Jurnal Mandiri IT
Vol. 14 No. 1, July (2025), pp. 115-122

ISSN 2301-8984 (Print), 2809-1884 (Online)
Published by Institute of Computer Science

Evaluation of free nutritious food program distribution in Tanah Sareal sub-district with ANOVA

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ARTICLE INFO

Article history:

Received Apr 30, 2025
Revised May 29, 2025
Accepted Jun 15, 2025

Kata kunci:

Analysis of Variance (ANOVA);
Free Nutritious Meals;
F-statistic;
MBG.

ABSTRAK

This study aims to evaluate The Makan Bergizi Gratis (MBG) or Free Nutritious Meal Program in Tanah Sareal Sub-district in the first quarter of 2025 by using one-way ANOVA test. The results of the analysis show that the F-statistic values for January, February, and March are 0.00044 which are all smaller than the F-critical value of 3.490, so the null hypothesis (H_0) stating that there is no significant difference in the distribution of food portions is accepted. The sample size of this study consisted of 5 schools, with data collected over a three-month period (January, February, and March). The calculated p-value for the F-statistic was 0.9996, indicating that the observed difference in meal distribution was not statistically significant. These findings suggest that the distribution of nutritious food portions in Kecamatan Tanah Sareal was relatively stable during the first quarter of 2025, with small fluctuations, but no significant variations. Although the program shows stability in distribution, further improvements in logistical aspects and coordination of distribution are recommended to ensure more equitable and timely distribution. Periodic evaluation of the program is needed to assess its efficiency and ensure that all areas in need are well served.

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1. INTRODUCTION

The Makan Bergizi Gratis (MBG) or Free Nutritious Meal Program is one of the government programs that aims to reduce nutrition problems in children, especially those from economically disadvantaged families. This program is particularly important given the high rates of stunting and malnutrition which are still major health problems in Indonesia (Hafid & Maula, 2024; Pambudi, 2025). Reducing stunting and malnutrition is part of the effort to improve the quality of human resources in the future. The program aims not only to improve children's nutrition, but also to support the improvement of their education quality, which is the foundation for the development of superior human resources in the future (Harper et al., 2023; Soma et al., 2024).

However, one of the major challenges of the MBG program is the efficient and equitable distribution of meals. In areas such as Tanah Sareal, access to nutritious food is often hindered by inadequate infrastructure, which affects the effectiveness of the distribution process (Bruce et al., 2022; Du & Weisbrod, 2024; Gagliano et al., 2023). Uneven distribution can lead to children in need of nutritious food not getting appropriate access (Bui et al., 2023; Sarjito, 2024). To ensure the success of this program, good coordination between food providers and schools is needed, so that food supplies can arrive on time and in the right amount according to the needs of each region (Merlinda & Yusuf, 2025; Setiawan, 2024; Yusriadi, 2025).

Providing nutritious food to children not only aims to improve their nutritional status, but also to support optimal academic achievement. Students who receive nutritious meals have higher learning motivation and find it easier to concentrate during learning activities (Saleh & Imanda, 2025; Zanesty & Adhyaksa, 2025) . Nutritious food can improve student concentration, which directly contributes to better academic outcomes (Arafin, 2024). Therefore, the MBG program has the potential to provide broader long-term benefits for children, both in terms of their physical health and in the context of their intellectual development (Burkholder et al., 2024; Ouellette et al., 2024).

Although several studies have evaluated the distribution of nutrition programs in Indonesia, most of these studies have not considered fluctuations in distribution over specific periods or have not used a systematic approach to analyzing distribution differences. For example, the study by Bui et al. (2023) examined food distribution in Texas during the COVID-19 pandemic, but it focused more on access and diversity of distribution sites, without identifying variations in food distribution over specific time periods. Another study, conducted by Bruce et al. (2022), focused on an intergenerational meal program but did not use statistical methods to test for differences in distribution over time.

Therefore, this study focuses on using Analysis of Variance (ANOVA) to examine differences in the distribution of free nutritious meals across months, providing a more structured and in-depth approach to analyzing the distribution data of the Free Nutritious Meal (MBG) program. ANOVA allows for a quantitative evaluation to identify significant differences in food distribution over specific periods, offering a clearer picture of the fluctuations in distribution that occurred in the Tanah Sareal Sub-district. The choice of Analysis of Variance (ANOVA) is based on its ability to test for significant differences among groups. In the context of the MBG program distribution, ANOVA enables an evaluation to assess whether there are differences in distribution between January, February, and March that could affect the success of the distribution. ANOVA has been widely used in studies related to nutrition interventions to identify variations in food distribution across different periods or locations (Chen & Zheng, 2023). As such, ANOVA is selected to provide a clearer assessment of the stability of food distribution that occurred in the Tanah Sareal Sub-district.

