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The Influence Analysis of Stunting, Human Development Index, and GRDP on Benefit Cost Ratio BPNT Indonesia 2021 - 2023

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Abstract

This study aims to evaluate the fiscal efficiency of the Non-Cash Food Assistance Program (BPNT) in Indonesia during the period 2021 to 2023 using a fiscal approach. *Benefit Cost Ratio* (BCR). The main focus of this study is to measure the extent to which the BPNT program provides socio-economic benefits compared to the costs incurred. The formulation of the problem raised is the extent to which BPNT efficiency can be explained through BCR, and how the variables stunting, Human Development Index (HDI), and Gross Regional Domestic Product (GRDP) influence the BCR value between provinces and time. The novelty of this study lies in the integration of evaluative and explanatory approaches using panel data across regions and years. Secondary data were obtained from BPS and the Ministry of Home Affairs covering 34 provinces in three years. The results of the BCR calculation show that there are 13 provinces that consistently have a BCR value of zero for three years, indicating that the program has not shown a significant impact on reducing stunting. The results of panel data regression with the Common Effect model show that the variables stunting, HDI, and GRDP do not have a significant effect on BCR. This finding indicates that the effectiveness of BPNT in improving community welfare is not optimal and has not been strongly reflected through the indicators used. This study concludes that although BPNT is an important program in social protection, its fiscal effectiveness still needs to be improved by considering a more adaptive program design and integration with other nutrition and poverty alleviation programs. These results provide implications for improving social assistance policies to be more targeted and have a real impact.

INTRODUCTION

The Indonesian government began replacing the direct rice food subsidy program, namely Raskin, since 2017 with a more modern food assistance system through Non-Cash Food Assistance (BPNT). This scheme uses the Family Welfare Card (KKS) which allows beneficiary families to buy food at designated e-warongs. This policy shift is intended to improve the accuracy of aid recipients, encourage distribution efficiency, and suppress the practice of irregularities in aid distribution (Arif *et al*., 2020). Then in 2020, the program was developed into the Sembako Program, which provides recipients with the flexibility to purchase a variety of nutritious food commodities, not just rice and eggs. This expansion is intended to strengthen food interventions and increase nutritional intake for poor households (Banerjee *et al*., 2021).

The problems of stunting and poverty in Indonesia are still major challenges, even though the government has distributed large amounts of funds through various social assistance programs, including the Non-Cash Food Assistance Program (BPNT). Research conducted by Aisyah *et al.* (Aisyah et al., 2021) highlighted that although BPNT generally contributes to food security for low-income communities, its impact in reducing the prevalence of stunting has not been evenly distributed across provinces. The same thing was also found in the TNP2K report (Tim Nasional Percepatan Penanggulangan Kemiskinan, 2019) which assessed that obstacles in distribution and the lack of policy integration between institutions limited the effectiveness of the program, especially in reaching the problem of malnutrition in children. An overview of the number of stunted toddlers can be seen in **Figure 1**

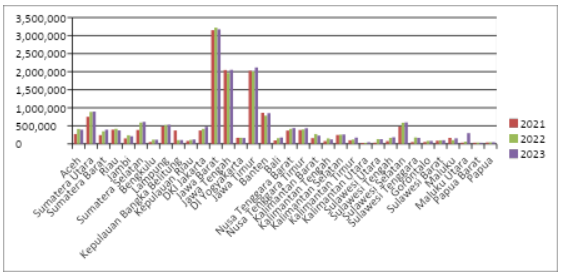

Figure 1 Data on the Number of Stunting Toddlers 2021 – 2023

Source: BPS Secondary Data

Figure 1 namely data on the number of stunted toddlers during the same period, it can be seen that the high budget does not automatically result in significant improvements in nutrition. Provinces with large budgets such as Central Java and East Java still record high stunting rates and tend not to experience significant changes from year to year. However, if associated with **Figure 2**,

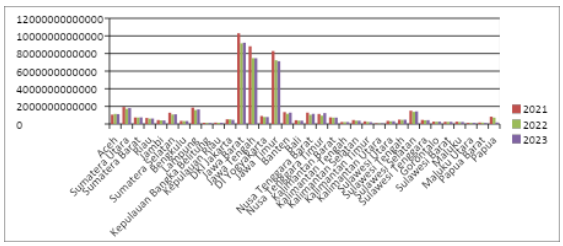

Figure 2 Budget Fund Graph for KPM 2021 - 2023

Source: BPS Secondary Data

Figure 2 presents the allocation of BPNT funds by province from 2021 to 2023. From the graph, it can be seen that densely populated areas such as West Java, Central Java, and East Java dominate the absorption of aid funds. This reflects a distribution approach based on the number of Beneficiary Families (KPM), which is reasonable considering the high population concentration in these areas. This condition shows that the amount of funds does not always reflect the success of the program in addressing social and public health problems. As stated by Leung and Wolfson (Leung & Wolfson, 2025), the decline in household income due to social restrictions during the COVID-19

