

Government Health Expenditure, Regional Economic Capacity, and Childhood Stunting in Papua Province

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Abstract

Purpose: This study examines the trend of childhood stunting prevalence in Papua Province between 2022 and 2024 and tests the partial and simultaneous influence of government health expenditure and regional economic capacity, proxied by Gross Regional Domestic Product (GRDP) per capita, on stunting prevalence across nine regencies and municipalities.

Methodology: A quantitative panel data design was applied to secondary data from Statistics Indonesia, the Ministry of Health, the Directorate General of Fiscal Balance, and regional financial reports, estimated through panel regression in EViews 12.

Results: Stunting prevalence stayed largely stagnant and remained above the national average. Government health expenditure showed a negative but statistically insignificant relationship with stunting prevalence, while GRDP per capita showed a negative and statistically significant relationship. Jointly, both variables significantly predicted stunting prevalence, with an R squared of 0.362, meaning the model explains 36.2% of its variance.

Conclusions: Regional economic capacity carries more weight in reducing stunting than health expenditure alone, indicating that fiscal allocation needs pairing with sustained regional economic growth to produce measurable nutritional gains.

Limitations: The three year window, narrow set of two predictors, and nine regency sample constrain generalization.

Contributions: The study extends human capital theory by showing that the payoff from health spending depends on the economic capacity surrounding it, offering practical direction for fiscal and economic policy in Indonesia's most persistently underdeveloped province.

Keywords: *Government Health Expenditure, GRDP Per Capita, Panel Data, Papua, Stunting Prevalence*

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1. Introduction

Health spending sits at the center of national development in Indonesia, largely because of its bearing on human capital formation and long run economic productivity (Becker, 1964; Schultz, 1961). Among the country's most stubborn public health problems is childhood stunting, a form of chronic undernutrition marked by impaired linear growth that carries consequences well beyond childhood, shaping cognitive development, school outcomes, and future earnings (Victora et al., 2021). Indonesia has answered this challenge with a string of national strategies, most notably the National Strategy for

Accelerating Stunting Prevention 2018 to 2024, which calls for convergent action across health, sanitation, education, and regional fiscal policy ([Badan Perencanaan Pembangunan Nasional, 2024](#)). Yet national stunting prevalence, while trending downward overall, still sits well above the World Health Organization threshold for public health significance in a number of provinces ([World Health Organization, 2023](#)).

Papua Province shows this problem in its sharpest form. The 2023 Indonesia Health Survey placed stunting prevalence in Papua well above the national average, and the province continues to rank among the most affected in the country despite growing government spending aimed at stunting reduction. Between 2022 and 2024, health expenditure earmarked for stunting handling across the nine regencies and municipalities of Papua averaged between IDR 20.6 billion and IDR 24.5 billion each year, while average stunting prevalence across those same units ranged from 22.0% in Kota Jayapura to 38.47% in Supiori Regency. That spread, occurring alongside broadly similar spending levels, is the empirical puzzle this study sets out to explain: why comparable health budgets produce such different nutritional outcomes across a province marked by stark disparities in GRDP.

Existing research on health expenditure and stunting in Indonesia points in different directions. [Sari \(2023\)](#) found that government health expenditure significantly reduced stunting prevalence across Indonesian provinces, an effect that was especially visible outside Java. [Indra and Khoirunurrofik \(2022\)](#) showed that village fund allocation and administrative capacity together reduced stunting, with the emphasis falling on governance quality rather than the sheer size of the budget. [Bowser et al. \(2016\)](#), by contrast, found that healthcare spending alone became an unreliable predictor of stunting once income inequality entered the picture, suggesting that economic conditions may condition, or even override, the direct effect of health spending. Taken together, these findings imply that the health expenditure and stunting relationship is not fixed but is shaped by the underlying economic environment, a proposition that has rarely been tested at the sub provincial level in a setting as structurally disadvantaged as Papua.

