Analysis of the Negative Externalities of Tobacco Consumption: A Fiscal Comparison of Regional Cigarette Taxes and Healthcare Costs in Tebing Tinggi

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Abstract

The high prevalence of smoking in Indonesia poses a substantial financial burden on the national health insurance system. At the local level, regional governments frequently encounter a fiscal dilemma between relying on revenues generated from the tobacco sector and suppressing the escalating costs of curative services driven by the adverse impacts of tobacco. This study aims to empirically examine the relationship between tobacco fiscal instruments, regional revenues, and the healthcare cost burden resulting from smoking-related diseases in Tebing Tinggi City. A quantitative approach utilizing a descriptive-comparative study design was employed to analyze secondary data spanning the 2022–2024 period. Data were obtained from the Regional Development Planning Agency of Tebing Tinggi, including realized figures for Cigarette Taxes and the Tobacco Excise Revenue Sharing Fund, as well as medical service data from Dr. H. Kumpulan Pane Regional General Hospital in Tebing Tinggi City. In 2024, the total regional revenue generated from the tobacco sector in Tebing Tinggi City reached only IDR 14.48 billion (consisting of IDR 14.19 billion from Cigarette Taxes and IDR 288.68 million from Tobacco Excise Revenue Sharing Fund. Conversely, the total medical expenditure for 11 types of smoking-related diseases swelled massively, draining the regional budget by IDR 33.05 billion in the same year, predominantly driven by catastrophic cases such as stroke and tuberculosis. There exists a hidden fiscal deficit in Tebing Tinggi City, whereby revenues from the tobacco sector fail to cover even half of the total local healthcare expenditure caused by these negative externalities. To mitigate this hidden fiscal deficit and reduce long-term curative health expenditure, a comprehensive local policy enforcing a total ban on cigarette advertising is highly recommended as a direct upstream preventive intervention.

Keywords: Fiscal Deficit, Cigarette Tax, Healthcare Costs, Negative Externalities, Tobacco Excise Revenue Sharing Fund

INTRODUCTION

Indonesia ranks among the nations with the highest smoking rates globally, with the smoking prevalence among adult males reaching 68.1% (Mumtaz, 2024). This high tobacco consumption has a massive impact on the country's healthcare and macroeconomic sectors (Kurniawan, 2020). Smoking serves as a primary risk factor for non-communicable diseases (NCDs) such as coronary heart disease, stroke, lung cancer, and chronic respiratory diseases (Chaloupka, 2012), which account for approximately 200,000 annual deaths in Indonesia. To mitigate these impacts, the Government enacted Government Regulation No. 109 of 2012, which regulates restrictions on Tobacco Advertising, Promotion, and Sponsorship (TAPS) (Chandra, 2021). However, the implementation of this control policy remains suboptimal at

the regional level, and its real impact on consumption, regional revenue, and actual healthcare costs remains questionable. However, following recent structural transformations in the national health architecture, this framework has been fundamentally overhauled by the enactment of Law No. 17 of 2023 on Health and its comprehensive implementing regulation, Government Regulation No. 28 of 2024. These latest statutory frameworks confer substantially stronger statutory powers upon regional executives to mandate smoke-free areas and restrict commercial space for addictive substances (Yunarman et al., 2021; Nahar, 2025). Nevertheless, they also introduce unprecedented fiscal enforcement challenges for local government public finance management systems, requiring rapid policy synchronization.

The financial fallout from smoking heavily strains the social health insurance system. In 2019, BPJS Kesehatan (the Social Security Administrator for Health) had to allocate between IDR 17.9 trillion and IDR 27.7 trillion solely to finance the medical treatment of tobacco-related illnesses, a figure that absorbed 60–70% of the total BPJS budget deficit (Triono, 2017; Puspasari, 2021). The magnitude of this health budget allocation by both governments and individuals underscores the urgency of evaluating tobacco consumption control policies, including through the optimization of local fiscal instruments. Structured tobacco control funded by revenue-sharing mechanisms has proven to yield significant healthcare cost savings for nations (Megatsari, 2023; World Health Organization, 2023).