pandemic caused two-thirds of families to worry about access to food, accompanied by disruptions in nutrition services that worsened the condition of children. Therefore, the success of BPNT should not only be measured by how much funds are distributed, but also by how far its positive impact is on the welfare of recipients, especially in reducing poverty and stunting rates. For this reason, an evaluation approach based on the benefit-cost ratio and cross-provincial socio-economic analysis are important in formulating more effective and sustainable policies. Similar programs in other countries, such as SNAP (*Supplemental Nutrition Assistance Program*) in the United States and *Diatrophy*in Greece, showed that the success of food aid programs was strongly influenced by the flexibility of program design and the use of data to tailor implementation locally (Leung & Wolfson, 2025; Ma *et al*., 2022). Meanwhile, a number of studies emphasize the importance of including health and economic indicators, such as food prices, poverty, and stunting, into long-term impact evaluations (Diamantis *et al*., 2024).

Unfortunately, in Indonesia itself, comprehensive evaluations are based on quantitative approaches such as **Benefit–Cost Ratio (BCR)** is still rarely done. Most studies focus more on the technical aspects of distribution or perceptions of beneficiaries at the local level, for example, studies examining the causes of stunting through a dynamic panel approach that show limited coverage (Munawaroh *et al.*, 2024). Evaluations that simultaneously link macro variables such as food prices, stunting, and poverty to the effectiveness of the BPNT program nationally are still minimal.

To fill the research gap, this study uses two main approaches. First, evaluation using BCR will calculate the efficiency of the program by comparing costs (number of beneficiaries and total budget) with various socio-economic benefits such as food expenditure, employment rates, stunting, food prices, and poverty rates. The choice of indicators refers to guidelines from global evaluative studies such as by Banerjee *et al.*(Banerjee et al., 2023) and Hidrobo *et al.*(Hidrobo et al., 2018). Second, the panel regression approach is applied to trace the relationship between poverty and food prices on program efficiency outcomes across time and regions. This approach is used to present a more complete picture of how food assistance can affect people's welfare in real and sustainable ways. Through this method, it is hoped that research can contribute to compiling an evaluation of the BPNT program that not only looks at the distribution side, but also the real effectiveness in reducing poverty and improving the nutritional quality of the Indonesian people.

Based on this background, this study draws a formulation of the problem that it wants to express, namely, To what extent can the fiscal efficiency of BPNT during 2021–2023 be measured using the Benefit–Cost Ratio (BCR), taking into account cost and benefit variables such as food consumption, work participation rates, stunting, food prices, and poverty? In addition, how do socio-economic variables (poverty levels and food prices) affect the BPNT BCR value between regions and time?

Therefore, this study has the main objective to evaluate the level of fiscal efficiency of the implementation of the Non-Cash Food Assistance Program (BPNT) in Indonesia throughout 2021 to 2023 using the *Benefit–Cost Ratio* (BCR) approach. This efficiency assessment is carried out by taking into account a number of variables, including expenditure variables such as the number of Beneficiary Families (KPM) and the total funds allocated, as well as outcome variables that include household expenditure on food consumption, participation rate in the workforce, stunting prevalence rate, food prices, and poverty levels. In addition, this study also aims to examine the extent to which socio-economic variables, especially poverty levels and food prices, affect the BCR value

between provinces over time. To examine the relationship between macroeconomic dynamics and the effectiveness of the food assistance program, the panel regression approach is used as an analysis method.

In evaluating the effectiveness and efficiency of the Non-Cash Food Assistance Program (BPNT), this study uses three main complementary theoretical approaches. Where the theory used to support this study focuses on economic and social conditions, these theories include theories related to policy implementation, social justice and needs. In addition, to strengthen the analysis, this study uses a conceptual approach *Benefit Cost Ratio* (BCR). The concept is used to help describe the evaluation of the Non-Cash Food Assistance program. This approach does not only focus on technical efficiency, but also on the fairness of aid distribution and the fulfillment of basic needs of the poor. The four literature reviews can be described as follows:

LITERATURE REVIEW

Policy Implementation Theory – Mazmanian and Sabatier (1983)

Mazmanian and Sabatier stated that the success of policy implementation is largely determined by the clarity of objectives, the capacity of implementing institutions, administrative structures, and adequate socio-political support. They emphasized that "the clearer and more internally consistent the objectives, the greater the likelihood of successful implementation" (Mazmanian & Sabatier, 1984). In the context of BPNT, ideal implementation should reflect technical and administrative effectiveness in the field. Hermawan research *et al.* (Hermawan et al., 2021) showed that the implementation of BPNT still faces a number of technical obstacles, such as limited e-warong infrastructure, inaccurate KPM data, and delays in aid distribution. These problems weaken the success of program implementation, especially in targeting community groups who need assistance in a timely manner. Therefore, the success of the implementation of the BPNT policy needs to be examined from a technical and institutional perspective to see its effectiveness.

Theory of Social Justice – John Rawles (1971).