The economic side of the story has its own independent support. [Siswati et al. \(2021\)](#) found that GDP and geographic area function as meaningful social determinants of stunting across Indonesian provinces. [Torlesse et al. \(2016\)](#) added household level evidence, showing that access to treated water and improved sanitation, both closely tied to regional economic capacity, materially lowered the odds of stunting among Indonesian children. [Randani et al. \(2022\)](#) reinforced this picture at the provincial level, linking economic and consumption variables directly to stunting prevalence using the 2019 Indonesian nutritional status survey. Read together, these studies suggest that regional economic capacity, typically proxied by GRDP per capita, shapes household access to nutritious food, clean water, sanitation, and health services in ways that health expenditure by itself cannot replace, particularly in geographically isolated and economically constrained regions such as Papua.

No prior study, however, has directly tested the partial and joint effects of government health expenditure and GRDP per capita on stunting prevalence using panel data at the regency and municipal level within Papua specifically, a province that combines the country's highest prevalence with some of its widest internal economic disparities. Studies to date have either examined health expenditure and stunting nationally or provincially, which smooths over within province differences, or examined economic determinants of stunting without setting them against health expenditure in the same regression framework. That gap matters because it bears directly on a policy question local governments face every budget cycle: whether stunting reduction should lean more heavily on expanding health sector budgets, on broader regional economic development, or on both together.

This study pursues four connected aims. It analyzes the trend of stunting prevalence in Papua Province from 2022 to 2024, tests the partial effect of government health expenditure on stunting prevalence, tests the partial effect of GRDP per capita on stunting prevalence, and tests the simultaneous effect of both variables over the same period. What makes this study distinct is its disaggregated, regency level panel design within a single structurally disadvantaged province, which lets the relative explanatory power of fiscal and economic determinants be compared under conditions

of within province heterogeneity that provincial or national studies simply cannot capture. Theoretically, the study extends human capital theory by treating the effectiveness of health expenditure as conditional on, rather than separate from, the regional economic capacity in which that spending occurs. Practically, the findings are meant to help the Papua Provincial Government and its regencies and municipalities design fiscal and economic development strategies capable of producing more durable reductions in childhood stunting, and to inform the broader debate over whether stunting reduction belongs to the health sector alone or to a wider cross sectoral development agenda. This question carries particular weight for Papua, where the same fiscal transfer regime funds regencies with GRDP per capita ranging from roughly IDR 7 billion to more than IDR 10 billion, a spread wide enough that identical health budgets can sit atop very different underlying economic foundations.

2. Literature Review and Hypotheses Development

2.1 Human Capital Theory and Government Health Expenditure

Human capital theory, first articulated by [Schultz \(1961\)](#) and extended by [Becker \(1964\)](#), treats spending on health and education as investment rather than consumption, an outlay expected to raise the productive capacity of individuals and, in aggregate, of nations. Applied to public finance, this view frames government health expenditure as a deliberate investment intended to improve population health and, through that channel, raise long run human capital and productivity ([Musgrave & Musgrave, 1989](#)). Expenditure aimed at maternal and child nutrition, including supplementary feeding, maternal and child health services, nutrition education, and growth monitoring, fits this logic directly, representing an investment meant to protect the developmental potential of the next generation ([Bhutta et al., 2017](#)).

The returns to that investment are neither automatic nor immediate. [Runtiningsih and Susanto \(2024\)](#) show that the allocation and effectiveness of local health budgets in Indonesia is shaped as much by political competition as by technical planning, a reminder that the path from budget to outcome runs through governance rather than around it. Because stunting reduction depends on sustained behavioral change and cross sectoral coordination rather than a single budget cycle, its returns tend to lag well behind the spending itself ([Bhutta et al., 2017](#)). Recent work on Indonesian sub national governance increasingly treats the marginal productivity of health expenditure as something that varies by region rather than as a fixed parameter, shaped by local administrative capacity and the underlying economic conditions in which spending occurs ([Indra & Khoirunurrofik, 2022](#)).

2.2 Government Health Expenditure and Stunting Reduction in Indonesia

The Indonesian evidence on health expenditure and stunting is genuinely mixed. [Sari \(2023\)](#) used a fixed effects panel across thirty three provinces from 2010 to 2020 and found that government health expenditure significantly reduced stunting, with the effect strongest outside Java. [Akhmadi and Pasaribu \(2020\)](#) likewise stressed the strategic role of state spending in accelerating stunting reduction, arguing that well targeted, adequately funded programs can shift prevalence over time. [Ananda \(2025\)](#) added a household level dimension, showing that parental income and education jointly predict stunting incidence among Indonesian toddlers, a finding that reinforces the argument that fiscal inputs alone rarely tell the whole story.