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As successful distribution depends on coordination and matching supply with demand, good management at the implementer level is also a key factor for the smooth running of this program. Training and capacity building of school-level implementers is important to ensure that food is distributed in a timely manner and according to the needs of students (Diaz, 2024; Winduro, 2025). Proper matching between the number of recipients and the amount of supply is crucial to avoid oversupply or scarcity, which can disrupt the smooth running of the program. This practice of supply matching is crucial in ensuring that every area, including remote areas, receives its fair share of nutritious food (Frazier et al., 2022; Hecht et al., 2020; Zhao, 2025).

This study is expected to make a significant contribution to the policy on the distribution of free nutritious meals in Indonesia. By using ANOVA, the results of this study can provide a clearer picture of imbalances in distribution and potential improvements in logistics for the MBG program. Additionally, this study is expected to enrich the literature on nutritional distribution analysis in developing countries, particularly in the context of government programs focused on reducing stunting and malnutrition.The primary goal of this study is to analyze the distribution differences of free nutritious meals in the Tanah Sareal Sub-district during the first quarter of 2025, using Analysis of Variance (ANOVA). By analyzing distribution data for the months of January, February, and March, this study aims to determine whether there are significant differences in distribution and identify factors influencing distribution. The results of this study are expected to provide policy recommendations for improving the efficiency and equity of the MBG program distribution (Harper et al., 2023).

2. RESEARCH METHODS

This study used a quantitative approach to evaluate the differences in the distribution of Free Nutritious Meals (MBG) in Tanah Sareal sub-district in the first quarter of 2025. The analysis used is a one-way Analysis of Variance (ANOVA) to test whether there is a significant difference in the distribution of nutritious food portions between January, February, and March 20252025 (Chen & Zheng, 2023).
The research steps taken in this study are as follows:

a. **Data Collection**
The data used in this study were obtained from the distribution of nutritious food in several schools in Tanah Sareal Subdistrict, specifically in the first quarter of 2025, during January, February, and March, at five schools. The schools involved are SMKN 1 Bogor, SMP PGRI 6, SMP Siliwangi, SDN Kedungbadak 1, and Paud Cikal Mandiri. These five schools were selected using purposive sampling, a non-random selection technique, which ensures that the sample is representative of the schools that participate in the MBG program and that are capable of providing reliable data for the research. This technique allows for a more focused selection, ensuring that the schools chosen have experience with the MBG program and can provide the necessary data to evaluate its distribution.
Each school was observed for a period of three months, covering the months of January, February, and March 2025. For each month, the number of food portions distributed to the students at each school was recorded. This study used primary data, which was collected directly from the schools involved in the MBG program. The primary data collected included the number of food portions distributed to each school and the date of distribution for each month.
In terms of validity, the data was verified through cross-checking with official distribution reports from each school to ensure accuracy and completeness. To ensure the reliability of the data, the data collection process was standardized across all five schools, ensuring that the same data collection methods were consistently applied each month. Furthermore, the data collection was conducted over a three-month period, allowing for an accurate representation of the fluctuations in the distribution of meals over time.

b. Data Processing
After the data is collected, processing is carried out to obtain the average portion distribution per month (mean per group) and the total portion distribution for three months. This processing aims to facilitate further analysis using ANOVA.For statistical software, Microsoft Excel was used in this study. Excel was selected due to its accessibility and ease of use for performing calculations such as means, variances, and conducting the ANOVA analysis. The software was particularly suitable for handling the dataset and performing the statistical tests necessary for this research.To ensure a robust analysis, the data was processed to calculate the Sum of Squares Between (SSB) and Sum of Squares Within (SSW), and subsequently to determine the Mean Square Between (MSB) and Mean Square Within (MSW), and calculate the F-statistic.

c. Analysis with ANOVA
To test for significant differences between months, a one-way ANOVA analysis was conducted. This analysis compares the variance between months (Sum of Squares Between or SSB) with the variance within months (Sum of Squares Within or SSW). The formula used in ANOVA is:

a. Sum of Squares Between (SSB)
SSB measures the variation between the group mean (month) and the grand mean (overall mean) (Li Zhen, 2023).
The formula is:

$$SSB = \sum_{i=1}^{k} n_i \left(\bar{X}_i - \bar{X}_{grand}\right)^2 \quad (1)$$

Where: n_i is the number of data in group i, $\bar{X}_i$ is the average of group i, k is the number of groups (months), $\bar{X}_{grand}$ is the overall average of all groups.