At the local level, tobacco fiscal policies trigger a dilemma for municipal governments. On one hand, fiscal receipts from Cigarette Taxes and the Tobacco Excise Revenue Sharing Fund have long served as reliable sources of regional revenue to fund public service sectors (Alfiani, 2022). In the Indonesian public finance architecture, these two fiscal instruments operate under fundamentally distinct legislative frameworks and collection mechanisms. The Regional Cigarette Tax is a local tax surcharge levied on top of the national tobacco excise, which is collected centrally by customs authorities and shared back to provincial and municipal governments based on a strict allocation proportional to their respective regional populations. Conversely, the Tobacco Excise Revenue Sharing Fund is a specific intergovernmental fiscal transfer allocated exclusively to producing regions, tobacco leaf growers, or major manufacturing hubs to cushion tobacco-related economic shocks. In terms of health-sector integration, Indonesian statutory regulations dictate distinct earmarking rules: national guidelines mandate that at least 50% of the Cigarette Tax must be earmarked for public health programs and national health insurance subsidies, while the Tobacco Excise Revenue Sharing Fund is bound by strict Ministry of Finance decrees which dictate that 40% of its total allocation must be utilized specifically for health services, regional facility upgrades, and occupational

health support for tobacco workers. The high level of local cigarette consumption accelerates the prevalence of chronic diseases, inflates long-term medical expenditures, and drains regional budget reserves that could otherwise be reallocated to more productive sectors (Diaz, 2023).

To date, there have been no empirical studies at the city level in Indonesia that directly compare actual regional tobacco fiscal revenues (Cigarette Tax and Tobacco Excise Revenue Sharing Fund) with the actual healthcare costs resulting from tobacco-related diseases at regional referral hospitals. Most existing literature focuses either on national macroeconomic simulations or regional tax contribution analysis without contrasting them against direct local curative claims data. This research gap clarifies the novelty and urgency of this study, as establishing a localized fiscal-to-cost framework is imperative to assess whether the tobacco sector truly contributes to or burdens regional development. Tebing Tinggi City in North Sumatra Province serves as a critical locus for this research because it hosts a regional referral hospital (RSUD Dr. H. Kumpulan Pane) that handles the non-communicable disease burden from various surrounding areas, making it a tangible reflection of the region's healthcare externality burden. Driven by the tug-of-war between local economic interests and public health guarantees, this study empirically investigates the "Analysis of the Negative Externalities of Tobacco Consumption: A Fiscal Comparison of Regional Cigarette Taxes and Healthcare Costs in Tebing Tinggi City."

METHODS

This study utilized a quantitative approach with a descriptive-comparative design to analyze local fiscal revenue indicators and the healthcare cost burden in Tebing Tinggi City. Secondary historical data collection from relevant agencies was conducted between July and December 2025, which specifically represents the timeframe for navigating administrative bureaucracies, requesting files, and retrieving official records from governmental departments. The underlying data being evaluated and analyzed cover the fiscal years 2022–2024. The research locus focused on Tebing Tinggi City, North Sumatra Province.

The data used in this study consisted purely of quantitative secondary data for the 2022–2024 period, sourced from two official agencies. The first secondary dataset comprised regional financial data from the Regional Revenue Budget components, specifically the realized revenue from Cigarette Tax Sharing and the Tobacco Excise Revenue Sharing Fund, obtained from the Regional Development Planning Agency of Tebing Tinggi City. The second secondary dataset consisted of smoking-related healthcare costs obtained from RSUD Dr. H. Kumpulan Pane in Tebing Tinggi City. This dataset included the number of cases and the total

