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# Fiscal Independence, Health Insurance Coverage, and Education Expenditure in Human Development: Examining the Poverty Pathway in West Kalimantan

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## ABSTRACT

Fiscal decentralization and improved access to essential services are expected to support human development, although their associations may vary across local contexts. This study examines the relationships between fiscal independence, national health insurance (BPJS) participation, education expenditure, and the Human Development Index (HDI), with poverty assessed as a potential indirect pathway. The analysis draws on fixed-effects estimates for a balanced panel of 14 districts and municipalities in West Kalimantan over 2021–2025 (70 observations). In the poverty equation, fiscal independence was positively associated with poverty (coefficient = 0.009600; p = 0.0152), BPJS participation was negatively associated (−0.398109; p = 0.0001), and education expenditure was not significant at the 5% level. In the HDI equation, fiscal independence (0.096173; p = 0.0040) and education expenditure (1.564931; p = 0.0043) showed positive associations, whereas BPJS participation (−2.320619; p = 0.0100) showed a negative association. Poverty had an unexpected positive coefficient (9.412542; p < 0.001). Sobel tests indicated statistically significant indirect associations for fiscal independence and BPJS participation, but not for education expenditure. These results are interpreted as conditional associations because measurement uncertainty, potential common time effects, and unobserved confounding preclude causal inference. The findings emphasize the importance of expenditure quality, effective service access, and careful model validation when assessing regional human-development policies.

***Keywords:*** *Fiscal Independence, Health Insurance, Education Expenditure, Poverty, Human Development, Fixed Effects*

## 1. INTRODUCTION

Contemporary debates on fiscal decentralization extend beyond the authority of subnational governments to mobilize revenue to their capacity to translate fiscal discretion into improved human capabilities. Fiscal federalism recognizes the informational advantages of local governments, although these advantages depend on intergovernmental financing arrangements, institutional incentives, and public accountability [1]. From a human-development perspective, meaningful opportunities to obtain education, access healthcare, and achieve an adequate standard of living are more important than the size of public budgets alone [2], [3]. Evidence from Indonesia indicates that the association between fiscal decentralization and welfare varies across indicators and levels of aggregation. Provincial evidence identifies a poverty-reducing association [4], whereas district-level research finds heterogeneous relationships among fiscal resources, economic growth, and development outcomes [5].

Previous studies also identify different pathways linking public expenditure to human development. District-level evidence from Indonesia reports positive relationships between education and health expenditure and the Human Development Index (HDI), although the direction of association varies across expenditure categories [6]. Research on HDI convergence across

provinces distinguishes revenue-based indicators of decentralization from expenditure functions and identifies poverty as an important constraint [7]. Other provincial evidence associates fiscal decentralization with both human development and income inequality, suggesting that its distributional implications may differ across regions [8]. Together, these findings justify examining local fiscal capacity, health protection, and education spending as distinct explanatory factors.

West Kalimantan provides a relevant setting because provincial averages conceal substantial differences across districts and municipalities. The BPS statistics compiled for this study indicate that provincial HDI increased from 68.99 in 2021 to 72.09 in 2025. In 2025, Pontianak City recorded an HDI of 82.80, compared with 67.60 in North Kayong Regency. Over the same period, the provincial poverty rate decreased from 7.15% to 6.16%; in 2025, poverty rates ranged from 10.51% in Melawi to 3.99% in Kubu Raya. These descriptive patterns indicate that aggregate improvements have not eliminated disparities in human-development outcomes [9].

The study data also reveal differences in fiscal independence and national health insurance (BPJS) participation. In 2025, the highest reported fiscal-independence ratio was 36.42% in Pontianak City, whereas the highest BPJS participation rate was 95.98% in North Kayong Regency. Fiscal information was compiled from Directorate General of Fiscal Balance records [10]. Such differences are analytically relevant because a higher revenue ratio does not necessarily indicate better public services, just as insurance registration does not guarantee healthcare utilization. Recent evidence documents persistent spatial and distributional disparities in Indonesia [11] and relates fiscal decentralization to differences in local governance performance [12].

Against this background, this study examines the associations of fiscal independence, BPJS participation, and education expenditure with poverty and HDI in 14 districts and municipalities of West Kalimantan from 2021 to 2025. It further assesses poverty as a potential indirect statistical pathway. Rather than interpreting statistically significant coefficients as direct evidence of policy effectiveness, we compare their direction and magnitude with theoretical expectations and previous empirical findings, while identifying limitations in measurement and model specification. This approach is important because inclusive development depends on the distribution of benefits and institutional performance, not merely on aggregate fiscal capacity [13].

