

Analysis of Students' Perceptions of Free Nutritious Meals on Food Waste at Madrasah Tsanawiyah 3 Surabaya City

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ABSTRACT

Background: the Free Nutritious Meal Program, initiated in 2025, aims to improve students' nutritional status and learning readiness, however, it carries the potential to generate food waste at the consumption level if the meals are not optimally consumed. **Objective:** this study aims to identify students' perceptions of the Free Nutritious Meal Program, determine the level of food waste, and analyze the effect of students' perceptions of the Free Nutritious Meal program on food waste at Madrasah Tsanawiyah 3 Surabaya City. **Methods:** this study employed a cross-sectional design involving 63 student respondents. Data on students' perceptions were collected using a validated and reliable questionnaire, while food waste was measured using the Visual Comstock method. Data were analyzed using ordinal regression. **Results:** the results indicated that 90.5% of students held a moderate perception of the Free Nutritious Meal Program, and 73.0% of students exhibited a low level of food waste. The ordinal regression analysis revealed that students' perceptions did not have a significant effect on food waste (Sig. = 0.538 > 0.05). It can be concluded that students' perceptions are not the primary determining factor in reducing food waste.

Keywords: food waste; free nutritious meal; perceptions; MBG program

Background

Food waste has become a global issue with serious impacts on the economy, environment, and food security. Previous reports have positioned Saudi Arabia as the world's largest food waste producer, with an estimated 427 kilograms per capita per year. Meanwhile, Indonesia ranks second with an estimated 300 kilograms of food waste per capita annually (1). Furthermore, the Food Waste Index Report 2024 by the United Nations identifies Indonesia as the largest food waste generator in Southeast Asia, producing a total of 14.73 million tons per year (2).

The National Waste Management Information System (SIPSN, 2024) of the Ministry of Environment and Forestry indicates that food waste is the primary contributor to total national waste generation, reaching 35.3 million tons per year or approximately 96,748 tons per day. At the local level, Surabaya City generates approximately 659,033.63 tons per year, or 1,805.57 tons per day. The majority of this waste originates from food residue, accounting for 55.48%, which is generated from both household consumption activities and school institutions (3).

To measure and evaluate the phenomenon of food waste in the school environment, clear and measurable indicators are required. Based on the Food Loss and Waste (FLW) Protocol by the World Resources Institute (4) and institutional food management literature (5), the primary indicator of food waste at the consumption level is plate waste. This indicator is measured through several parameters, namely the proportion or percentage of unconsumed food from the total initial portion served, assessed either through visual estimation or by weighing each food component. Beyond the percentage and estimated weight of the residue, food waste indicators also encompass the identification of the most discarded food components and the occurring disposal patterns. This phenomenon not only reflects resource wastage but also contradicts the principles of sustainability and moral values that prohibit excess and food waste.

One of the main sources of food waste in educational settings is the school meal program, including

the Free Nutritious Meal program, which was initiated in Indonesia in early 2025. The free nutritious meal program in Indonesia known as the MBG program serves as a nutritional intervention strategy implemented by the government and relevant agencies to alleviate the burden of malnutrition, undernutrition, and micronutrient deficiencies, which remain serious public health issues in the country. (6).

The MBG program holds strategic potential as a supportive measure for both student health and academic achievement. However, its implementation potentially introduces a new issue: the emergence of plate waste. High levels of plate waste indicate that food is not consumed optimally and can serve as an indicator of failure in food service management (5). BAPPENAS 2024 reported that the MBG program generates between 1.1 and 1.4 million tons of food waste annually. This figure, based on a 2024 Bappenas study, highlights a significant challenge in school food waste management (7). High levels of plate waste not only reflect inefficiencies in the food service system but also lead to a loss of nutritional value that students require for their growth and development (8).

The urgency of this issue was confirmed through a preliminary study conducted on 30 MBG recipient students at MTSN 3 Surabaya City. The observational results indicated that the average food waste reached 23.85%. Out of the 30 respondents, only 12 students (40%) consumed almost their entire food portion (residue <10%), whereas the remaining 18 students (60%) left varying amounts of food. Further analysis revealed that plant-based side dishes, particularly vegetables, were the most discarded components, primarily due to a dislike of these food types. These findings indicate an acceptance issue that potentially hinders the effectiveness of the MBG program in meeting students' targeted nutritional intake.