b. Sum of Squares Within (SSW)

SSW measures the variation within each group (month). It describes how much the individual values within the group vary compared to the average of the group (José Camacho, 2024)

$$SSW = \sum_{i=1}^{k} \sum_{j=1}^{n_i} \left(\bar{X}_{ij} - \bar{X}_i\right)^2 \quad (2)$$

Where: $\bar{X}_{ij}$ is the value of the-j observation in group i, $\bar{X}_i$ is the mean of group i , k is the number of groups (months), n_i is the number of data in group i.

c. Mean Square Between (MSB)
MSB is the mean square of variation between groups (differences in food portion distribution between months). It is calculated by dividing SSB by the degrees of freedom between groups. MSB describes the average variation between groups (Sutrisno et al., 2024).
The formula is:

$$MSB = \frac{SSB}{df_B} \quad (3)$$
$$df_B = k - 1$$

Where: k is the number of groups (months), df_B is the degree of freedom between groups.

d. Mean Square Within (MSW)
MSW is the mean square of within-group variation (differences in the distribution of food portions within each month). It is calculated by dividing SSW by the within-group degrees of freedom. MSW represents the average within-group variation (Li Zhen, 2023).
The formula is:

$$MSW = \frac{SSW}{df_w} \quad (4)$$
$$df_w = N - k$$

Where: k is the number of groups (months), N is the total number of observations, df_w is the degrees of freedom within groups,

e. F-statistic
The F-statistic is used to test the significance of differences between groups. The F-statistic is calculated by comparing MSB and MSW. If the F-statistic value is greater than the F-critical value at a certain significance level, then the null hypothesis (H_0) stating that there is no significant difference can be rejected.
The formula is:

$$F = \frac{MSB}{MSW} \quad (5)$$

Where: MSB Average squared variation between groups (difference in food portion distribution between months), MSW Average squared variation within groups (difference in food portion distribution within each month).

f. After calculating the F-statistic, we compare it to the F-critical value from the F-distribution table.
The F-critical value is determined based on the degrees of freedom between groups (df_B) and the degrees of freedom within groups (, df_w). For a significance level of 0.05, the F-critical value can be found using the F-distribution table or statistical software tools such as Excel.
The formula is:

$$\mathrm{F-critical} = FINV(0.05, df_B, df_w) \quad (6)$$

g. The p-value is calculated by comparing the F-statistic with the F-distribution. If the F-statistic is greater than the F-critical value, the p-value will be small, suggesting that the null hypothesis can be rejected. If the F-statistic is smaller than the F-critical value, the p-value will be larger, indicating that there is no significant difference between the groups.
The formula is:

$$\text{p} - \text{value} = FDIST(F, df_B, df_w) \quad (7)$$

3. RESULTS AND DISCUSSION

3.1 Research Results

Based on calculations using one-way ANOVA, the following are the results of the distribution of Free Nutritious Meals (MBG) in Kecamatan Tanah Sareal during the first quarter of 2025. The calculation of Sum of Squares Between (SSB), Sum of Squares Within (SSW), Mean Square Between (MSB), Mean Square Within (MSW), and the F-statistic were performed across the entire data set for the three months (January, February, and March). The summary table below presents the overall ANOVA calculation results:

Table 1. One-Way ANOVA Calculation Results

Components	January
Sum of Squares Between (SSB)	2.642,70
Sum of Squares Within (SSW)	6.038.739,20
Mean Square Between (MSB)	880,90
Mean Square Within (MSW)	2.012.913,07
F-statistic	0,00044
F-critical	3,490
p-value	0,9996

The F-statistic value obtained is 0.00044, which is substantially smaller than the F-critical value of 3.490, indicating that there is no statistically significant difference between the food distribution across the three months. In addition, the p-value of 0.996 confirms that the null hypothesis (H_0), which states that there is no significant difference in the distribution of food portions, cannot be rejected. Therefore, the results suggest that the distribution of nutritious food portions in Tanah Sareal was relatively stable throughout the first quarter of 2025, with no significant fluctuations that would justify rejecting the null hypothesis.

3.2 Discussion

The ANOVA results, with an F-statistic of 0.00044 and a p-value of 0.996, show that there is no significant difference in the distribution of Free Nutritious Meals (MBG) across the months of January, February, and March. The F-statistic value is far below the F-critical value of 3.490, indicating that any differences observed in the distribution across months are statistically insignificant. This suggests that the MBG program has been consistent in its distribution of nutritious meals across the first quarter of 2025.