## 2. LITERATURE REVIEW

### *2.1 Fiscal Capacity and Human-Development Outcomes*

Fiscal federalism suggests that decentralized decision-making may allow public services to reflect local preferences more closely, although fiscal authority alone does not guarantee equitable service delivery [1]. In this study, fiscal independence is proxied by the ratio of locally generated revenue to intergovernmental transfers. An increase in the ratio may result from higher own-source revenue, reduced transfers, or both, with potentially different consequences for distribution and public-service provision. Evidence from Bali links fiscal decentralization to HDI, with capital spending playing a moderating role [14], while research in Central Kalimantan emphasizes financial performance and public-service efficiency [15]. District-level research further highlights variations in governance outcomes associated with decentralization [12]. Accordingly, fiscal independence and expenditure effectiveness should be treated as conceptually distinct dimensions.

### *2.2 Health Insurance, Financial Protection, and Economic Vulnerability*

Human-capital theory regards health as an asset that influences productivity and the capacity to participate in education and employment [16], [17]. Public health insurance may protect household consumption by reducing financial exposure to illness, although its benefits depend on active membership, service availability, and quality of care. Indonesian household evidence associates JKN participation with a lower probability and amount of out-of-pocket expenditure, particularly among disadvantaged groups, while also identifying supply-side constraints [18]. A separate evaluation reports higher observed out-of-pocket spending following JKN implementation, potentially reflecting increased healthcare utilization alongside remaining patient payments [19]. Research involving people with disabilities likewise shows that insurance coverage does not necessarily eliminate financial barriers to care [20]. These findings distinguish administrative enrollment from effective financial protection and service access.

### *2.3 Education Spending and Poverty as a Pathway*

Investment in education may improve skills, productivity, and opportunities over the life course [21], while learning quality plays a central role in the long-run relationship between human capital and development [22]. Nevertheless, the effects of current education expenditure on household poverty may emerge gradually, especially when spending is directed toward staffing or routine administration rather than immediate improvements in learning. Several Indonesian studies report positive associations between education expenditure and HDI [6], [23], [24]. Because education is itself a component of HDI, the relationship between education spending and the aggregate index should not be interpreted automatically as an independently identified reduction in poverty.

On theoretical grounds, greater fiscal capacity, broader health insurance coverage, and higher education expenditure are expected to be associated with lower poverty and higher HDI, while poverty is expected to have a negative association with HDI. The corresponding indirect pathways through poverty are expected to reflect these directional relationships. We assess these expectations against the estimated coefficients, including results whose signs differ from the theoretical predictions.

## 3. METHODS

This study uses a balanced panel of 14 districts and municipalities in West Kalimantan over 2021–2025, comprising 70 district-year observations. The district-level indicators were compiled from publications of BPS–Statistics Indonesia and fiscal records of the Directorate General of Fiscal Balance [9], [10]. Poverty and BPJS participation were measured as percentages, HDI as an index, fiscal independence as the ratio of locally generated revenue to intergovernmental transfers, and education expenditure as a monetary amount transformed using the natural logarithm. The reported coefficients and hypothesis tests are based on fixed-effects estimations originally performed using EViews 9. For this article, we analyzed and interpreted those estimation results without conducting an additional estimation of the underlying panel data.

Two fixed-effects equations were used. The first model was specified as $Poverty_{it} = \alpha_i + a_1 Fiscal_{it} + a_2 BPJS_{it} + a_3 \ln(Education_{it}) + \varepsilon_{it}$. The second was specified as $HDI_{it} = \mu_i + c_1 Fiscal_{it} + c_2 BPJS_{it} + c_3 \ln(Education_{it}) + b\, Poverty_{it} + \nu_{it}$, where i denotes the district or municipality, t

denotes the year, and $\alpha$_i and μ_i denote district-specific intercepts. For predictor j, the indirect statistical association through poverty is expressed as a_j × b, whereas c_j denotes the conditional direct association. This decomposition describes associations within the specified models and does not, by itself, establish causal mediation.

