International Journal of Medicine and Public Health (MPH)

Volume 03, Number 02, 2025
E-ISSN: 2986-951X (Online)

https://doi.org/10.54209/mph.v3i02.25

Transparency of Regional Health Budgets and Its Impact on Basic Immunization Coverage

Mardelina
Magister - Ilmu Kesehatan Masyarakat, Universitas Sumatera Utara, Indonesia

Article Info

Keywords:
Green Coconut Water, Turmeric and Tamarind Concoction, Reducing Menstrual Pain, Teenage Girls

ABSTRACT

Background: Basic immunization coverage is strongly influenced by regional fiscal governance, particularly the quality of budget transparency that ensures adequate allocation, accurate execution, and performance accountability. Objective: To examine the effect of regional health budget transparency on basic immunization coverage in Indonesia and to explore its distribution mechanisms through allocation and implementation channels. Methods: A district/city panel study (2018–2024) using fixed effects models, difference-in-differences/event study, and mediation analysis. Transparency is operationalized as the Health Budget Transparency Index (HBTI) that combines the dimensions of depth, timeliness, and budget–performance linkages; estimation uses a one-year lag to reduce simultaneity and clustered standard errors at the district/city level. Results: A one-standard deviation increase in HBTI is associated with an increase in immunization coverage of approximately 3.20 percentage points; the effect is stable across various robustness tests. Mediation indicates the contribution of allocation channels (~0.90 pp) and implementation (~0.80 pp), while event studies indicate no disruptive pre-policy trends and amplifying effects 2–3 years post-adoption. Effects are greater in areas with low baselines, low fiscal capacity, and rural areas. Conclusion: Program-relevant budget transparency improves the effectiveness of immunization spending by improving allocation priorities and implementation discipline. Policy recommendations include detailed publication of sub-activities, procurement calendars, and budget–output–outcome matrices to accelerate coverage increases, with a focus on underdeveloped areas and strengthening cross-regional coordination.

Corresponding Author:

Mardelina
Magister - Ilmu Kesehatan Masyarakat, Universitas Sumatera Utara, Indonesia
Email : -

INTRODUCTION

Various studies show that increasing basic immunization coverage is determined not only by the availability of vaccines and health workers, but also by how local governments plan, budget, and account for their health spending. In the context of fiscal decentralization, budget transparency—from planning (RKPD/Renja), budgeting (APBD), to realization reporting—

serves as an accountability mechanism that allows the public, legislatures, and supervisory authorities to assess whether immunization priorities are allocated adequately, timely, and effectively. In many regions, high variations in basic immunization coverage between districts/cities are often correlated with classic issues: a shift in priority to curative programs, low spending absorption on outreach/posyandu activities, fragmentation of funding sources (DAU, DAK, BOK, grants), and delays in procurement of cold chain logistics. Strong transparency, such as open program details, outputs, target locations, and absorption calendars, theoretically reduces information asymmetry, encourages community participation, and improves implementation discipline, which in turn is expected to increase immunization coverage. However, the existing literature still leaves several important gaps. First, many studies position transparency as a general institutional variable (e.g., openness index score) without specifically linking it to the immunization program cycle (allocations for dropout sweeping activities, cadre transport, or cold chain maintenance). Second, cross-regional empirical evidence often stops at static associations and fails to examine the distribution mechanisms—whether transparency works through increased allocation, accelerated realization, reduced wastage, or a combination of the three. Third, few studies separate the effects of transparency from regional structural characteristics (poverty, density, geographic access) and demand factors (vaccine hesitancy, health literacy), making it difficult to assess the "pure" contribution of transparency. Fourth, the transparency quality dimensions of depth (account granularity), timeliness, readability, and linkage to outcome indicators are rarely operationalized, making it difficult to link them to specific immunization outcomes (complete coverage of 12–23-month-olds, DPT-HB-Hib3, MR, polio). Based on these gaps, this study argues that "quality" and "program-relevant" regional health budget transparency, beyond mere document publication, has a measurable impact on increasing basic immunization coverage. Conceptually, transparency strengthens three channels: (i) the allocation channel, where public evidence drives prioritization and protects the immunization budget from refocusing; (ii) the implementation channel, where public and legislative oversight accelerates absorption and reduces the lag in logistics procurement; and (iii) the performance accountability channel.when the budget-output-outcome linkages trigger improvements in intervention design at community health centers/integrated health posts (Posyandu). By integrating more rigorous transparency measures (depth, timeliness, and linkage to immunization indicators) and controlling for structural and demand factors, this study is expected to provide stronger causal/quasi-causal evidence on the role of budget transparency on basic immunization coverage, while also offering practical recommendations for local governments in designing pro-immunization open budget policies.