However, the results must be interpreted in the context of potential real-world implications. While the statistical analysis suggests stability, it is important to consider other factors such as logistical challenges, regional disparities, and timing of distribution that may affect the effectiveness of the program. For example, factors like school infrastructure, transportation, and coordination between food providers and schools can influence the success of meal delivery.

When comparing these results to similar studies, it is evident that stable food distribution is a key factor in successful nutrition programs. Previous studies, such as those conducted by Bruce et al. (2022) and Pambudi (2025), have shown that effective coordination and distribution mechanisms are essential for ensuring equitable access to nutritious meals, particularly in areas with limited resources. Government policies aimed at improving nutrition and reducing malnutrition should consider these factors and ensure that logistical challenges do not undermine the success of nutrition programs.

Furthermore, it is important for policymakers to monitor the MBG program continuously and consider periodic evaluations to identify areas for improvement. Although the statistical results indicate stability, continuous improvement in logistical operations is necessary to ensure the program meets its goals of providing nutritious meals to children, especially in remote areas. This could involve better planning for supply chain management, addressing infrastructure challenges, and ensuring that distribution occurs in a timely manner.

In terms of theoretical and practical contributions, this study highlights the importance of evaluating the stability and effectiveness of nutrition distribution programs. It provides insights into how statistical tools like ANOVA can be used to assess distribution patterns and guide improvements in government nutrition programs. Further research should focus on examining the reasons behind small fluctuations in distribution and exploring how these factors can be addressed to improve overall program performance.

4. CONCLUSIONS

Based on the results of the study, it can be concluded that there is no significant difference in the distribution of Free Nutritious Meals (MBG) between January, February, and March 2025 in Tanah Sareal Sub-district. The F-statistic value obtained for the three months is very small and does not exceed the F-critical value, so the null hypothesis (H_0) stating that there is no significant difference in the distribution of food portions can be accepted. This indicates that the distribution of the MBG program in this sub-district was relatively stable throughout the first quarter of 2025. Although there were slight fluctuations in the average distribution of food portions, the differences were not statistically significant. While the stability of the program's distribution is encouraging, the findings suggest that improvements in the logistics and coordination aspects of the program are necessary. One potential improvement could involve the integration of information technology for real-time tracking of food distribution. A robust monitoring system that tracks food deliveries and monitors real-time data would enhance the efficiency of distribution and ensure that food is delivered to the right locations at the right times. Such a system would also allow for better targeting, ensuring that areas with the greatest need are prioritized, and addressing logistical bottlenecks that may arise in the distribution process. Additionally, the distribution monitoring system could be improved by incorporating feedback mechanisms from the schools and other local stakeholders. This would allow for the collection of real-time data on any challenges or delays experienced in the delivery process, enabling quick corrective actions to be taken.This study contributes to the understanding of the effectiveness of the MBG program, particularly in assessing the stability of food distribution. The findings have significant implications for public policy, especially for local and national government efforts aimed at reducing malnutrition and improving food security for schoolchildren. Policymakers can use these insights to enhance the implementation and monitoring of nutrition intervention programs, not just in Tanah Sareal but in other regions as well. Ensuring equitable access to nutritious food is crucial to improving children's health and education outcomes, and more efficient distribution systems will play a key role in achieving this. Furthermore, future research could explore a comparative analysis between sub-districts with varying levels of program implementation to identify best practices and factors that contribute to successful distribution. It would also be beneficial to examine external factors such as logistics, weather conditions, and school readiness in the distribution process. These factors could have an impact on the efficiency of the program and provide deeper insights into areas that require improvement.In conclusion, while the MBG program demonstrates relative stability in distribution, adopting more advanced technologies and improving monitoring mechanisms are critical to ensuring the continued success and expansion of the program. This study offers valuable insights for policymakers and provides a foundation for future research to further explore and optimize the delivery of nutritious meals to children in Indonesia.

References

Arafin, M. (2024). Impact of School Meals in Bangladesh. *World Journal of Advanced Research and Reviews*, *26*(1).

Bruce, J. S. , L., T., G., E., P., V., R., & Merrell, S. B. (2022). Examination of an Intergenerational Summer Meal Program for Children and Older Adults. *Journal of Community Health*.

Bui, T., Melnick, E., & M., T. (2023). The Distribution of and Access to Free Meal Sites Serving School Aged Children During the COVID-19 Pandemic: Evidence From Texas. *The Journal of School Health*, *9*(2), 234–243.

Burkholder, K., Bennett, B. L., & Melnick, E. (2024). Participation in the US Department of Agriculture's Summer Meal Programs: 2019-2021. *The Journal of School Health*, *92*(2), 429–435.

Chen, T., & Zheng, L. (2023). One-Way High-Dimensional ANOVA. *Journal of Mathematics*.