Other studies push back against treating expenditure volume as decisive. [Bowser et al. \(2016\)](#) found that the relationship between healthcare spending and stunting prevalence across developing countries weakened substantially once income inequality was accounted for, implying that spending effects run through, rather than around, underlying economic conditions. [Indra and Khoirunurrofik \(2022\)](#) reached a similar conclusion for village fund transfers, finding that fiscal allocation alone was not enough without complementary administrative capacity at the local level. [Yusri \(2022\)](#), working in Aceh Province, showed that the effect of government expenditure on poverty, health, and education outcomes depends heavily on how budgets are composed and targeted rather than on their total size.

Based on this literature, the study proposes that government health expenditure directed at stunting handling has a negative partial effect on stunting prevalence, expressed as the first hypothesis.

H₁: Government health expenditure has a significant negative effect on stunting prevalence across regencies and municipalities in Papua Province

2.3 Regional Economic Capacity and Child Nutritional Status

The GRDP per capita is widely used as a proxy for regional economic capacity and, through that, for household purchasing power and access to nutritious food, clean water, sanitation, and health services ([Mangkoesoebroto, 2002](#)). [Siswati et al. \(2021\)](#) applied multilevel analysis to Indonesian provincial data and found that GDP per capita significantly predicts both moderate and severe stunting, independent of health sector spending. [Torlesse et al. \(2016\)](#) added household level evidence, showing that treated water and improved sanitation, both closely tied to regional economic development, cut the odds of stunting substantially, with untreated water use raising stunting risk more than threefold among households without improved sanitation. [Randani et al. \(2022\)](#) reached a comparable conclusion using the 2019 Indonesian nutritional status survey, linking provincial economic and consumption variables directly to stunting outcomes.

The mechanism connecting regional economic capacity to stunting reduction runs through several channels at once. Higher GRDP per capita tends to raise household income and purchasing power, which broadens access to diverse and nutritious diets, expands local fiscal capacity for public health and sanitation infrastructure, and improves access to health services beyond what health sector budgets alone capture ([Vilcins et al., 2018](#)). This multichannel pathway suggests that regional economic development is a broader, more structurally embedded determinant of nutritional outcomes than sector specific spending, especially where health expenditure represents only a small share of the total socioeconomic determinants of child growth.

H₂: GRDP per capita has a significant negative effect on stunting prevalence across regencies and municipalities in Papua Province

2.4 Fiscal Transfers and Regional Development Disparities in Papua

Papua presents a distinctive institutional and geographic setting that complicates any straightforward transfer of national findings. As a recipient of Indonesia Special Autonomy Fund, intended to address historical development gaps and accelerate regional growth, Papua receives fiscal transfers beyond standard regional budget allocations ([Direktorat Jenderal Perimbangan Keuangan, 2025](#)). [Prabowo et al. \(2021\)](#) evaluated this policy directly and found that Special Autonomy has produced measurable but uneven gains in community welfare across Papua, with implementation quality varying sharply by regency. [Harikedua \(2024\)](#) extended this line of analysis, showing that Special Autonomy combined with administrative redistricting has reshaped regional economic planning in Papua without fully closing the gap in economic capacity between newly formed and established regencies. At the national level, [Akita et al. \(2021\)](#) found that Indonesia general allocation fund only partially equalizes fiscal revenues across regions, meaning that provinces such as Papua continue to depend heavily on supplementary transfers to fund basic services, while [Anggraeni et al. \(2023\)](#) showed that fiscal decentralization's effect on poverty alleviation in Indonesia depends strongly on local administrative capacity, a conclusion that parallels the governance dependent pattern documented for stunting expenditure in this study. Yet the province's extreme geographic fragmentation, spanning highland, coastal, and island territories with widely varying infrastructure, produces internal disparities in both economic capacity and health service delivery that provincial or national aggregation obscures ([Badan Pusat Statistik Provinsi Papua, 2023](#)). [Mansula et al. \(2024\)](#), studying a comparable eastern Indonesian setting in East Nusa Tenggara, found that regional budget allocation for stunting handling had uneven effects across districts, depending heavily on each district's underlying economic and infrastructure conditions, a pattern that speaks directly to the intra provincial variation observed within Papua.