Chow and Hausman tests favored the district fixed-effects specification for both equations ($p < 0.001$), and Sobel tests were applied to the products of the estimated coefficients. However, conventional standard errors may not adequately account for serial dependence within districts. District fixed effects also do not remove common shocks across years or all time-varying confounding. Accordingly, the estimates are interpreted as conditional associations rather than causal effects. Causal mediation would require stronger assumptions about temporal ordering and unmeasured confounding [25]. Because the panel covers only five years, specifications incorporating year effects, alternative lag structures, cluster-robust inference, and checks of variable measurement remain important directions for further analysis; these checks were not part of the reported estimations.

## 4. RESULTS AND DISCUSSION

### 4.1 Descriptive Patterns and Model Selection

Across the 70 observations, the mean poverty rate was 6.93% (standard deviation [SD] = 2.26), mean HDI was 69.99 (SD = 3.91), mean fiscal independence was 11.40% (SD = 7.64), and mean BPJS participation was 59.51% (SD = 13.04). Mean education expenditure was approximately IDR 419.99 billion (SD = IDR 148.46 billion). The dispersion of fiscal and insurance indicators indicates substantial heterogeneity among districts and municipalities, supporting a subprovincial analysis of human-development outcomes.

Table 1. Fixed-effects model selection and reported fit

| Model test | Poverty equation | HDI equation |
|---|---|---|
| Chow test: cross-section F | 143.8611; $p < 0.001$ | 50.9475; $p < 0.001$ |
| Hausman test: $\chi^2$ | 53.7588; $p < 0.001$ | 45.4655; $p < 0.001$ |
| $R^2$ | 0.995046 | 0.991336 |
| Adjusted $R^2$ | 0.993550 | 0.988504 |

*Source: Fixed-effects model-selection tests and estimates from the study's EViews 9 analysis.*

Both equations exhibit very high coefficients of determination. Nevertheless, the fit of a fixed-effects model partly reflects persistent differences across districts and municipalities. The reported $R^2$ values therefore should not be read as the proportion of changes in HDI or poverty caused by the policy variables. The statistical precision of the estimated associations also requires caution until uncertainty is assessed using methods appropriate for panel dependence.

### 4.2 Conditional Coefficients for Poverty and HDI

Table 2. Reported district fixed-effects coefficients

| Explanatory variable | Poverty: coefficient (p) | HDI: coefficient (p) |
|---|---|---|
| Fiscal independence | 0.009600 (0.0152) | 0.096173 (0.0040) |
| BPJS participation | −0.398109 (0.0001) | −2.320619 (0.0100) |
| ln(education expenditure) | 0.111294 (0.0907) | 1.564931 (0.0043) |
| Poverty rate | — | 9.412542 (< 0.001) |

*Source: Coefficient estimates from the study's EViews 9 fixed-effects analysis.*

In the poverty equation, fiscal independence exhibited a positive association with poverty, contrary to the expected negative relationship. BPJS participation was negatively and significantly associated with poverty, whereas the positive coefficient for logged education expenditure did not

reach statistical significance at the 5% level. In the HDI equation, fiscal independence and education expenditure were positively associated with HDI, while BPJS participation had a negative coefficient. The poverty coefficient was also positive and relatively large, contrary to theoretical expectations. These findings are presented as estimated, without adjusting unexpected signs. Because the coding and scale of the BPJS and poverty variables have not been independently reconciled with the source data, the larger coefficients cannot reliably be interpreted as effects of a one-percentage-point increase.

### 4.3 Indirect Associations Through Poverty

Table 3. Reported indirect pathways and Sobel tests

| Path through poverty | Indirect (a × b) | Direct coefficient | Reported Sobel test |
|---|---|---|---|
| Fiscal → Poverty → HDI | 0.090360 | 0.096173 | Significant; $p < 0.05$ |
| BPJS → Poverty → HDI | −3.747218 | −2.320619 | $Z = -3.7619$; $p \approx 0.00017$ |
| Education → Poverty → HDI | 1.047559 | 1.564931 | $Z = 1.6902$; $p \approx 0.091$ |

*Source: Authors' calculation of indirect coefficient products from the reported model estimates; Sobel statistics from the original analysis.*

The estimated indirect associations are obtained by multiplying the corresponding coefficients in the poverty and HDI equations. The reported Sobel tests indicate statistically significant indirect associations for fiscal independence and BPJS participation, but not for education expenditure. Their directions require careful interpretation. The combination of a positive fiscal independence–poverty coefficient and a positive poverty–HDI coefficient produces a positive indirect product. Conversely, the negative BPJS–poverty coefficient yields a negative indirect product when combined with the positive poverty–HDI coefficient. These patterns do not demonstrate that increasing poverty benefits human development or that expanding insurance coverage harms it. Statistical significance of a coefficient product is insufficient to identify causal mediation [25].