Rawls in *A Theory of Justice States* that social justice is achieved if economic and social inequalities are arranged in such a way that they benefit the least advantaged groups in society. His "difference principle" states that "social and economic inequalities are to be arranged so that they are to the greatest benefit of the least advantaged" (Rawles, 1971). In the implementation of BPNT, Rawls' principle of justice is relevant to assess the extent to which food aid targets poor households appropriately. Ariansyah *et al.* (Ariansyah et al., 2025) found that there were problems with the accuracy of recipient data which caused inclusion errors (non-poor individuals received assistance) and exclusion errors (poor individuals did not receive assistance). Failure to target the most needy groups made the program less fair and weakened the social redistribution function that should be carried out by the state.

Basic Needs Theory – Abraham Maslow (1954)

According to Maslow, human needs are arranged hierarchically, and physiological needs such as food occupy the most basic level. Maslow asserted that "any deprivation in basic needs such as food makes it impossible for higher-level motivations to emerge" (Maslow, 1954). This means that without meeting basic needs, society cannot develop socially or economically. In a study conducted by Ramadani & Sihombing (Ramadani & Sihombing, 2024), BPNT was proven to contribute to increasing access to food and nutrition in poor households. However, this success has not been evenly distributed because there are still obstacles such as late distribution and

lack of supervision. This finding shows that although BPNT has great potential to meet the basic needs of the community, its effectiveness is still limited if it is not accompanied by improvements in the implementation mechanism.

Benefit–Cost Ratio (BCR) Concept

As a quantitative evaluative tool, BCR is used to measure the fiscal efficiency of public programs. BCR is the ratio between total benefits (socio-economic output) and total costs incurred. If the BCR value is > 1, then the program is categorized as fiscally efficient. According to Boardman *et al.* (Boardman et al., 2018), "BCR is a key metric in cost–benefit analysis that reflects the value for money of a public investment.". In the context of BPNT, the benefits measured include a decrease in stunting rates, a decrease in poverty rates, and an increase in food consumption. The costs calculated include the central government budget for the program and the number of KPM per province. Rambe's research *et al.* (Rambe et al., 2022) showed that the efficiency of local government spending in poverty alleviation programs varied g reatly between provinces, especially before and during the COVID-19 pandemic. Java-Bali Province showed better efficiency performance than Sulawesi and Nusa Tenggara, due to differences in local economic structures such as food prices, population distribution, and effectiveness of supervision. This supports the importance of using BCR analysis in assessing whether the allocation of BPNT funds actually produces socio-economic benefits that are equal to or greater than the costs incurred.

METHODOLOGY

This research is a quantitative research with an evaluative and explanatory approach. The evaluative approach is used to assess the efficiency of the BPNT program through the method *Benefit–Cost Ratio* (BCR), while the explanatory approach is used to determine the effect of socio-economic variables (poverty and food prices) on the program efficiency value through panel data regression analysis. This study was conducted at the provincial level in Indonesia, covering 34 provinces, with an observation period from 2021 to 2023. This time selection takes into account the period after the COVID-19 pandemic, where food aid policies experienced an expansion of schemes and budget allocations.

The type of data used in this study is secondary data, in the form of data on the number of stunted toddlers, the Human Development Index (HDI), and Gross Domestic Product at current prices (PDRB), data on the number of Beneficiary Families (KPM), and the BPNT budget per province, sourced from the Central Statistics Agency (BPS). Furthermore, data from the Ministry of Home Affairs is also used regarding the number of stunted toddlers with their percentages. The following is the operational definition of each variable used in the BCR analysis for the panel model regression test:

Variables	Type	Operational Definition	Source
BCR (*Benefit–Cost Ratio)*	They depend	The ratio between total benefits and costs of the BPNT program as a measure of fiscal efficiency	Self-calculation
HDI (Human Development Index)	Independent	Combined index of education, health and purchasing power (0–100)	Central Bureau of Statistics

JS (Number of Stunting Toddlers)	Independent	Number of stunted toddlers (people per year)	Central Agency of the Ministry of Home Affairs
GRDP (Gross Domestic Product)	Independent	Total value of regional economic output at current prices (in trillions of rupiah)	Central Bureau of Statistics

This study uses quantitative analysis techniques to assess the efficiency of the Non-Cash Food Assistance Program (BPNT) and analyzes the influence of socio-economic variables on this efficiency. This analysis technique is divided into several stages as follows:

1. **Analysis *Benefit–Cost Ratio* (BCR)**
   The BCR method is used to assess the efficiency of BPNT. The basic formula of BCR is:

$$BCR = \frac{Total\ Manfaat\ Sosial\ Ekonomi}{Total\ Biaya\ Program}$$

   Socio-economic benefits are obtained from the calculation of the reduction ((Percentage of Stunting x Number of Stunting Toddlers) x Average Food Expenditure). Meanwhile, the cost calculation is obtained by means of BPNT Budget x Number of KPM. So that a BCR value is obtained which is used to see the efficiency of the program. Here is the explanation:
   - BCR > 1: The program is efficient.
   - BCR = 1: Program impas (break-even).
   - BCR < 1: Program is inefficient.
2. **Panel Data Regression Analysis**
   After the BCR calculation is done, the next step is to test the influence of socio-economic variables on the BCR using panel data regression. The panel data regression model is used because it can analyze data across provinces and across time simultaneously, providing a more comprehensive picture of the influence of the variables studied. This model allows for control of unobserved heterogeneity and combines time and individual dimensions efficiently.
   The purpose of using panel regression is:
   1. Improve the efficiency of model parameter estimation.
   2. Controlling for province-specific characteristics (unobserved heterogeneity).
   3. Provides more varied and informative data.
   4. Capture the dynamics of time and regional effects simultaneously.