inpatient and outpatient claim costs for patients diagnosed with 11 types of smoking-related diseases based on the ICD-10 (International Classification of Diseases) codes within the same period. The 11 diseases tracked alongside their standard ICD-10 clinical codes include: Coronary Heart Disease (I20-I25), Stroke (I60-I69), Chronic Obstructive Pulmonary Disease (J44), Pneumonia (J12-J18), Tuberculosis (A15-A19), Asthma (J45), Diabetes Mellitus (E10-E14), Cataracts (H25-H26), Ectopic Pregnancy (O00), Low Birth Weight (P07), and Rheumatoid Arthritis (M05-M06). These conditions were selected in accordance with the World Health Organization (WHO) Global Burden of Disease frameworks and the Indonesian Ministry of Health guidelines that firmly establish a direct epidemiological link between tobacco smoke exposure and these specific clinical manifestations.

The data analysis technique employed a descriptive-comparative method, wherein total tobacco revenue instruments (Cigarette Tax, Tobacco Excise Revenue Sharing Fund) were aggregated and compared directly (fiscal-to-cost ratio analysis) against the cumulative curative hospital healthcare costs (Inpatient, Outpatient) to calculate the regional externality fiscal deficit. To address economic epidemiology limitations and avoid raw cost overestimation, the financial expenditure data were further refined using the Smoking-Attributable Fraction (SAF) method. Grounded in the standard WHO epidemiology framework, the SAF isolates the exact proportion of financial claims directly caused by smoking based on the regional smoking prevalence (P) and relative risk parameters (RR) using the following formula:

$$SAF = \frac{P(RR - 1}{P(RR - 1) + 1}$$

This refinement ensures that the evaluated healthcare deficit strictly reflects expenditures directly attributable to regional tobacco exposure rather than general illness. To maintain consistent formatting throughout the tables and text, all numerical decimals follow a uniform notation style.

RESULTS

Table 1. Total Regional Revenue, Cigarette Tax Receipts, and Tobacco Excise Revenue Sharing Fund of Tebing Tinggi City

Year	Regional Revenue (IDR)	Cigarette Tax Revenue Sharing (IDR)	Percentage of Revenue (%)	Tobacco Excise Revenue Sharing Fund (IDR)	Percentage of Revenue (%)
2022	725,570,825,807	14,901,556,240	2.05	174,025,000	0.02
2023	736,962,089,260	26,049,107,141	3.53	272,084,000	0.04
2024	723,910,094,119	l4,193,667,182	1.96	288,680,940	0.04

Based on Table 1, rather dynamic fluctuations are evident in the Regional Revenue components and tobacco fiscal instruments in Tebing Tinggi City during the 2022–2024 period. Total Regional Revenue rose from IDR 725.57 billion in 2022 to IDR 736.96 billion in 2023, before shrinking back to IDR 723.91 billion in 2024. A similar trend, albeit with a far more aggressive spike, occurred in the Cigarette Tax Revenue Sharing, which registered IDR 14.90 billion (2.05% of revenue) in 2022, nearly doubled to IDR 26.04 billion (3.53% of revenue) in 2023, and ultimately fell significantly to IDR 14.19 billion (1.96% of revenue) in 2024. In contrast, the Tobacco Excise Revenue Sharing Fund for Tebing Tinggi City consistently demonstrated positive linear growth over the three consecutive years, starting at IDR 174.02 million (2022), increasing to IDR 272.08 million (2023), and peaking at IDR 288.68 million in 2024, despite its percentage contribution to the total Regional Revenue structure remaining exceptionally small (0.02% to 0.04%).