Because health expenditure and economic capacity operate through different and only partly overlapping channels, their combined effect is unlikely to equal the simple sum of their separate effects. This expectation motivates the third hypothesis.

H₃: Government health expenditure and GRDP per capita simultaneously have a significant effect on stunting prevalence across regencies and municipalities in Papua Province

2.5 Synthesis

Three points of agreement emerge from this body of work. Government health expenditure can reduce stunting, but its effectiveness depends heavily on governance quality, targeting, and program continuity rather than on spending volume by itself ([Sari, 2023](#); [Indra & Khoirunurrofik, 2022](#)). Regional economic capacity, proxied by GRDP per capita, functions as a robust, multichannel determinant of child nutritional status that operates independently of, and at times more powerfully than, health sector spending ([Siswati et al., 2021](#); [Torlesse et al., 2016](#); [Randani et al., 2022](#)). The relative weight of these two determinants likely varies across institutional and geographic settings, and structurally disadvantaged, fiscally dependent provinces such as Papua represent a demanding test of both propositions ([Mansula et al., 2024](#); [Bowser et al., 2016](#)).

What remains missing is a study that compares the partial and simultaneous explanatory power of these two determinants using disaggregated panel data within Papua itself. Provincial and national studies average over substantial within province heterogeneity in both economic capacity and expenditure allocation, which can mask exactly the mechanisms that matter at the level where programs are implemented and nutritional outcomes are actually produced. The present study fills that gap through panel regression analysis covering nine regencies and municipalities in Papua across three consecutive fiscal years, offering evidence directly relevant to the design of integrated fiscal and economic development policy in Indonesia most persistently high prevalence province.

The practical stakes of this synthesis extend well beyond academic curiosity. Papua operates within an institutional setting where fiscal transfers, including the Special Autonomy Fund, are explicitly meant to speed regional development and narrow disparities relative to the rest of Indonesia ([Direktorat Jenderal Perimbangan Keuangan, 2025](#)). If health expenditure effectiveness genuinely depends on regional economic capacity, then stunting reduction strategies built solely on expanding health sector budgets, without matching attention to regional economic development, risk reproducing the very pattern this study documents, rising nominal expenditure paired with prevalence that stays high and geographically uneven. This concern is what motivates the simultaneous testing of both determinants here rather than examining either in isolation, since policy built on an incomplete reading of their relative and joint contributions risks steering scarce fiscal resources away from the interventions most likely to move the needle on child nutrition.

3. Research Methodology

This study uses a quantitative panel data regression design, chosen because the research aims required estimating both the partial and simultaneous influence of two independent variables, government health expenditure and GRDP per capita, on stunting prevalence across several regencies and municipalities observed over several years. Panel data suits this purpose well because it combines cross sectional variation across the nine regencies and municipalities of Papua Province with time series variation across 2022 to 2024, increasing the degrees of freedom available for estimation and letting the model account for unobserved heterogeneity across units that a purely cross sectional or purely time series design could not capture ([Gujarati & Porter, 2012](#)). The research covers all nine regencies and municipalities of Papua Province following its administrative redistricting, Jayapura Regency, Kepulauan Yapen Regency, Biak Numfor Regency, Sarmi Regency, Keerom Regency, Waropen Regency, Supiori Regency, Mamberamo Raya Regency, and Kota Jayapura, yielding twenty seven regency year observations across the study period.