   The panel regression model used in this study is mathematically formulated as follows:

$$BCR_{it} = \alpha + \beta_1 \ln(IPM_{it}) + \beta_2 \ln(JS_{it}) + \beta_3 \ln(PDRB_{it}) + \epsilon_{it}$$

   Information :
   - BCR_{it} = BPNT program efficiency value
   - $\ln(IPM_{it})$ = Log of IPM value
   - $\ln(JS_{it})$ = Log Number of Toddler Stunting
   - $\ln(PDRB_{it})$ = Log Gross Domestic Product
   - α = Constant
   - $\beta_1, \beta_2, \beta_3$ = Coefficient
   - ϵ = Error term

   So the hypothesis used is:
   H_0= there is an influence of the JS, IPM, and GRDP variables on BCR

H_1= there is no influence of the JS, IPM, and GRDP variables on BCR

3. **Best Panel Model Selection**

To select the best panel regression model, three types of tests were performed as follows:

➢ **Uji Chow**

The Chow test is used to compare whether the more appropriate model is the Common Effect Model (CEM) or the Fixed Effect Model (FEM). If the test results show a significance value below 0.05, then FEM model is considered more appropriate. Conversely, if the result is above 0.05, then CEM model is more suitable to use.

$$F_{count} = \frac{RSS1 - RSS2/(i-1)}{RSS2/(it-1-k)}$$

Where:

- $RSS1$: Residual sum of squares from the CEM model
- $RSS2$: Residual sum of squares of the FEM model
- i : Number of cross-sections
- t : Time series
- k : Number of independent variables

➢ **Uji Lagrange Multiplier (LM)**

The Lagrange Multiplier test is performed to determine whether the most appropriate panel model is*Common Effect model* (CEM) or *Random Effect Model*(REM). If the result is significant P - value < 0.05, then REM becomes the main choice. However, if it is not significant, then the CEM model is considered more appropriate.

$$LM = \frac{NT}{2(T-1)} \sum_{i=1}^{N} \left[\frac{T^2 \sigma^2}{\sigma^2} - 1 \right]$$

Where:

- T : number of units*time series*
- N : number of units*cross section*
- σ_i^2 : *variance* residual equation to i
- σ^2 : *variance* residual equation system

If $P - value < 0.05$ then the selected REM model, while when $P - value > 0.05$ So the CEM model is chosen.

➢ **Hausman test**

The Hausman test is used to choose between FEM and REM. When the test results show $P - value < 0.05$, then FEM is selected. Conversely, if $P - value > 0.05$, then REM is considered more appropriate

$$w = (b-\beta)'[Var(b-\beta)]^{-1}(b-\beta)$$

Where:

- b : Slope and FEM vector estimates
- β : Slope vector estimation REM

3. **Classical Assumption Test**

➢ **Normality Test**

Used to determine whether the residual or error distribution of the regression model is normally distributed. In this study, testing is carried out by observing the probability value (prob.) of skewness. If the probability value of skewness is above 0.05, then the residual data is considered to be normally distributed. Conversely, if it

is below 0.05, then there is an indication that the residual distribution is not normal.

- **Multicollinearity Test**
  Used to identify whether there is a very strong relationship between independent variables or whether they significantly influence each other. This test is carried out using the Variance Inflation Factor (VIF) value. If the VIF value for each independent variable is below 10, then the model is declared free from multicollinearity problems. However, if the VIF exceeds that number, it means that there is an indication of quite strong multicollinearity.
- **Heteroscedasticity Test**
  Aims to see whether the variance of the residual is constant (homoscedastic) or not (heteroscedastic). This test is carried out using the method *Breusch-Pagan* or *Cook-Weisberg*. If the significance or probability value of the test is above 0.05, then the model is considered not to contain heteroscedasticity problems. Conversely, if the value is below 0.05, then there is heteroscedasticity that needs to be considered in interpreting the regression results.

4. Regression Statistical Test

- **t-test (Partial Test)**
  To determine the influence of each independent variable on the dependent variable individually. Here is the t-test formula:

$$t = \frac{r\sqrt{n-k-1}}{\sqrt{1-r^2}}$$

Information :
r : partial correlation coefficient
n : amount of data
k : number of independent variables

So the hypothesis is as follows:

H_0: β = 0 (no effect)
H_1: $\beta \neq 0$ (influential)
With the criteria: Sig. < 0.05 → significant variable.