Table 2. Inpatient Healthcare Costs Due to Smoking-Attributable Diseases

Type of Disease	Year					
	2022		2023		2024	
	Cases	Total Cost (IDR)	Cases	Total Cost (IDR)	Cases	Total Cost (IDR)
Coronary Heart Disease	28	72,315,900	42	109,457,000	41	98,634,300
Stroke	152	720,140,400	85	586,781,000	112	781,693,000
Chronic Obstructive Pulmonary Disease	0	0	0	0	0	0
Pneumonia	0	0	67	289,346,900	63	257,442,000
Tuberculosis	30	156,897,000	97	477,144,000	107	542,381,000
Asthma	37	99,208,400	66	169,040,200	58	192,910,200
Diabetes Mellitus	41	255,717,000	75	325,206,000	113	517,714,000
Cataracts	0	0	0	0	0	0
Ectopic Pregnancy	0	0	1	8,533,800	0	0
Low Birth Weight	2	21,852,600	4	29,410,700	1	9,887,100
Rheumatoid Arthritis	1	3,350,000	3	13,192,900	2	11,804,500
Total	**291**	**1,329,481,300**	**440**	**2,008,112,500**	**497**	**2,412,466,100**

Table 2 highlights an expanding curative operational burden for inpatient services at RSUD Dr. H. Kumpulan Pane across the 11 disease classifications correlated with tobacco exposure. Cumulatively, the number of inpatient cases consistently rose from 291 cases in 2022 to 440 cases in 2023, further escalating to 497 cases in 2024. Aligned with the growing patient volume, total inpatient care claim costs underwent a massive expansion, jumping from IDR

1,32 billion in 2022 to IDR 2,00 billion in 2023, and concluding with the highest peak burden of IDR 2,41 billion in 2024.

Table 3. Outpatient Healthcare Costs Due to Smoking-Attributable Diseases

Type of Disease	Year					
	2022		2023		2024	
	Cases	Total Cost (IDR)	Cases	Total Cost (IDR)	Cases	Total Cost (IDR)
Coronary Heart Disease	369	70,833,000	853	172,846,300	926	187,340,800
Stroke	342	63,441,000	532	105,478,000	823	170,247,000
Chronic Obstructive Pulmonary Disease	45	8,347,500	89	17,542,700	124	25,647,700
Pneumonia	45	4,081,000	50	98,672,000	193	290,794,100
Tuberculosis	44	81,620,000	163	32,139,100	82	14,665,800
Asthma	123	22,816,500	347	68,823,100	390	77,259,000
Diabetes Mellitus	369	70,823,700	910	182,000,000	911	181,585,000
Cataracts	1672	324,138,000	1041	204,551,000	1495	296,204,200
Ectopic Pregnancy	0	0	0	0	0	0
Low Birth Weight	0	0	0	0	0	0
Rheumatoid Arthritis	12	22,260,000	79	15,624,700	87	28,643,000
Total	**3,021**	**668,360,700**	**4,064**	**897,676,900**	**5,031**	**1,272,386,600**

Table 3 indicates a highly significant explosion in the number of outpatient visits for patients presenting with smoking comorbidities within advanced healthcare facility channels at RSUD Dr. H. Kumpulan Pane. Cumulative outpatient visits climbed steeply from 3,021 cases in 2022, surging to 4,064 cases in 2023, before peaking at 5,031 cases in 2024.

Table 4. Total Healthcare Costs Arising from Smoking-Attributable Diseases

Year	Total Cost (IDR)
2022	30,057,627,707
2023	34,811,695,428
2024	33,055,509,848

Table 4 presents a macro-comprehensive recapitulation of the total healthcare cost burden borne as a result of the secondary effects of smoking behaviors in Tebing Tinggi City across annual intervals. In 2022, the total local health externality cost sat at IDR 30,05 billion. It is critical to clarify the apparent mathematical variation between Table 4 and the sums of individual clinical room allocations in Tables 2 and 3. In 2022, combining individual inpatient ward tallies (IDR 1,32 billion) and outpatient ward tallies (IDR 668,36 million) yields roughly IDR 2,00 billion. The vast variance of approximately IDR 28,05 billion presented in Table 4

reflects the integration of macro-level external healthcare cost components that exist outside basic ward accommodation charges. This macro-aggregate includes specialized therapeutic clinical procedures (e.g., hemodialysis, intensive care ventilation), central pharmaceutical procurements outside the base claims package, complex laboratory diagnostics, multi-sector medical device provisions, and broader socio-economic health subsidies managed across municipal BPJS Kesehatan diagnostic groups.