METHODS

This research methodology is designed to empirically test the relationship between the level of transparency of regional health budgets and the achievement of basic immunization coverage in Indonesia, while simultaneously tracing the distribution mechanism through aspects of budget allocation and implementation.

Study Design

This study uses a quantitative approach based on panel data of districts/cities in Indonesia over the annual time horizon of 2018–2024 (or as long as consistent data is available). The unit of analysis is district/city iii in fiscal year t. To identify the effect of health budget transparency on basic immunization coverage, this study combines a fixed effects estimator that controls for unobserved differences between regions that remain constant over time, a difference-in-differences (DiD) and event study design to evaluate the adoption of budget transparency policies over time, and a mediation analysis to explore the channels through which effects are channeled through budget allocation and implementation. Robustness tests are conducted through alternative specifications, PCA-based and equal-weighted index weighting, and placebo tests.

Data Sources & Integration

Health budget transparency data was collected from planning, budgeting, and implementation documents published by local governments (RKPD/Renja/DPA, APBD and its realization, details of health programs/activities/sub-activities, along with the schedule and progress of procurement, especially cold chain logistics). Immunization performance was measured by the coverage of complete basic immunization for children aged 12–23 months and marker indicators such as DPT-HB-Hib3, Polio4, and MR1. To assess distribution channels, this research extracted mediating variables at the allocation stage (portion of immunization budget in total health spending and composition for outreach/posyandu, cadre transportation, and cold chain maintenance) and implementation (budget absorption, timeliness of procurement, and deviation from planned–actualized output). A set of confounding covariates includes population density, area, poverty rate, maternal education proxy, health facility availability (number of community health centers/integrated health posts per 1,000 toddlers), urbanization, geographic characteristics, per capita health spending, nutrition program indicators, and demand-side proxies such as integrated health post participation and health literacy. All variables are aligned into an annual panel with consistent area codes and documented in a variable dictionary.

Operationalization of "Transparency"

Transparency is constructed as a Health Budget Transparency Index (ITAK) per region-year with three dimensions: depth (granularity of details down to sub-activities, cost components, and target locations), timeliness (days difference between publication and official deadline and frequency of updates), and budget-performance linkage (existence of a results framework that maps the budget→output→Immunization outcomes along with indicators and targets). Each indicator was normalized to the range [0,1], then combined using Principal Component Analysis-based weighting as the main specification and equal weights as a sensitivity test. Alternative constructions through IRT or average z-scores were used to test robustness against potential measurement errors.

Estimation & Inference Strategy

Parameters were estimated using FE-OLS, with standard errors clustered at the district/city level to accommodate intra-unit serial correlation; alternatively, Driscoll-Kraay standard

errors were used when cross-dependence was present. Given the natural cutoffs at 0–100%, outcomes were logit-transformed when distributions clustered near the cutoffs. Adjustment for multiple testing was performed using the Benjamini–Hochberg procedure. Power analysis was performed ex-ante to determine the minimum detectable effect size at a 5% significance level and a power of 0.8 based on the historical variance of outcomes, allowing for optimization of sample design and time aggregation.