- **F Test (Simultaneous Test)**
  To find out whether all independent variables together have a significant effect on the dependent variable. Here is the F test formula:

$$F = \frac{\frac{R^2}{(k-1)1}}{1-R^2/(n-k)}$$

Information :
R^2 : coefficient of determination
n : amount of data
k : number of independent variables

So the hypothesis used is as follows:

H_0: β = 0 (no effect)
H_1: $\beta \neq 0$ (influential)
With the criteria: Sig. < 0.05 → significant variable.

- **Coefficient of Determination (R^2)**
  To find out how much variation in the dependent variable (BCR) can be explained by the independent variable. Here is the R^2 formula :

$$R^2 = \frac{RSS}{TSS}$$

Information
RSS : *Regression Sum Square*
TSS : *Total Sum Square*
So if R^2 approaches 1 → the model explains the data well.

RESULT AND DISCUSSION

Results

Test Benefit Cost Ratio (BCR)

Based on the BCR variable that has been processed by considering benefit data consisting of the percentage of stunting, the number of stunted toddlers from 34 provinces in Indonesia which is then combined with data on the average price of community consumption expenditure in Indonesia in 2021 - 2023. So that it produces BCR data to test the feasibility of this BPNT program. The following are the results of the BCR test that has been tested on Excel.

Table 1 BCR Calculation Results

Province	BCR (*Benefit Cost Ratio*) = B/C		
	2021	2022	2023
Aceh	0	1	0
North Sumatra	0	0	0
West Sumatra	0	2	1
Riau	0	1	1
Jambi	0	0	0
South Sumatra	0	0	0
Bengkulu	0	0	0
Lampung	0	0	0
Bangka Belitung Islands	-1	2	1
Riau islands	0	2	1
Jakarta	-1	1	0
West Java	0	0	0
Central Java	0	0	0
In Yogyakarta	0	0	0
East Java	0	0	1
Banten	0	0	2
Bali	0	0	0
West Nusa Tenggara	0	1	1
East Nusa Tenggara	0	0	1
West Kalimantan	0	1	0
Central Kalimantan	1	0	0
South Kalimantan	0	1	0
East Kalimantan	0	-1	2
North Kalimantan	1	1	5
North Sulawesi	0	0	0
Central Sulawesi	0	2	-2
South Sulawesi	0	0	0
Southeast Sulawesi	0	2	0
Gorontalo	0	0	0
West Sulawesi	0	-1	0
Maluku	0	-1	2
North Maluku	0	0	9
West Papua	0	0	0
Papua	0	0	0

Source: researcher data in Excel

Test results Test *Benefit Cost Ratio* (BCR) is obtained by calculating each *Cost* And *Benefit* from 34 provinces. Based on **Table 1** shows that there are 13 provinces consistently in a 3 year period that have a feasibility of 0 for the BPNT program. This means that during the 3 years the program had no impact on reducing stunting in the province. However, it is different when viewed from other benefits studied, so this study needs to be studied further regarding

the benefit and cost variables that have been used. After seeing the test results from *Benefit Cost Ratio* (BCR), then to see the simultaneous influence of these variables, a regression test is carried out.

Multiple Regression Test

Before conducting a regression test, it is necessary to conduct a test of the best model selection because the data used is panel data, the test needs to be carried out. Next, is the classical assumption testing stage to ensure that there is no bias in the processed data variables.

Classical Assumption Test

Before conducting a regression test, it is necessary to ensure that the conditions used are free from bias problems. Therefore, it is necessary to conduct a classical assumption test, consisting of Multicollinearity Test, Heteroscedasticity and normality test, here are the test results:

1. Multicollinearity Test

Table 2 Multicollinearity Test

Variables	VIF	1/VIF
lnPDRB	3.07	0.32598
lnJS	2.46	0.40591
lnIPM	1.4	0.71542
Mean VIF	2.31	-

Source: Data processed by the author using Stata

Results *Variance Inflation Factor (VIF)* indicates that there is no significant multicollinearity problem in the regression model. *lnPDRB* own *VIF* = 3,07, *lnJS* own *VIF*= 2.46, and *lnIPM* own *VIF* = 1.40, all are below the threshold of 10, which indicates that the correlation between the independent variables is still within reasonable limits. With *Mean VIF* of 2.31, it can be concluded that this model does not experience disturbing multicollinearity, so that the independent variables in the model can be used without significantly affecting the accuracy of the coefficient estimates.