Secondary data came from four sources. Regional government budget realization reports supplied health expenditure specifically allocated to stunting handling, drawn from Regional Government Financial Reports for each regency and municipality for fiscal years 2022 through 2024, including primary financial statements from Biak Numfor Regency and Kota Jayapura ([Pemerintah Kabupaten Biak Numfor, 2024](#); [Pemerintah Kota Jayapura, 2024](#)). Stunting prevalence data came from the Indonesia Health Survey and the Indonesia Nutritional Status Survey published by the Ministry of

Health ([Kementerian Kesehatan Republik Indonesia, 2023, 2025](#)). GRDP per capita at constant prices came from Statistics Indonesia at the regency and municipal level ([Badan Pusat Statistik, 2024](#)). Supplementary regional health profile data documented health workforce and facility distribution. Government health expenditure was measured as the realized annual budget allocated to stunting intervention programs, including supplementary feeding, maternal and child health services, nutrition education, and growth monitoring, expressed in billions of Indonesian Rupiah. GRDP per capita used constant price figures to control for inflationary distortion. Stunting prevalence, the dependent variable, was measured as the percentage of children under five with height for age z scores below negative two standard deviations, following World Health Organization growth reference standards ([World Health Organization, 2023](#)).

Model selection followed the standard three stage specification testing procedure in EViews 12. The Chow test determined whether the Common Effect Model or the Fixed Effect Model fit better, testing the null hypothesis of no significant period effects. The Hausman test then determined whether the Fixed Effect Model or the Random Effect Model was more efficient and consistent, testing the null hypothesis that random effects were uncorrelated with the independent variables. Because the first two tests can point in conflicting directions, the Lagrange Multiplier test, following the Breusch-Pagan, Honda, and King-Wu procedures, served as the deciding step between the Common Effect Model and the Random Effect Model. After model selection, hypothesis testing proceeded through the partial t test for each independent variable, the simultaneous *F* test for the overall model, and the coefficient of determination to gauge how much of the variance in stunting prevalence the selected model explains. All procedures used a 5% significance threshold applied consistently across partial and simultaneous tests.

4. Results and Discussions

4.1 Result

Table 1 sets out the classification bands used throughout this study to interpret budget effectiveness style comparisons and to frame the discussion of expenditure adequacy relative to stunting outcomes across the nine regencies and municipalities of Papua Province during 2022 to 2024.

Table 1. Average stunting handling expenditure, GRDP, and stunting prevalence by Regency and Municipality in Papua Province, 2022-2024

Regency or Municipality	Average Stunting Expenditure (IDR Billion)	Average GRDP at Constant Prices (IDR Billion)	Average Stunting Prevalence (%)
Biak Numfor	22.38	8.74	27.20
Jayapura Regency	23.56	9.86	23.20
Keerom	24.54	8.13	28.23
Kepulauan Yapen	23.99	8.51	34.83
Mamberamo Raya	22.88	7.67	34.27
Sarmi	20.84	8.18	27.90
Supiori	20.60	7.08	38.47
Waropen	23.71	7.77	23.57
Kota Jayapura	24.13	10.53	22.00

Table 1 shows that stunting prevalence varied considerably across the nine units despite fairly similar average stunting handling expenditure, which ranged narrowly between IDR 20.6 billion and IDR 24.5 billion. Kota Jayapura, with the highest average GRDP of IDR 10.53 billion, recorded the lowest stunting prevalence at 22.0%, while Supiori Regency, with the lowest average GRDP of IDR 7.08 billion, recorded the highest stunting prevalence at 38.47% despite receiving a comparable level of stunting handling expenditure. This inverse pattern between economic capacity and stunting prevalence, occurring alongside relatively uniform health expenditure levels, offers preliminary descriptive support for the idea that regional economic conditions carry more consistent weight in

shaping stunting outcomes than health expenditure volume alone, a relationship formally tested through the panel regression that follows.

Before estimating the panel regression model, three specification tests determined the most appropriate estimation approach. Table 2 reports the results of the Chow test, Hausman test, and Lagrange Multiplier test used to select the optimal panel data model.