Based on the aforementioned background, this study was conducted to analyze the influence of school students' perceptions of the Free Nutritious Meal program on food waste at Madrasah Tsanawiyah 3 Surabaya City. This study aims to identify students' perceptions of the MBG, determine the level of food waste, and analyze the effect of students' perceptions on food waste at Madrasah Tsanawiyah 3 Surabaya City. The proposed hypothesis is that there is a significant influence of students' perceptions of the Free Nutritious Meal program on food waste. The findings of this study are expected to provide a comprehensive overview of how students' perceptions affect food consumption behavior, particularly regarding the consumption of meals provided through the MBG program.

Methods

This study employed a quantitative approach with a cross-sectional design. The research was conducted at Madrasah Tsanawiyah 3 Surabaya City from September 2025 to June 2026. Data collection was carried out in February 2026. The study population comprised all 900 students Madrasah Tsanawiyah 3 Surabaya City participating in the Free Nutritious Meal program. A probability sampling technique using simple random sampling was utilized to select the sample. Based on the Lemeshow formula. Thus it is obtained a total of 63 respondents were enrolled in this study.

The independent variable was students' perceptions of the MBG program, measured using a questionnaire consisting of 25 statements on a 4 point Likert scale. The dependent variable was food waste, assessed through direct observation of plate waste using the Visual Comstock method on a 0-5 scale. Both perception and food waste data were subsequently categorized into low, moderate, and high levels. The total perception score is calculated after reverse scoring the negative questions. Score range (25-100). Categories; Low: <50, Medium: 50-74 dan High: >75.

Meanwhile, the food waste variable is measured based on the remaining consumption of each food component. The final food waste score per student is calculated by averaging the Visual Comstock scores for each component. Interpretation of food waste levels based on median values; low (0-1,9) (little food left over or completely eaten), moderate (2-2,9) (about half a portion of food left over), high (≥ 3) (mostly unconsumed).

Data analysis included univariate analysis to describe the characteristics of the variables and bivariate analysis using ordinal regression to examine the influence between ordinal-scaled variables, with a significance level set at $p < 0.05$.

Results

Table 1. Characteristics of respondents at Madrasah Tsanawiyah 3 Surabaya City

Characteristics	N	%
Gender		
Male	31	49,2
Female	32	50,8
Age (years)		
13	17	27,0
14	42	66,7
15	4	6,3
Total	63	100

Table 1 shows that the majority of the respondents were female (50.8%). This nearly balanced distribution provides a fairly good representation of both genders in analyzing the students' perceptions of the free nutritious meal program on food waste. Shows that the majority of the respondents were 14 years old (66.7%). The dominance of 14-year-old respondents in this study aligns with the general age characteristics of Madrasah Tsanawiyah 3 Surabaya City students, which typically range from 13 to 15 years old. Mean $\pm$ SD=13,79 $\pm$ 0,54

Table 2 Cross-tabulation of students' perceptions of free nutritious meals on food waste

Student's perception	Food waste						Total	<i>P value</i>	<i>Nagelkerke</i>	
	Low		Moderate		High					
	n	%	n	%	n	%	n			%
Moderate	41	71.9	13	22.8	3	5.3	57	100	0,538	0,009
High	5	83.3	1	16.7	0	0,0	6	100		
Total	46	73,0	14	22,2	3	4.8	63	100		

Table 2 presents the cross-tabulation of the influence of students' perceptions of the MBG Program on food waste. The table shows that 57 students had a moderate perception of the free nutritious meal program. Meanwhile, 46 students (73.0%) exhibited a low level of food waste, indicating that the majority of students consumed the free nutritious meals. Furthermore, the results of the ordinal regression test revealed that students' perceptions of the free nutritious meal program did not have a significant influence on *food waste*, with a *p*-value of 0.538 ($p > 0.05$). Additionally, the Nagelkerke R-squared value was 0.009, meaning that the perception variable could only explain 0.9% of the variation in food waste, while the remaining 99.1% was influenced by other factors outside of perception. These findings indicate that students' perceptions of the free nutritious meal program are not the primary determining factor in determining food consumption behavior or the occurrence of food waste. Thus, other factors such as food quality, portion suitability, or meal duration are likely more dominant.

Discussion

The findings of this study indicate that the majority of students hold a fairly positive perception of the Free Nutritious Meal program, indicating good acceptance of this program as an effort to meet nutritional needs during school hours. This is in line with literature stating that school lunch policies contribute significantly to the learning process and students' physical readiness (9). This perception is formed through the interaction of cognitive components, where students understand the nutritional benefits of the program; affective components, which reflect emotional and sensory responses to food; and conative components, which indicate students' intentions in responding to the served meals (10) (11). Students view the MBG Program not merely as free food, but as a form of support for their health and learning concentration at school (9).