2. Heteroscedasticity Test

Table 3 Heteroscedasticity Test

Test	Mark
Null Hypothesis (H0)	Constant variance
Variables	Fitted values of BCR
Chi-squared (chi2)	1.91
P-value	0.1669

Source: Data processed by the author using Stata

Heteroscedasticity test using *Breusch-Pagan / Cook-Weisberg Conducted* to verify whether the regression model faces heteroscedasticity problems (*Islam et al.,* 2023). Based on the test results, the value chi-squared *(chi²)* of 1.91 with-value 0.1669 shows that the null hypothesis stating that the residual variance is constant (*homoscedasticity*) cannot be rejected. Because P-value greater than 0.05, there is insufficient evidence to support the presence of heteroscedasticity in the model. This means that the residual variance can be assumed to be constant, and the assumption homoscedasticity fulfilled, which makes the regression model estimation accurate and efficient.

3. Uji Skweness/Kurtosis

Table 4 Skewness/Kurtosis Test

Variables	Number of Obs.	Pr (Skewness)	Kurtosis	adj chi2 (2)	Prob > chi2
BCR	102	0	0	-	0

lnJS	102	0.1897	0.6322	2	0.3684
lnIPM	102	0.848	0.013	5.92	0.0519
lnPDRB	102	0.0371	0.2801	5.38	0.068

Source: Data processed by the author using Stata

Test results *Skewness/Kurtosis* show that *BCR is not* normally distributed, with *(Skewness)* = 0.0000 and *Kurtosis*= 0.0000, which indicates significant asymmetry and non-normal distribution. Meanwhile,*lnJ normally* distributed because *(Skewness)*= 0.1897 and *Kurtosis* = 0.6322, both of which are greater than 0.05.lnIPE shows a symmetric distribution *(Skewness)* = 0.8480), but *Kurtosis*= 0.0130 is close to 0.05, indicating a slight deviation that is not significant enough to state the data is not normal.*lnPDRB* has a slight deviation on *(Skewness)*= 0.0371, but *Kurtosis* = 0.2801 is greater than 0.05, which indicates a normal distribution. Overall, *BCR* not normally distributed, while *lnJS normally* distributed, and lnIPM as well as *lnPDRB* shows minor but insignificant deviations.

Best Model Selection

1. Uji Chow

Table 5 Chow Test

Variables	Coefficient	Standard Error	t-Statistic	P-value
lnJS	13.368	0.4122	3.24	0.002
lnIPM	19.566	0.7111	2.75	0.008
lnPDRB	0.9211	0.8834	1.04	0.301
Constant	-359.586	317.581	-1.13	0.262

Source: Data processed by the author using Stata

Table 6 Chow Test Model Summary

Statistics	Mark
F(3, 65)	6.18
P-value	0.0955
R-squared (within)	0.2218
R-squared (overall)	0.0018

Source: Data processed by the author using Stata

This model uses as a group variable and takes into account the variability between individuals in each group *(Roslan et al.*, 2022). The results of the fixed effects regression show that *lnJS* And *lnIPM* have a significant impact on *BCR*, with coefficients of 1.3368 (*p-value*0.002) and 1.9566 (*p-value*0.008), and a 95% confidence interval that does not include zero, confirms a significant positive relationship. However, *lnPDRB* does not have a significant effect with a coefficient of 0.9211 (*p-value*0.301), because the confidence interval includes zero. Although the effects remain significant individually, the test *F* for $u_i = 0$ shows that the variation between groups is not statistically significant, with*p-value*of 0.0955 (> 0.05). Therefore, based on these results, the model*Common Effect Model (CEM)* more appropriate to use than *Fixed Effect Model (FEM)*, although some of the variables in *table 5* shows significance.

2. Uji Lagrange Multiplier (LM)

Table 7 LM Test

Variables	Coefficient	Standard Error	z-Statistic	P-value	95% Confidence Interval
lnJS	0.0742	0.1553	0.48	0.633	[-0.2301, 0.3786]
lnIPM	23.977	26.285	0.91	0.363	[-2.7739, 7.5693]
lnPDRB	-0.1691	11.761	-0.14	0.889	[-2.4750, 2.1367]

cons tant	-86.286	109.41 5	- 0.79	0.43	lnPD 30.07[B 12.8163]	0.921 0798	- 0.169 1409	1.090 .221	0.8568 91

Source: Data processed by the author using Stata

Table 8 LM Test Model Summary

Statistics	Mark
Forest chi2(3)	1.23
P-value	0.7452
R-squared (within)	0.0286
R-squared (overall)	0.0124

Source: Data processed by the author using Stata

Test results *LM* shows that the model*random effect not* significant in explaining*BCR*. Coefficient for *lnJS*, *lnIPM*, And *lnPDRB everything* is insignificant with p-value greater than 0.05, which means there is no significant influence of the independent variables on*BCR*. In addition, the value *R-squared* which is very low (*within* = 0,0286; *between* = 0,0131; *overall*= 0.0124) shows that this model is only able to explain a small part of the variation in *BCR*. Test *Wald chi²* with *p-value* of 0.7452 also shows that the overall model is not significant. Thus, because p-value test LM > 0.05, then the most appropriate model to use is *Common Effect Model (CEM)*.