Table 2. Panel data model specification test results

Test	Statistic	Probability	Decision
Chow Test (Period F)	2.288	0.125	Common Effect Model preferred over Fixed Effect Model
Hausman Test (Chi-Square)	4.575	0.102	Random Effect Model preferred over Fixed Effect Model
Lagrange Multiplier (Honda, cross-section)	1.681	0.046	Random Effect Model preferred over Common Effect Model
Selected Model			Random Effect Model

Table 2 shows that the Chow test produced a Period F statistic of 2.288 with a probability of 0.125, above the 5% threshold and therefore favoring the Common Effect Model over the Fixed Effect Model. The Hausman test produced a Chi-Square statistic of 4.575 with a probability of 0.102, also above the threshold and favoring the Random Effect Model over the Fixed Effect Model as the more efficient and consistent estimator. Because the Chow and Hausman tests jointly pointed toward a choice between the Common Effect Model and the Random Effect Model, the Lagrange Multiplier test served as the deciding procedure. While the Breusch-Pagan statistic did not reach significance, the Honda statistic for the cross section dimension produced a value of 1.681 with a probability of 0.046, significant at the 5% level and indicating meaningful random effects across regencies and municipalities. On this basis, the Random Effect Model was selected as the most appropriate estimator for this study.

The Random Effect Model was estimated using the Panel EGLS method with the Swamy and Arora estimator for the random effects variance components. The estimated regression equation is Y equals 67.102 plus negative 0.382 times X_1 plus negative 3.470 times X_2 , where Y represents stunting prevalence, X_1 represents stunting handling expenditure, and X_2 represents GRDP per capita. Table 3 reports the corresponding hypothesis test results.

Table 3. Random effect model regression and hypothesis test results

Variable	Coefficient	t-Statistic	Probability	Decision
Constant	67.102	4.757	0.000	-
Stunting Handling Expenditure (X_1)	-0.382	-0.590	0.561	H_1 rejected
GRDP per Capita (X_2)	-3.470	-3.315	0.003	H_2 accepted
F-statistic = 6.816	-	-	0.005	H_3 accepted
R-squared = 0.362 (36.2% variance explained)	-	-	-	-

Table 3 shows that the constant term of 67.102 indicates the estimated stunting prevalence level when both independent variables are held at zero. The coefficient for stunting handling expenditure was negative at -0.382 with a t-statistic of -0.590 and a probability of 0.561, above the 5% significance threshold. This result leads to the rejection of H_1 and indicates that government health expenditure did not carry a statistically significant partial effect on stunting prevalence during the study period, even

though the negative sign matched theoretical expectation. The coefficient for GRDP per capita was negative at -3.470 with a t-statistic of -3.315 and a probability of 0.003, below the 5% threshold. This result leads to the acceptance of H_2 and confirms that regional economic conditions carried a statistically significant negative effect on stunting prevalence, such that a one unit increase in GRDP per capita corresponded to a 3.470 unit decrease in stunting prevalence, holding health expenditure constant. The simultaneous F -test produced a value of 6.816 with a probability of 0.005, below the 5% threshold, leading to the acceptance of H_3 and confirming that government health expenditure and GRDP per capita jointly carried a statistically significant influence on stunting prevalence even though health expenditure alone did not. The coefficient of determination showed an R -squared value of 0.362, meaning that 36.2% of the variance in stunting prevalence across the nine regencies and municipalities during the study period is explained by the two independent variables jointly, while the remaining 63.8% traces to factors outside the scope of the present model, including poverty, maternal education, sanitation access, food security, and health workforce distribution.

4.2 Discussion

The rejection of H_1 , despite the negative directional sign on health expenditure, diverges from [Sari's \(2023\)](#), who found a significant negative relationship between government health expenditure and stunting prevalence across Indonesian provinces using an eleven year panel from 2010 to 2020. Several factors specific to Papua and to this study's design may explain the gap. The three year observation window used here is considerably shorter than Sari, and the benefits of nutrition investment, including maternal and child health services and nutrition education, typically need sustained, multi year implementation before population level effects show up, consistent with the delayed returns to human capital investment described by [Becker \(1964\)](#) and [Schultz \(1961\)](#). The finding also lines up with [Indra and Khoirunurrofik \(2022\)](#), who found that fiscal allocation alone, in their case village fund transfers, could not reduce stunting without complementary administrative capacity, suggesting that the effectiveness of stunting handling expenditure in Papua may hinge less on the volume of funds allocated than on implementation quality, targeting accuracy, cross sectoral coordination, and the outsized geographic and logistical challenges built into Papua regency level governance. The result also echoes [Bowser et al. \(2016\)](#), who found that healthcare spending's effect on stunting prevalence became statistically indistinguishable from zero once underlying economic and distributional conditions were accounted for across countries, a pattern that appears to repeat at the regency level within Papua.