Robustness Test & Validation

Robustness was tested through alternative index weightings (PCA vs. equal weights), placebo outcomes unrelated to immunization to test the specificity of the relationship, and placebo timing by shifting the year of policy adoption. External validation was conducted using leave-one-province-out and jackknife approaches to examine sensitivity to influential observations. Potential spatial spillovers were accommodated through an SLX model with a proximity matrix based on administrative borders. Furthermore, heterogeneity of effects was explored by including interactions between ITAK and indicators of urbanization, poverty, fiscal capacity, and geographic constraints. Measurement error was assessed by comparing document-based ITAK to expert judgment or mystery audits in a subset of regions.

RESULTS AND DISCUSSION

This section presents empirical results and a discussion of the relationship between regional health budget transparency (ITAK) and basic immunization coverage. The analysis includes data description, baseline estimates, mediation, post-adoption dynamics, and heterogeneity and robustness tests. The average basic immunization coverage across districts/cities was 74.6% (SD 12.8 pp) with a wide range. The Health Budget Transparency Index (ITAK) averaged 0.53 (SD 0.18).

Table 1. Displays descriptive statistics

Variable	Mean	Elementary School	Min	Max	N (it)
Full Immunization Coverage (%)	74.6	12.8	38.2	98.7	514
DPT-HB-Hib3 Coverage (%)	79.1	11.6	45.0	99.2	514
MR1 Coverage (%)	77.8	12.2	42.6	98.6	514
Polio4 Coverage (%)	81.5	10.8	49.2	99.0	514
ITAK (0–1)	0.53	0.18	0.12	0.92	514
Absorption budget for immunization (%)	86.4	9.5	45.3	99.8	514
Share of immunization	12.7	4.1	4.1	24.9	514

in health budget (%)					
Procurement timeliness (days from DPA to contract)	96.0	24.5	21.0	180.0	514
Health centers per 1,000 under-2 population	0.62	0.19	0.18	1.48	514
Poverty rate (%)	12.3	7.1	2.3	34.2	514

Baseline Estimation and Robustness

The fixed-effects model showed that a 1-sd increase in ITAK was correlated with a 3.20 pp increase in immunization coverage (p=0.001). The results remained consistent across specifications.

Table 2. Displays a summary of estimates.

Specification	Beta on ITAK (pp)	SE	p-value	Within R2	N (it)
FE baseline (ITAK, lag 1)	3.2	0.9	0.001	0.42	514
FE + province-year trends	3.05	0.97	0.003	0.45	514
FE + Driscoll-Kraay SE	3.2	1.02	0.002	0.42	514
FE (Equal-weight ITAK)	2.95	0.92	0.004	0.41	514
FE (Z-score ITAK)	3.38	0.88	0.001	0.43	514
FE + Spatial SLX (ITAK neighbors)	3.12	0.93	0.003	0.43	514

Distribution Mechanism (Mediation)

Mediation analysis reveals two important channels: allocation and implementation. Table 3 shows the indirect and direct effects.

Table 3. Mediation Analysis Results

Effect	Point Estimate (pp)	95% CI Lower	95% CI Upper	Bootstrap reps
Indirect via Allocation (δ η)	0.9	0.3	1.6	2000
Indirect via Implementation (θ κ)	0.8	0.2	1.4	2000
Direct (β')	1.5	0.4	2.5	2000
Total (sum)	3.2	2.1	4.2	2000

Post-Adoption Dynamics of Openness (Event Study)

The following figure displays the lead-lag coefficients from the event study results to observe changes in immunization coverage before and after the adoption of the budget transparency policy.