3. Hausman test

Table 9 Hausman test

Variables	(b) Fixed Effect	(B) Random Effect	(b - B) Difference	S.E. (√diag (V_b-V_B))
Lnjs	1.336 .308	0.074 2487	1.262 .060	0.3818 78
Lnipm	1.956 .596	2.397 .664	- 0.441 068	6.477.9 45

Source: Data processed by the author using Stata

Table 10 Hausman Model Summary Test

Test Statistics	Mark
Chi-square (χ²)	19.6
Degrees of freedom (df)	3
Prob > x²	0.0002

Source: Data processed by the author using Stata

Hausman test used to select between models *fixed effect* or *random effect*, with *null hypothesis (H_0)*assumes there are no systematic differences between the two models, while alternative *hypothesis (H_a)* indicates that the model fixed *effect more* consistent *(Gallo & Sénégas,* 2023). The results of this test show a significant difference between the model coefficients*FIVE* And *REM* on variables lnJS, *lnIPM*, And *lnPDRB*, with the biggest difference in *lnJS*(1.26206) and *lnPDRB*(1.0902). Value Chi-squared *statistic of* 19.60 with p-value 0.0002 which is less than 0.05 indicates that the null hypothesis (H_0) rejected. Thus, the most accurate model used is *Fixed Effect Model (FEM)* because the test results show p-value < 0,05.

CEM Best Model Test

The results of the model selection test between CEM, FEM and REM obtained the best model test in this study using CEM, the following are the test results:

Table 11 Best CEM Model Test

Variables	Coefficient	Standard Error	t-Statistic	P-value
lnJS	0.0742	0.1552	0.48	0.634
lnIPM	23.977	26.852	0.89	0.376

lnPDRB	-0.1691	0.1761	-0.96	0.339
constant	-86.286	109.415	-0.79	0.432

Source: Data processed by the author using Stata

Table 12 Best Model Test CEM Model Summary

Model Summary	Mark
F(3, 98)	0.41
P-value	0.7456
R-squared	0.0124
Adjusted R-squared	-0.0178

Source: Data processed by the author using Stata

Based on the results of the model regression*Common Effect Model (CEM)*, it is known that simultaneously the three independent variables, namely *lnJS*, *lnIPM*, And *lnPDRB*, does not have a significant effect on the dependent variable (BCR). This is proven through uji *F*, which aims to test whether all independent variables together have an influence on *BCR*. Mark *F-statistic* produced is *0,41* with *p-value as* big as *0,7456*, which is well above the significance limit *0,05*. Thus, *null hypothesis* (H_0: $\beta = 0$), which states that all regression coefficients are equal to zero, cannot be rejected, and means that statistically this model is not significant simultaneously. In addition, the value of the coefficient of determination (R^2) is only as big as *0,0124*, which shows that this model is only able to explain 1.24% of the variation in*BCR*, while the rest is explained by other variables outside the model. In fact, the value*Adjusted* $R^2$the negative ($-0,0178$) emphasizes that the ability of this model to explain data is very weak and even worse than the model with only constants. Therefore, it can be concluded that*The CEM model is inadequate in explaining the relationship between lnJS, lnIPM, and lnPDRB to BCR*, both simultaneously and individually.

Discussions

This research uses panel *regression model*, which combines *cross-time data* And *cross individual* (area), to provide a more in-depth analysis.*BCR* was chosen as the dependent variable, because *BCR* often used to evaluate the extent to which the benefits of a development program outweigh the costs incurred (*Shon et al*., 2018). *Model panel allows* researchers to analyze variation between individuals or regions as well as changes over time, providing a more accurate picture of the development policies implemented.

The independent variable selected in this study was the number of toddlers who experienced *stunting*, *IPM*, And *GRDP at current prices*. *Stunting Chosen* because it has a large long-term impact on the quality of life and productivity of society in the future (Mcgovern et al., 2017). *Stunting*, which is often caused by malnutrition during critical periods in a child's growth, can hinder their physical and mental development (*Larsen et al.*, 2023). *IPM* used to describe the welfare of people's lives, by measuring three main dimensions: health, education, and income, all of which have a significant influence on the success and efficiency of development (*Nawawi et al*., 2022). Increasing *IPM* showing increased access to better health services, education and income (*Singh et al.*, 2025).

Besides that, *GRDP at current prices was* chosen as a variable because it is an important indicator for measuring the economic conditions of a region (*Rabbi et al.,* 2021). *GRD P*reflects the value of goods and services produced in a region, which reflects the economic productivity of the region. Measurement *GRDP* at current prices provides a more accurate picture of the value of economic output without the influence of price changes *(Kholifia et al*., 2021). This study uses multiple *regression to* analyze the impact independent *variables* to *BCR* as

dependent variable, as well as doing *multicollinearity test*to ensure that there is no strong linear relationship between independent *variables which* can affect the results of the model (*Shrestha*, 2020).

Based on these results, several theories can provide insight into understanding the related policy context *BCR*. *Policy Implementation Theory* by *Mazmanian & Sabatier,* (1984) emphasized that the success of a policy is greatly influenced by factors such as the availability of resources and the suitability between policy objectives and real conditions in the field. This shows that constraints in implementing a policy can affect the achievement of desired results, including increasing *BCR (Haryaningsih et al., 2022; Jiang et al*., 2024).