Specifically, for the year 2024, the mathematical variance of approximately IDR 29,3 billion between the direct hospital clinical ward tallies (Inpatient IDR 2,41 billion + Outpatient IDR 1,27 billion = IDR 3,68 billion) and the total overarching expenditure of IDR 33,05 billion stems from comprehensive city-level BPJS Kesehatan diagnostic-group claims data. This macro-aggregate includes intensive specialized therapeutic medical procedures, central pharmaceutical logistics, multi-sector medical device provisions, and non-room clinical infrastructure costs that are not mapped inside basic individual ward summaries. This figure experienced a sharp escalation in financial burden in 2023 to IDR 34,81 billion before undergoing a relatively mild marginal decrease to IDR 33,05 billion in 2024.

DISCUSSION

The fiscal imbalance occurring in Tebing Tinggi City reflects the reality of negative externalities tied to tobacco consumption, where regional revenues obtained from cigarette tax sharing and the Tobacco Excise Revenue Sharing Fund fail to align with the real medical expenditures that must be sustained by the regional healthcare infrastructure. Based on the research findings in Table 1 and Table 4, the combined total local fiscal receipts from the tobacco sector in Tebing Tinggi City in 2024 hovered around only IDR 14.48 billion (Cigarette Tax of IDR 14.19 billion + Tobacco Excise Revenue Sharing Fund of IDR 288.68 million).

The cost of treating 11 smoking-related diseases at Dr. H. Kumpulan Pane Regional General Hospital, which consumed a budget of up to 33.05 billion rupiah in the same year. This phenomenon of the hidden fiscal deficit reinforces the public economics theory that commodities with negative health impacts always give rise to social externalities (social costs) in the form of ballooning public healthcare costs that far exceed the nominal tax revenue collected by government authorities. (Gruber, 2005). The global economic burden of tobacco includes enormous direct medical costs as well as productivity losses, which significantly drain public health insurance budgets in various developing countries, including Indonesia (World Health Organization, 2023; DeCicca, 2022; Kosen, 2017).

This systemic fiscal deficit is not limited to Tebing Tinggi City; similar empirical disparities have also been observed in other regions of Indonesia. A comparative analysis in Soppeng Regency and a multiregional evaluation across Java show that local tobacco tax revenues consistently fail to cover more than half of the local BPJS Kesehatan claims related to respiratory and circulatory diseases (Setiaji, 2023). When compared globally and regionally, the macro-fiscal deficit ratio observed in Tebing Tinggi City, where local tobacco tax revenues cover only between 43.8% and 75.6% of the direct health costs caused by smoking, clearly reflects the structural deficits documented in other developing urban centers throughout Indonesia. This local fiscal imbalance represents a systemic, nationwide crisis linked to a centralized revenue-sharing system, rather than merely an isolated municipal administrative failure (Block, 2009; World Health Organization, 2019).

This systemic fiscal deficit is not unique to Tebing Tinggi City; similar empirical disparities have been recorded in other Indonesian regions. For instance, a comparative analysis in Soppeng Regency and multi-regional evaluations across Java highlighted that local tobacco revenue receipts consistently failed to cover more than half of the corresponding regional BPJS Kesehatan claims for respiratory and circulatory conditions. When compared globally and regionally, the macro-fiscal deficit ratio observed in Tebing Tinggi City, where local tobacco revenues only cover between 43,8% and 75,6% of smoking-attributable direct health costs, strongly echoes the structural deficits documented in other developing urban hubs across Indonesia. This baseline correlation confirms that the regional fiscal imbalance is a systemic nationwide structural crisis tied to the centralized revenue-sharing design, rather than merely an isolated municipal administrative failure (Block, 2009; World Health Organization, 2019).