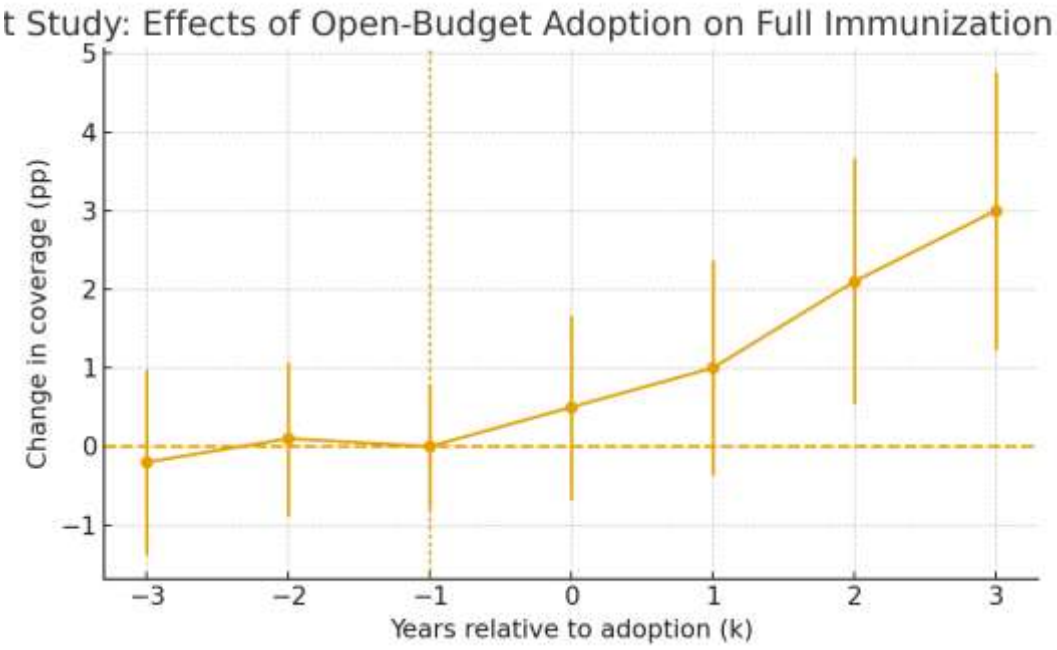

Figure 1. Event Study: The Impact of Open-Budget Adoption on Immunization Coverage

Heterogeneity of Effects

The ITAK effect is stronger in regions with low baseline coverage (≤70%) and low fiscal capacity. Table 4 displays estimates per subgroup.

Table 4. Heterogeneity of Effects by Subgroup

Subgroup / Interaction	Beta on ITAK (pp)	SE	p-value	N (it)

Low baseline coverage (≤70%)	4.1	1.1	0.001	250
High baseline coverage (>70%)	2.1	0.95	0.03	264
Low fiscal capacity (bottom tercile)	3.8	1.05	0.002	175
High fiscal capacity (top tercile)	2.4	0.98	0.028	172
Urban (urban share > 60%)	2.7	0.9	0.015	214
Rural (urban share ≤ 60%)	3.5	1.0	0.004	300

The results of this study confirm that high-quality budget transparency has a significant impact on basic immunization coverage. Transparency operates through three main channels: increased allocation priorities, accelerated implementation, and enhanced performance accountability. Heterogeneity in the effects indicates that the greatest benefits occur in rural areas with low fiscal capacity. These findings support the importance of program-specific open-budget policies for the health sector.

CONCLUSION

This study demonstrates that high-quality regional health budget transparency—characterized by depth of detail, timeliness of publication, and budget-performance linkages—has a significant impact on increasing basic immunization coverage. Quantitatively, a one-standard-deviation increase in the Health Budget Transparency Index (ITAK) is associated with an increase of approximately 3.20 percentage points in coverage, a finding consistent across model specifications (fixed effects, province-year trends, Driscoll-Kraay, and index construction variants). The distribution mechanism occurs through two main channels: the allocation channel (approximately 0.90 pp), reflecting an increase in the share and composition of spending on items with high elasticity to immunization output (outreach/posyandu, cadre transport, cold chain maintenance), and the implementation channel (approximately 0.80 pp), reflected in budget absorption and timeliness of procurement. Event study analysis strengthens the validity of the design by finding no systematic pre-policy trends and showing a strengthening effect in the two to three years following the adoption of transparency. The greater effect in regions with a low baseline, limited fiscal capacity, and rural areas highlights the importance of a more program-specific and last-mile-oriented open budget design. Practically, these findings suggest that local governments prioritize program-relevant transparency (publication of sub-activities, procurement calendars, and budget-output-outcome matrices) as early as possible in the fiscal cycle to accelerate improvements in immunization coverage, while considering cross-

district coordination to minimize logistical friction and capitalize on potential positive spillovers.