### 4.4 Fiscal Independence and The Unexpected Positive Poverty Association

The positive coefficient for fiscal independence in the poverty equation challenges the assumption that greater reliance on locally generated revenue necessarily reduces poverty. Because fiscal independence is measured relative to transfers, a higher ratio may reflect stronger local revenue mobilization, lower transfers, or both. The present specification does not distinguish these processes or identify which population groups benefit from public expenditure. Siburian [4] reports a poverty-reducing relationship for fiscal decentralization using a different period and level of geographic aggregation. The contrast with the present result therefore points to possible contextual and methodological heterogeneity rather than a direct contradiction. Recent qualitative evidence from West Nusa Tenggara further suggests that governance arrangements can limit the extent to which additional fiscal capacity translates into poverty reduction [26].

The positive relationship between fiscal independence and HDI is more consistent with the proposition that fiscal capacity can support human-development outcomes. Sofilda et al. [5] identify links among locally generated revenue, central government transfers, human capital, and regional economic growth, with effects differing by fiscal-independence category. Pramartha et al. [14] report a positive fiscal decentralization–HDI relationship in Bali that is moderated by capital expenditure. Evidence from Central Kalimantan likewise highlights public-service efficiency as a relevant mechanism [15]. Although these studies do not estimate the same model, they suggest that revenue capacity and the allocation and efficiency of expenditure may operate through distinct channels. The governance differences discussed by Astriana and Khoirunurrofik [12] reinforce the importance of institutional conditions in interpreting the present findings.

### 4.5 Health Insurance: Poverty Protection Versus The Negative HDI Coefficient

The negative BPJS coefficient in the poverty equation is consistent with a potential financial-protection pathway: lower exposure to medical expenses may enable households to maintain food consumption, schooling, and other essential expenditure during illness. Maulana et al. [18] find that insured Indonesian households are less likely to incur out-of-pocket payments, although the association varies by socioeconomic group and location. By contrast, another evaluation reports higher observed out-of-pocket spending after insurance implementation, partly in the context of increased utilization [19]. These findings highlight the distinction between improved access to care and the financial burden remaining after care is received. Because the present analysis uses aggregate district-year data, it cannot identify the household-level mechanism responsible for the observed association with poverty.

The negative coefficient for BPJS participation in the HDI equation should not be interpreted as evidence that insurance coverage reduces human development. Enrollment may have increased more rapidly in previously underserved areas, and administrative participation does not necessarily imply effective access to healthcare. Evidence concerning people with disabilities in Indonesia demonstrates that barriers to service use and catastrophic expenditure may persist despite coverage [20]. The design and adequacy of social insurance can also influence behavioral and welfare outcomes beyond nominal enrollment [27]. A more informative evaluation would therefore examine active membership, provider availability, utilization, transport costs, out-of-pocket payments, and health outcomes alongside the enrollment rate.

Common temporal developments may also contribute to the observed association. Between 2021 and 2025, BPJS coverage expanded while economic activity adjusted after the pandemic and HDI continued to change. Although district fixed effects account for time-invariant regional characteristics, they do not control for common year shocks or district-specific trends. Thus, the sign and magnitude of the BPJS–HDI coefficient require further assessment using verified measurement units and appropriate time controls before any causal interpretation can be considered.

### 4.6 Education Expenditure: a Positive HDI Association Without a Detected Poverty Pathway

Education expenditure was positively and significantly associated with HDI, whereas its association with poverty did not reach the 5% significance threshold. This distinction is plausible if additional expenditure is reflected in educational access or other aspects of human development before it affects household income. Evidence from Indonesian districts reports a positive relationship between functional education spending and HDI [6], consistent with findings from other national studies [23], [24]. Nevertheless, because educational attainment is incorporated into the HDI, part of the observed relationship may reflect the proximity between the expenditure target and the components of the index. The coefficient should therefore not be interpreted as a separately identified welfare return or a proven mechanism of poverty reduction.

Nominal education budgets also vary with population size, salaries, inflation, and mandated administrative expenditure. Future research could examine real expenditure per school-age resident, distinguish recurrent spending from instructional and capital expenditure, and analyze educational outcomes separately from aggregate HDI. Evidence on fiscal decentralization and HDI convergence further supports disaggregating expenditure functions [7]. Importantly, the absence of a statistically significant education–poverty coefficient in this five-year panel does not rule out longer-term poverty effects, which may emerge over the extended period required for human-capital accumulation [22].