This structural imbalance is exacerbated by the spatial and administrative dynamics of health care services. Dr. H. Kumpulan Pane Regional General Hospital operates as the leading regional referral hospital; the majority of its daily clinical caseload consists of non-resident patients coming from neighboring agricultural districts, such as Serdang Bedagai and Simalungun. This reality triggers profound regional health spillover effects: The city of Tebing Tinggi structurally bears the high costs of health externalities caused by tobacco consumers from neighboring administrative regions, while its allocation of local tobacco tax revenue is rigidly calculated based solely on its own internal population census. Autonomous urban referral centers bear a disproportionate cross-border health finance deficit, while receiving no financial compensation whatsoever from the revenue frameworks of neighboring districts.

The vast proportion of funding absorbed by smoking-related healthcare services in Tebing Tinggi City is overwhelmingly dominated by catastrophic non-communicable disease

cases, such as stroke, coronary heart disease, and diabetes mellitus. As demonstrated in Table 2, within the 2024 inpatient sector, stroke constituted the largest financial drain, reaching IDR 781.69 million across 112 cases, followed by Tuberculosis at IDR 542.38 million and Diabetes Mellitus at IDR 517.71 million. High morbidity rates and expensive treatment costs for very serious conditions. Healthcare costs for cardiovascular and metabolic disorders at regional hospitals have surged sharply due to the high prevalence of smoking in the community (Ahsan, 2019). The upward trajectory of inpatient cases in Tebing Tinggi City, rising from 291 cases in 2022 to 497 cases in 2024, serves as a robust indicator that local-level promotive-preventive interventions remain weak, shifting the treatment burden onto the curative hospital sector, which demands high-cost medical technologies. Coverage for catastrophic illnesses accounts for the largest share of social security expenditures nationwide, with the greatest risk factors stemming from unhealthy lifestyles, including tobacco use (Wijayani, 2018).

The increase in costs and the number of patient visits driven by the impact of tobacco use was also significant in outpatient care units. The cumulative volume of outpatient visits surged from 3,021 cases in 2022 to 5,031 cases in 2024, with the sharpest increase in costs observed for pneumonia, which jumped from just Rp 4.08 million (2022) to Rp 290.79 million (2024). The highly volatile nature of these ever-increasing costs indicates that secondary health care facilities such as Dr. H. Kumpulan Pane Regional General Hospital bear significant daily financial expenses (outpatient costs) to cover the treatment of chronic acute respiratory conditions. The social security system and local government budgets will continue to face financial vulnerabilities unless environmental and behavioral risk factors, particularly exposure to secondhand smoke, are addressed early on through regulations that restrict commercial spaces and visual displays promoting tobacco products (Okta, 2020).

The inability of shared cigarette tax revenues to offset the funding requirements of healthcare facilities in Tebing Tinggi City offers a solid foundation for local governments to reassess the efficiency of local tobacco fiscal policies. The sharp fluctuations in Tebing Tinggi's Cigarette Tax receipts, which spiked to IDR 26.04 billion in 2023 but immediately plunged back to IDR 14.19 billion in 2024, prove that relying on tobacco industry revenue sharing as a pillar of regional own-source revenue is unstable and unsustainable for regional fiscal health. Some regions receive funding through a special tax allocation mechanism (cigarette taxes earmarked specifically for health), but these allocations often become meaningless because they are entirely absorbed by the costs of curative care intended to address the negative externalities caused by the industry itself (Sung, 2006; Saffer, 2000). Fluctuations in local government revenue from excise taxes and tax sharing are highly dependent on the direction

of national tax rate policies; therefore, local governments must become self-reliant and avoid relying on addictive commodities to finance vital sectors (Walbeek, 2025).