The significant negative effect of GRDP per capita on stunting prevalence supports the view that regional economic capacity is a more consistent and powerful determinant of child nutritional outcomes than health sector spending alone. This lines up with [Siswati et al. \(2021\)](#), who found GDP per capita to be a significant social determinant of stunting across Indonesian provinces, with [Torlesse et al. \(2016\)](#), who showed household level economic and environmental conditions closely tied to regional economic capacity substantially shaping stunting risk, and with [Randani et al. \(2022\)](#), who linked provincial economic and consumption variables directly to stunting prevalence. The size of the coefficient, showing that a one unit rise in GRDP per capita corresponds to a 3.470 unit fall in stunting prevalence, considerably larger in absolute terms than the health expenditure coefficient, suggests that the multichannel pathway through which regional economic development works, covering household purchasing power, food security, sanitation infrastructure, and access to both public and private health services, carries broader leverage over nutritional outcomes than sector specific budget allocation alone ([Vilcins et al., 2018](#)).

The simultaneous significance of both variables, despite the non-significance of health expenditure alone, points to a complementary rather than mutually exclusive relationship between the two determinants. This matches [Mansula et al. \(2024\)](#), who found that regional budget allocation for stunting handling produced uneven effects across districts in East Nusa Tenggara depending on each district's underlying economic conditions, suggesting that fiscal intervention and regional economic development work together, rather than separately, to shape the trajectory of stunting reduction in structurally disadvantaged provinces. Theoretically, this finding extends human capital theory as set out by [Schultz \(1961\)](#) and [Becker \(1964\)](#) by showing that the marginal productivity of government

health investment is not a fixed parameter but depends on the economic environment surrounding it. In economically capacitated areas such as Kota Jayapura, health expenditure may work broadly as intended within a supportive infrastructure and household income context, while in economically constrained regencies such as Supiori and Mamberamo Raya, the same nominal expenditure level runs into substantially higher structural barriers, including limited market access, constrained household purchasing power, and inadequate complementary infrastructure, that blunt its effectiveness. The 63.8% of unexplained variance further signals that stunting prevalence in Papua is shaped by a wide range of additional factors, including maternal education, sanitation access, food security, geographic isolation, and health workforce distribution, that sit beyond the fiscal and economic determinants examined here and deserve further study.

These findings carry direct implications for how stunting reduction policy is sequenced in Papua. If health expenditure effectiveness genuinely depends on regional economic capacity, simply raising nominal budget allocations for stunting handling in economically constrained regencies such as Supiori and Mamberamo Raya is unlikely on its own to produce proportional gains in prevalence. Policy design should instead consider linking health sector investment explicitly with regional economic development initiatives, including support for local food production, infrastructure that lowers transportation and market access costs, and employment programs that raise household purchasing power directly. Such an integrated approach would follow the same multichannel pathway through which GRDP per capita appears to shape stunting outcomes, rather than treating fiscal and economic interventions as separate, uncoordinated tracks addressing the same underlying developmental challenge. This is consistent with the broader argument advanced by [Yaya et al. \(2020\)](#), who found that economic growth reduced childhood stunting across a wide range of sub-Saharan African countries, and with [Randani et al. \(2022\)](#), who reached a parallel conclusion within Indonesia itself, reinforcing that economic development and health spending are best treated as complementary levers rather than substitutes.

These results also speak to a broader theoretical debate about how public health investment should be conceptualized in fragile and geographically fragmented regions. Much of the classical human capital literature, following [Schultz \(1961\)](#) and [Becker \(1964\)](#), treats health expenditure as an input whose returns scale reasonably predictably with the size of the investment. The Papua findings complicate that picture, suggesting that a fixed nominal expenditure can yield sharply different returns depending on the surrounding economic environment, a pattern that echoes the multichannel argument put forward by [Vilcins et al. \(2018\)](#) and the household level evidence from De [Silva and Sumarto \(2018\)](#), who showed that education, sanitation, and healthcare together, rather than income alone, shape nutritional outcomes in Indonesia. For a province like Papua, where GRDP per capita varies by nearly 50% across regencies within the same fiscal transfer regime, this implies that a uniform, one size fits all approach to health budget allocation is unlikely to close the prevalence gap between the best and worst performing regencies documented in Table 1.