Furthermore, *Social Justice Theory* presented by (*Rawles,* 1971). provides important insights into the extent to which policies have paid attention to the fair distribution of resources, especially for groups most in need (*Audard,* 2024; *Woldegiorgis,* 2022). If policies fail to prioritize disadvantaged groups, they have the potential to exacerbate social inequality and hinder the achievement of desired goals, such as increasing *BCR* effective (*Maslow,* 1954).

Final, *Basic Needs Theory* which was submitted by *Abraham Maslow* helps assess whether the policies implemented are adequate to meet the basic needs of the community (*Mcleod, 2025; Meshram*, 2023). Based on this regression model, although there are attempts to explain *BCR*, the fulfillment of basic community needs has not been fully achieved in the policies implemented. Therefore, it is important to ensure that existing policies can meet strong basic needs, in order to improve *BCR* more effectively (*Panagiotopoulos et al.,* 2024).

Previous research has shown that although the Non-Cash Food Assistance Program (BPNT) contributes to the food security of poor families, its impact on other social issues, such as stunting, is still limited and uneven across provinces. *Aisyah et al.,* (2021) revealed that although BPNT played a role in increasing food security, its impact on reducing stunting prevalence did not show significant changes in several regions. Similar findings were also conveyed in the TNP2K, which assessed that constraints in distribution and lack of coordination between institutions reduced the effectiveness of the program, especially in terms of improving nutrition in children.

Research by *Leung and Wolfson,* (2025) and also *Ma et al.,* (2022) suggest that similar programs in other countries, such as SNAP in the United States, are more effective because they have a more flexible design and utilize local data to adjust their implementation. This suggests that the success of food programs is highly dependent on more integrated and data-driven distribution and implementation methods that are relevant to local conditions.

However, in Indonesia, comprehensive evaluations linking macroeconomic factors, such as poverty, food prices, and stunting, with the efficiency of food assistance programs are still limited. Most studies tend to focus more on the distributional aspects or perceptions of beneficiaries at the local level, such as those conducted by *Munawaroh et al*., (2024) who used a dynamic panel approach to explore the causal factors of stunting, although with limited coverage.

To fill the gap in the research, this study adopts two main approaches. First, an evaluation is conducted using *Benefit-Cost Ratio* (BCR) to measure the fiscal efficiency of BPNT, which takes into account cost and benefit variables such as food expenditure, work participation rate, stunting prevalence, food prices, and poverty levels. Second, a panel regression approach is applied to analyze the relationship between poverty and food prices on program efficiency viewed from a time and regional perspective.

The regression results obtained show that the variables tested, with number *of stunted toddlers* (X_1), *Human Development Index* (IPM) (X_2), And *GRDP at current prices* (X_3) as an

independent variable, does not show a significant influence on *Benefit Cost Ratio* (BCR) as the dependent variable. Although these variables should be able to provide a clearer picture of the factors that influence BCR, the results of the analysis show that their impact on BCR is very limited. In addition, this regression model can only explain a small part of the variation in BCR, indicating that the factors used in this model are not comprehensive enough to describe all aspects that influence BCR. Overall, this model does not provide a firm conclusion regarding the influence of these variables, indicating the need for improvement or addition of other more relevant variables in the analysis of development policies.

CONCLUSION

This study reveals that the achievement of fiscal efficiency in the implementation of the Non-Cash Food Assistance Program (BPNT) has not been evenly distributed throughout Indonesia. Several provinces did not show a significant impact in efforts to reduce the prevalence of stunting, even though the program has been implemented. Panel data regression findings show that the variables of the number of stunted toddlers, the Human Development Index (HDI), and Gross Regional Domestic Product (GRDP) do not contribute significantly to the level of program efficiency. This indicates that the effectiveness of the program is likely more influenced by factors outside of macro indicators, such as the accuracy of recipient targets, aid distribution mechanisms, and social and institutional conditions at the local level.

Policy Implications

1. **Reformation of Distribution Mechanism**
   The government needs to review the BPNT distribution scheme to be more responsive to the needs of regions that have not shown substantive impacts, especially in the context of reducing stunting.
2. **Synergy of Social and Health Programs**
   The implementation of BPNT should ideally be linked synergistically with other health and nutrition interventions, in order to optimize the program's social achievements.
3. **Recipient Data Validity Enhancement**
   Periodic updating and validation of the beneficiary database is required to make the distribution process more accurate and efficient.
4. **Community Based Contextual Approach**
   Program implementation strategies need to be adjusted to local socio-economic dynamics, and involve active participation of the community as recipients to ensure the acceptability and effectiveness of the program.
5. **Strengthening Qualitative Studies**
   It is recommended to conduct further studies using a qualitative approach to gain an in-depth understanding of the obstacles at the implementation level and community perceptions of the BPNT program.

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