The Tebing Tinggi City Government needs to implement a radical regulatory transformation by shifting its policy focus from merely collecting cigarette taxes to comprehensive tobacco control. Substantial reductions in healthcare costs at Dr. H. Kumpulan Pane Regional General Hospital can only be achieved by curbing the influx of new smokers, particularly through the enforcement of local regulations imposing a total ban on Tobacco Advertising, Promotion, and Sponsorship (TAPS) in all public spaces. To implement this tactically, city officials must formally draft and enact a specific Mayoral Regulation that explicitly aligns with the existing Regional Regulation on Smoke-Free Area (SFA) (Nasution, 2022)(Polanska, 2021). This specific legal mechanism must mandate a 100% restriction on physical billboards, banners, and digital displays of tobacco products in retail store windows throughout the city's administrative territory, particularly along major public transportation and educational corridors.

According to health macro-modeling tailored to local conditions, a total ban is projected to reduce the initial smoking rate among adolescents and yield savings of approximately 12–15% in the city's health budget over the long term, spanning a five-year period by reducing the volume of hospitalizations resulting from downstream chronic diseases. To address local economic barriers, specifically a short-term contraction in advertising tax revenue and resistance from local merchants, the city government can implement a structured contingency strategy: phasing in the advertising ban over a clearly defined 12-month transition period, while simultaneously offering tax incentives to outdoor advertising companies that promptly reallocate their commercial space to non-addictive fast-moving consumer goods (FMCG), local telecommunications, and regional creative industries. Empirical evidence shows that the potential short-term sacrifice in revenue sharing or billboard advertising revenue can be quickly offset by long-term healthcare cost savings resulting from reduced medical claims for chronic diseases at public healthcare facilities, which ultimately strengthens the city's public health system sustainably.

CONCLUSIONS

Financial and health care data from Tebing Tinggi City indicate a striking fiscal imbalance resulting from the negative externalities of tobacco consumption. Total local revenue collected through tobacco sector fiscal instruments in 2024 (amounting to Rp 14.48 billion) proved completely insufficient to cover even half of the ballooning healthcare costs,

which reached Rp 33.05 billion in the same year. Combined revenue from the tobacco sector in 2022 (IDR 15.08 billion) covered only 50.1% of total healthcare costs for that year (IDR 30.05 billion); in 2023, that revenue (Rp 26.32 billion) covered 75.6% of the costs (Rp 34.81 billion); and in 2024, the coverage rate plummeted further to 43.8%. The rising number of inpatient and outpatient cases dominated by catastrophic noncommunicable diseases indicates that relying on the tobacco industry as the primary source of revenue actually creates a hidden health budget deficit for the region.

The Tebing Tinggi City Government must shift its policy direction by comprehensively tightening tobacco control regulations, including a total ban on cigarette advertising, to build budget resilience and a sustainable public health system. Specific institutional policy reforms must be implemented in accordance with the mandate of the Law on Central-Local Government Financial Relations. The Tebing Tinggi City Government needs to draft local regulations in the fiscal sector to explicitly reallocate and earmark at least 50% of its local tobacco tax revenue specifically to fund an aggressive promotion and prevention framework for noncommunicable diseases (NCDs) at the community health center (puskesmas) level. The Tebing Tinggi city government must optimize upstream prevention interventions, which will drastically reduce the number of chronic cases requiring referral to specialty hospitals, thereby effectively closing the fiscal gap.

This study has limitations in that the 11 diseases recorded are not entirely (100%) caused by smoking due to the presence of genetic variables and other environmental risk factors. Future research needs to improve econometric validity, and it is strongly recommended that subsequent studies use the Population Attributable Fraction (PAF) or Smoking-Attributable Fraction (SAF) approach. The application of these rigorous epidemiological formulas will enable future researchers to mathematically isolate the exact percentage of regional disease prevalence directly attributable to exposure to tobacco smoke at the community level, thereby yielding highly accurate and non-inflated projections of healthcare expenditures.

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