Although the level of perceptual acceptance is good, the pattern of plate waste per component shows an interesting dynamic. Students tend to finish animal-based side dishes and staple foods more easily, but leave the highest amount of plant-based side dishes or vegetables. The high waste of vegetable components

is inseparable from children's sensory preferences, which generally dislike bitter tastes, mushy textures, or unappealing vegetable appearances (12). This phenomenon confirms that the sensory characteristics of food are the main determinants of acceptability, where food that does not align with personal taste and texture preferences will tend to be rejected, regardless of how much students understand the nutritional benefits of vegetables (13).

The lack of a significant influence of students' perceptions on the level of food waste confirms the existence of the attitude-behavior gap phenomenon, a condition where a person has a positive attitude or understanding towards something, but this does not always translate into consistent actions (14). Based on the Theory of Planned Behavior, the intention to consume or leave food is not only determined by individual attitudes or perceptions, but is also heavily influenced by subjective norms and perceived behavioral control (15). Students' physical conditions, such as the level of fullness or fatigue after studying, as well as social environmental pressures, become controlling factors that often override the initial intention to finish their meals.

The lack of significant influence also confirms that perception is not the sole or primary determinant of food waste behavior in schools. External and situational factors are proven to have a much more dominant role in determining the students' final decision to leave food. Sensory quality (taste and aroma), portion size suitability to students' stomach capacity, and limited meal duration often force students to leave food, even though they have a positive perception of the menu served (16). Portion sizes that are not adjusted to children's consumption capacity directly contribute to increased plate waste. Furthermore, the lack of active supervision and role modeling from teachers during meal times in class also contributes to the low drive for students to consume their portions optimally (15). Monotonous menu variations and less appealing presentation methods also accelerate the onset of boredom and food rejection (17).

From an Islamic perspective, the phenomenon of the gap between good intentions and the behavior of leaving food becomes a special concern, considering that religion strictly prohibits *israf* (wastefulness), including in consuming food which is a blessing from Allah (18). Good intentions to appreciate food must be followed by concrete actions, so as not to fall into behavior that contradicts the principles of gratitude and responsibility. Therefore, the effectiveness of the MBG program in reducing food waste requires a holistic approach. Interventions cannot solely focus on forming perceptions or nutritional education, but must be accompanied by optimizing presentation quality, flexible portion adjustments, adequate meal time management, and involving teachers in creating social norms that support zero-waste eating behavior in the school environment (15)(16). Efforts to strengthen the MBG Program by combining national standards with local food supplies and nutrition education are considered effective (19). The government has affirmed that ensuring the availability of and access to nutritious food for all segments of society particularly vulnerable groups is a crucial step toward improving public well-being and achieving sustainable food security (20).

Conclusions and Recommendations

Based on the research conducted at Madrasah Tsanawiyah 3 Surabaya City, it can be concluded that students' perceptions of the Free Nutritious Meal program are mostly in the moderate category, indicating a fairly positive acceptance of the program by the students. In line with this acceptance, the level of food waste in this program is mostly in the low category, reflecting that the majority of students tend to consume the served meals. However, the results show that students' perceptions do not have a significant influence on the level of food waste. These findings indicate that the perception factor alone is not the main determinant in predicting students' food consumption or disposal behavior.

Therefore, efforts to reduce food waste in the Free Nutritious Meal program cannot solely rely on forming perceptions or education. It is recommended for schools and food providers to conduct routine evaluations of menu variations, specifically improving the sensory quality of plant-based side dishes and vegetables. Additionally, adjusting portion sizes and providing adequate meal times need to be implemented to optimize food consumption. Future researchers are advised to expand the research variables by including sensory quality factors, meal duration, and students' physiological conditions, as well as using direct weighing methods for higher accuracy of food waste data.

Ethical Consideration and Competing Interest

In terms of research ethics, this study adhered to fundamental ethical principles, including informed consent, confidentiality, and voluntary participation. All participants were informed about the purpose and procedures of the study prior to data collection, and their consent was obtained before conducting the interviews and observations. The anonymity of participants was strictly maintained by ensuring that personal identities were not disclosed in the reporting of findings. Furthermore, all data collected were used solely for research purposes, ensuring respect for participants' rights and maintaining the integrity of the research process. There is no conflict of interest related to this publication. This study adhered to standard research ethics. Ethical approval was obtained from the Health Research Ethics Committee of the Sunan Ampel State Islamic University of Surabaya No. A-20/KEP/Un.07/09/01/2026. Informed consent was obtained from all participants and their guardians prior to data collection. Student anonymity and confidentiality were strictly maintained throughout the research process, and participation was entirely voluntary.

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