Du, N. , T. E. R., & Weisbrod, V. M. (2024). Identifying Parentally Perceived Barriers for Children with Celiac Disease to Participate in Elementary School Meal Programs. *JPGN Reports*, *5*(4).

Frazier, C. R. M., Pinkerton, E. A., & Grana, M. (2022). Feed1st, No Questions Asked: How a Hospital-Based Food Pantry Program Grew Its Impact During the COVID-19 Pandemic. *American Journal of Public Health*.

Gagliano, K. M., Yassa, M. O., & Winsler, A. (2023). Stop the Shame and the Hunger: The Need for School Meal Program Reform. *Children and Youth Services Review*, *155*.

Hafid, A. H., & Maula, A. (2024). Analyzing Free Nutritious Meals for Children in the Quran: A Literature Study of Economic (Iqtishadi) and Maqasid (Maqashidi) Perspectives in Tafsir. *ICONIS: International Conference on Islamic Studies*, *8*(1).

Harper, K., Bode, B., & Gupta, K. (2023). Challenges and Opportunities for Equity in US School Meal Programs: A Scoping Review of Qualitative Literature Regarding the COVID-19 Emergency. *Nutrients MDPI Journal* , *15*(17).

Hecht, A. A., Pollack Porter, & Turner, L. (2020). Impact of The Community Eligibility Provision of the Healthy, Hunger-Free Kids Act on Student Nutrition, Behavior, and Academic Outcomes: 2011-2019. *American Journal of Public Health*.

José Camacho. (2024). ANOVA Simultaneous Component Analysis for the Efficient Exploration of Massive Network Traffic. *IEEE Network Operations and Management Symposium*.

Li Zhen. (2023). Research and Application of Forecasting Based on ARIMA and ANOVA Models. *International Conference on Applied Physics and Computing (ICAPC)*.

Merlinda, A., & Yusuf, Y. (2025). Analisis Program Makan Gratis Prabowo Subianto Terhadap Strategi Peningkatan Motivasi Belajar Siswa di Sekolah Tinjauan dari Perspektif Sosiologi Pendidikan. *Journal of Multidisciplinary Research and Development*, *7*(2).

Ouellette, S., Gupta, K., & Lambert, L. (2024). Meal Distribution Methods and Safety Measures During COVID-19 School Closures. *Journal of Nutrition Education and Behavior*, *56*(4), 455–464.

Pambudi, A. W. (2025). Indonesia Government's Efforts to Eradicate Stunting Through the Free Nutritious Meal Program for Children: Opportunities and Challenges. *Jurnal Politikom Indonesiana*, *9*(2).

Saleh, M. F., & Imanda, R. (2025). Public Sentiment Analysis of the Free Meal Program: A Comparison of Naive Bayes and Support Vector Machine Methods on the Twitter (X) Social Media Platform. *Journal of Applied Informatics and Computing*, *9*(1).

Sarjito, I. A. (2024). Free Nutritious Meal Program as a Human Resource Development Strategy to Support National Defence. *International Journal Administration, Business & Organization*, *5*(5).

Setiawan, R. B. (2024). Good Demand-Supply Matching Practices as A Key to The Efficiency and Effectiveness of Free Nutritional Meal Programs: Leveraging Diverse Supply Sources to Maximize Government Expenditure Value. *Jurnal Indonesia Sosial Teknologi*, *5*(10).

Soma, R. I., Azhar, A., & Uchiyama, T. (2024). Food Preferences In Indonesian Schoolchildren And The Parents' Perspectives On The Upcoming Nutritious Free Meal Program. *E3S Web of Conferences*, 12.

Sutrisno, U., Wulandari, Y., Usep, S., Arifin, S., Manurung, M. M., & Faisal, M. (2024). Trends, Contributions and Prospects: Bibliometric Analysis of ANOVA Research in 2022-2023. *Indonesian Journal of Applied Mathematics and Statistics*.

Toossi, S. (2023). The Distribution of and Access to Free Meal Sites Serving School Aged Children During the COVID-19 Pandemic. *The Journal of School Health*.

Yusriadi, Y. (2025). The Impact of Free Nutritious Meal Programs on Food Security: A Systematic Review. *Journal of Indonesian Scholars for Social Research*, *5*(1).

Zanesty, R., & Adhyaksa, R. P. (2025). Design Thinking Approach For Sustainability of Free Meal Program at Al-Quds Traditional Islamic Boarding School. *J-MIND (Jurnal Manajemen Indonesia)*, *9*(2).

Zhao, V. (2025). Free Food for Thought: The Effect of Universal Free School Meals on Graduation Rates in the US. *Economics Letters*.