### 4.7 Positive Poverty–HDI Coefficient and Limits of The Reported Mediation Tests

The positive poverty coefficient (9.412542) in the HDI equation is the finding that most clearly warrants additional verification. In theory, poverty restricts access to healthcare, education, and adequate living standards. Research on HDI convergence in Indonesia identifies poverty and

unemployment as constraints on improvements in human development [7], while recent provincial evidence associates fiscal arrangements with both HDI and income inequality [8]. The unexpected coefficient could reflect differences in coding or scale, multicollinearity, omitted year effects, policy responses targeted toward disadvantaged areas, or other unmeasured time-varying factors. The available diagnostic information does not allow us to distinguish among these explanations.

This uncertainty also affects interpretation of the Sobel tests because the indirect coefficients inherit the sign of the positive poverty–HDI association. Causal mediation requires a defensible temporal sequence and assumptions that rule out specific forms of unmeasured confounding; these requirements are not established by two contemporaneous fixed-effects equations [25]. We therefore interpret the coefficient products only as indirect statistical associations. A useful extension would re-estimate the models with clearly documented variable definitions, year fixed effects, district-clustered uncertainty estimates, and lagged specifications. Confidence intervals for the indirect effects should also be assessed using a procedure appropriate for clustered panel data, once the underlying observations are available.

### 4.8 Policy Implications and Study Limitations

The results suggest that local policy evaluation should extend beyond increases in own-source revenue, insurance enrollment, or education budgets to consider the distribution and quality of public services. Fiscal accounts could be assessed by revenue source and by the extent to which spending reaches disadvantaged households. Health insurance monitoring could combine active membership, provider availability, service utilization, and household exposure to medical costs. Evaluation of education spending could incorporate inflation-adjusted expenditure per student, school attendance, learning outcomes, and disparities among districts with lower HDI. Recent work on inclusive growth [13] and spatial disparities [11] emphasizes the importance of identifying beneficiaries rather than relying only on aggregate performance measures. Evidence across Indonesian provinces also indicates that estimated welfare relationships vary by specification and institutional setting [28].

Several limitations qualify the interpretation of these findings. First, this article draws on the existing estimation outputs and does not re-estimate the models using the original district-year observations. Second, the precise coding and scale of selected variables, together with the completeness of the original statistical series, require further verification. Third, the reported district fixed-effects specifications do not include year effects and therefore may be sensitive to common shocks or endogenous policy responses. Fourth, conventional standard errors and Sobel tests may not fully capture dependence within a short regional panel. Finally, district-level associations cannot be used to infer household-level financial protection or individual educational outcomes. These limitations restrict causal claims but do not justify changing the signs or statistical significance of the reported coefficients.

## CONCLUSION

Based on fixed-effects estimates for 14 districts and municipalities in West Kalimantan during 2021–2025, this study finds that fiscal independence is positively associated with both poverty and HDI, whereas BPJS participation is negatively associated with both outcomes. Education expenditure is positively associated with HDI, but its association with poverty is not statistically significant at the 5% level. The positive coefficient for poverty in the HDI equation contradicts the principal theoretical expectation and warrants additional checks of measurement and model specification. The indirect coefficient products through poverty are statistically significant for fiscal independence and BPJS participation, but these associations do not establish causal mediation. Overall, the findings highlight the need to assess how fiscal resources are allocated, whether health protection translates into effective service access, and how education spending contributes to measurable improvements in human development.

Further research should reconcile the district-year series with the original statistical releases, verify variable definitions and units, incorporate year fixed effects and appropriate panel-robust inference, and examine alternative lag structures. Evaluating health and education outcomes separately would also help distinguish sectoral pathways from associations with the aggregate HDI. These steps are necessary before drawing stronger conclusions about the effectiveness of specific policies or the causal mechanisms linking them to poverty and human development.

## DATA AND ANALYTICAL TRANSPARENCY

The descriptive statistics, fixed-effects coefficients, model-selection tests, and Sobel statistics presented in this article are based on the EViews 9 outputs from the original analysis. No additional estimation using the underlying district-year observations was conducted for this article. Verification of the source series, measurement scales, and robustness of the estimates remains necessary before causal interpretations can be supported.

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