelerate the flow of sales of suboptimal products. In addition, considering Indonesia is a developing country, this allows suboptimal food products afforded by people with lower incomes. This proves that sustainability can be achieved through price offers in retail stores. Therefore, a price management strategy by retail stores is highly recommended, especially about optimally reducing and preventing food waste [30]. In line with the inverted pyramid in the food waste hierarchy, the top priority is a reduction from the source, although the price offers given to the public cannot eliminate the potential for food waste. In addition, a price offer strategy can change people's decisions in purchasing food based on their personalities. People tend to observe the physical characteristics of products based on the price offered. Price offers on suboptimal products are considered to be able to attract attention and give signals to the public. However, several studies disagree with the idea and

argue that reducing product prices does not entirely affect people's behavior. This is based on many considerations, such as psychological factors and the norms of each individual. One of the differing opinions is food products with low prices tend to have a bad opinion in society. The product is considered to have no selling value and has experienced a significant nutritional decline [31], [32]. It makes people reluctant to glance let alone buy it. This suggests that the effect of price reduction does not guarantee that it will significantly influence public behavior. Therefore, it is crucial that during the price offer program, retail stores include guarantees of safety and quality of suboptimal food products to convince the public.

Studies that explain the relationship and descriptions between public knowledge, attitudes, and behavior toward price offers are minimal. Previous studies tend to highlight the relationship between the three factors (knowledge, attitudes, and behaviors) and the intensity of purchase intentions. This study attempts to present the perspective that stores can use their resources (the public) to control food waste reduction. This cannot be continuously implemented without the stores' control. It is feared that the food waste only shifts from stores to homes, creating additional household waste. Although the knowledge, attitude, and behavior model can overcome this gap to understand how knowledge relates to attitudes clearly, and practices towards suboptimal product price offer in retail stores. The limitation of knowledge, attitude, and behavior is that the attitude analysis in the knowledge, attitude and behavior model does not relate it to other related factors, such as beliefs and emotions, both positive and negative. Recommendations for further research need to consider additional factors by using all aspects of knowledge, attitudes, and behavior toward price offers to determine the extent of knowledge, attitudes, and behavior aspects of the entire population. Moreover, attitudes and behaviors less specific to price offers should be developed through group discussions and in-depth interviews as a multidimensional measure.

#### 4. CONCLUSION

This research was conducted to determine the influence of public knowledge, attitudes, and behavior on price offers. This study collected data from 274 store visitors from store A (Beji District), store B (Sukmajaya District), and store C (Tapos District) with different backgrounds using a questionnaire (Likert scale). The results significantly influence public knowledge, attitudes, and behavior toward price offers. This study significantly impacts stores because of consumer behavior toward suboptimal products. This finding proves that the price offers approach can increase consumer behavior to buy less than optimal food and can be an effective marketing strategy and tool in the short term to help reduce food waste. However, it depends on the availability of consumers to receive it. Therefore, it is important to increase public confidence in suboptimal food products that are safe for consumption. It is also an assumption that retail stores can build a positive image with feedback that benefits consumers. Future research is expected to examine the respondents' demographic details to determine whether these variables influence or contribute to price offer.

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