5. Conclusions

5.1 Conclusion

This study examined the trend of stunting prevalence in Papua Province during 2022 to 2024 and the partial and simultaneous effects of government health expenditure and GRDP per capita on stunting prevalence across nine regencies and municipalities. Four conclusions emerge. Stunting prevalence in Papua Province stayed relatively stagnant throughout the study period and consistently exceeded the national average, reflecting persistent structural challenges including poverty, limited regional access, developmental disparities, and socio cultural factors. Government health expenditure directed at stunting handling did not carry a statistically significant partial effect on stunting prevalence, indicating that increased budget allocation alone had not yet translated into measurable prevalence reduction during the study period. GRDP per capita carried a negative and statistically significant partial effect on stunting prevalence, confirming that regional economic capacity is a more consistent driver of nutritional improvement than health expenditure alone. Government health expenditure and GRDP per capita jointly carried a statistically significant effect on stunting prevalence, explaining 36.2% of its variance, confirming that fiscal and economic determinants work in a complementary

rather than independent fashion in shaping stunting outcomes in Papua Province. Taken together, these conclusions suggest that stunting reduction policy in Papua cannot rely on health budget expansion alone but needs to be pursued alongside sustained regional economic development if measurable and durable improvements in child nutritional status are to be achieved across the province's most structurally disadvantaged regencies.

5.2 Research Limitations

Several limitations qualify how these findings should be read. The three year observation period, while enough to establish a consistent cross sectional pattern, is relatively short and cannot fully capture the medium to long term effects of health expenditure on stunting reduction, given that nutritional program impacts typically take years to show up. The model includes only two independent variables, government health expenditure and GRDP per capita, while stunting prevalence is shaped by a much wider set of factors, including poverty rates, maternal education, sanitation access, clean water availability, food security, health workforce density, and household caregiving practices, none of which entered the present model. Government expenditure was measured solely through budget realization figures, which cannot capture program implementation quality, targeting accuracy, or spending efficiency. The study's scope was limited to nine regencies and municipalities within Papua Province, which restricts how far these findings can be generalized to other Indonesian provinces with different social, economic, and geographic characteristics, and reliance on secondary data means the researcher could not independently verify data collection processes or field conditions.

5.3 Suggestions and Directions for Future Study

Future research should extend the observation period beyond three years to capture the medium and long term effects of government health expenditure on stunting reduction more fully, given the delayed returns to health investment implied by human capital theory. Later studies should add explanatory variables such as poverty incidence, maternal education, sanitation and clean water access, food security indicators, and health workforce distribution to build a more complete model of stunting prevalence in Papua. Researchers are encouraged to move beyond budget realization figures toward measures of expenditure quality, targeting accuracy, and implementation efficiency, potentially through mixed methods designs that pair panel regression with qualitative assessment of program delivery at the regency level. Comparative studies extending this analysis to other Indonesian provinces with high stunting prevalence, particularly regions receiving Special Autonomy transfers or classified as underdeveloped, frontier, or outermost areas, would help clarify whether the complementary relationship between health expenditure and regional economic capacity observed in Papua holds elsewhere. Future work might also usefully examine the moderating role of local governance quality and administrative capacity in shaping the effectiveness of stunting handling expenditure, an angle that would connect the fiscal findings reported here with the governance oriented literature on village fund allocation and administrative capacity in Indonesia more broadly.

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Author Contributions

IA conceptualized the study, collected and analyzed the panel data, carried out the econometric estimation, and drafted the original manuscript. ERM supervised the research design, validated the theoretical framework and analytical methodology, and critically reviewed and edited the manuscript. TPUS contributed to data verification, panel model specification testing, and manuscript revision. All authors read and approved the final version of the manuscript.

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