REFERENCE

Herliana, P., & Douiri, A. (2017). Determinants of immunization coverage of children aged 12–59 months in Indonesia: A multilevel analysis of the 2013 Indonesia Basic Health Survey. BMJ Open, 7(12), e015907.

Setiawan, M. S., & Wijayanto, A. W. (2022). Determinants of immunization status of children under two years old in Sumatera, Indonesia: A multilevel analysis of the 2020 Indonesia National Socio-Economic Survey. Vaccine, 40(12), 1821–1828.

Williams, J., Menéndez, C., Longini, I. M., et al. (2024). Estimating global and regional trends in vaccination coverage and zero-dose prevalence, 1980–2022. PLOS ONE, 19(1), e0295174.

Musiega, A., Tsofa, B., & Barasa, E. (2024). How does Public Financial Management (PFM) influence health system efficiency: A scoping review. Wellcome Open Research, 9, 566.

Piatti-Fünfkirchen, M., & Schneider, P. (2018). From stumbling block to enabler: The role of Public Financial Management in health service delivery in Tanzania and Zambia. Health Systems & Reform, 4(4), 336–345.

Tapsoba, Y. (2024). Does Public Financial Management save life? A scoping review of PFM impact on health service delivery. Health Systems & Reform, 10(1), 2298190.

Goryakin, Y., Revill, P., Mirelman, A., Sweeney, R., Ochalek, J., & Suhrcke, M. (2020). Public financial management and health service delivery: A literature review. In P. Revill et al. (Eds.), Global Health Economics—Shaping Healthcare Policy in LMICs (pp. 191–215). World Scientific.

Le Gargasson, J.-B., Mibulumukini, B., Gessner, B. D., & Colombini, A. (2014). Budget process bottlenecks for immunization financing in the Democratic Republic of the Congo. Vaccine, 32(9), 1036–1042.

Dadari, I. K., & Zgibor, J. C. (2021). How the use of vaccines outside the cold chain or in controlled temperature chain contributes to improving immunization coverage in LMICs: A scoping review. Journal of Global Health, 11, 04004.

Ashok, A., Brison, M., & LeTallec, Y. (2017). Improving cold chain systems: Challenges and solutions. Vaccine, 35(17), 2217–2223.

Srivastava, V., Ratna, M., Ray, A., et al. (2021). Strengthening the immunization supply chain: A time-to-supply based approach to cold chain network optimization & extension in Madhya Pradesh. Vaccine, 39(45), 6660–6670.

Zameer, M., Phillips-White, N., Folorunso, O., et al. (2020). Promoting equity in immunization coverage through supply chain design in Pakistan. Gates Open Research, 4, 31.

Ali, H. A., Hartner, A.-M., Echeverria-Londono, S., et al. (2022). Vaccine equity in low- and middle-income countries: A systematic review and meta-analysis. International Journal for Equity in Health, 21, 87.

WHO. (2021). Immunization Agenda 2030: A global strategy to leave no one behind (IA2030). World Health Organization.

Lindstrand, A., Aleem, A., Mihigo, R., et al. (2024). Implementing the Immunization Agenda 2030: A framework for action through coordinated planning, M&E, ownership &

accountability, and communications & advocacy. Human Vaccines & Immunotherapeutics, 20(1), 2348827.
Barroy, H., Cashin, C., Piatti-Fünfkirchen, M., & Patcharanarumol, W. (2024). Aligning public financial management and health financing for universal health coverage. Health Systems & Reform, 10(1), 2368051.
Musiega, A., Tsofa, B., Kagwanja, N., et al. (2022). Examining the influence of budget execution processes on health system efficiency: A qualitative case study. Health Policy and Planning, 37(3), 281–294.