

THE ROLE OF HEALTH-RELATED TAXATION IN REDUCING NCD'S AMONG SRI LANKAN POPULATION

Imalka Wasana Rathnayaka², Sunethra Perera³, Fareena Ruzaik⁴

Abstract

Non-communicable Diseases (NCDs) are a major health burden in Sri Lanka, with significant adverse impacts on labour force participation and productivity, resulting in reduced GDP, which in turn affects savings and taxation in the economy. Health-related taxation is one of the measures that can address this issue by governments in their fiscal policies to manage over-consumption to address adverse health impacts. This paper aims to examine the economic impact of health-based taxation in reducing health expenditure and Non-Communicable Diseases in Sri Lanka specially focusing on tobacco, alcohol, and Sugar-Sweetened Beverages. Though Sri Lanka has imposed taxes on these products over the past decades, there is a lack of studies on the economic impacts of health-based taxation. Therefore, this paper examines the impact of tax policy approaches on encouraging/promoting healthier choices and reducing NCDs in order to lower the healthcare costs in the country. The study is motivated by the growing challenges of epidemiological transition and the potential of health-based taxation on economic dimensions in Sri Lanka. This study uses a quantitative research design including correlation and multiple regression modelling to investigate the long-term relationship between taxation of sugar-sweetened beverages (SSBs), Tobacco (TOB), and Alcohol (LIQ), and disability-adjusted life years due to NCDs (DALY_NCDs) including several control variables during the period of 2017 – 2022. The findings reveal that higher GDP per capita growth and improved literacy rates are strongly associated with reduced DALY_NCDs, underscoring the crucial role of economic development and education in enhancing public health outcomes. However, the fiscal policy variables, specifically taxes on sugar-sweetened beverages and tobacco, surprisingly exhibit a positive relationship with DALY_NCDs, suggesting that these taxes may be ineffective or even counterproductive due to potential substitution effects or issues with tax design and enforcement. These funds can be used to improve the healthcare system, enhance access to healthcare services, and promote preventive measures to reduce the burden of NCDs. These insights provide valuable contributions to the ongoing discourse on health-based taxation policies and their economic repercussions, offering potential avenues for policy refinement and optimization.

Key Words

Non-Communicable Diseases, Health-based taxation, GDP Growth, Health Transition, Sri Lanka

² Senior Lecturer, Department of Economics, University of Colombo
wasana@econ.cmb.ac.lk

³ Professor of Demography (Chair), Department of Demography, University of Colombo, E-mail: sunethra@demo.cmb.ac.lk

⁴ Professor in Geography, Department of Geography, University of Colombo
Fareena@geo.cmb.ac.lk

Introduction

Non-communicable Diseases (NCDs) have become a major health concern in over the past years in Sri Lanka, with significant adverse impacts on labour force participation and productivity, resulting in reduced GDP, which in turn affects savings and taxation in the economy. Health-related levies are imposed by governments on products known to have adverse public health effects, including but not limited to tobacco (TOB), alcoholic beverages (LIQ), and sugar-sweetened beverages (SSBs) which aim to promote healthier behaviours among the population. These levies are widely regarded as 'win-win-win' policies for several reasons (WHO, 2022). The aim of health-related tax policies is to curtail the consumption of items identified as risk factors for NCDs. This is achieved by rendering these products less affordable through price increases (Adeyi et al., 2007). It is imperative that these taxes increases are implemented regularly and at a magnitude that results in real price increments surpassing the rate of economic growth, which can also generate extra revenue. This revenue can then be reinvested into societal health and well-being initiatives, if it is earmarked. Such tax policy measures can promote healthier choices and result in reduced healthcare costs in a country. Global obesity and diet-related noncommunicable diseases (NCDs) have been steadily increasing in the past two decades. This calls for immediate action to address the root causes. Health-based taxes could be used as an important measure to address these root causes. Among various such kinds of tax measures, excise taxes stand out as the most effective for health promotion. They bring about price adjustments, positioning harmful products at higher price points relative to other commodities (Knaul and Nugent, 2006). Furthermore, excise taxes can be readily adjusted upward over time, ensuring their continued effectiveness. To attain the greatest reduction in consumption, tax structures based on the quantity of an unhealthy product (referred to as specific taxes) or the unhealthy components within the product (such as pure alcohol or sugar) are preferable to tax structures linked to the product's overall value. Though many research studies are examining the implications of reducing taxes on foods such as fat, sugar, and salt on health (Bandy et al., 2020; Chouinard et al., 2007; Dogbe and Revoredo-Giha, 2022; Jensen and Smed, 2018). If the primary objective of health taxes is to reduce the consumption of unhealthy products, existing evidence supports implementing taxes that raise product prices by at least 20% (Wright et al., 2017). However, when such taxes effectively respond to positive health-related behaviours, the reliability of the associated revenue stream may decline while increasing labour productivity in the long run. Although these interventions offer substantial cost-effectiveness potential, careful consideration must be given to minimizing adverse impacts on equity and public acceptability (Brown, 2017). Therefore, it becomes imperative for governments to prioritize cost-effective interventions to reduce NCDs among the population. There is a dearth of research that focuses on the impact of health-based taxes on NCDs in the context of Sri Lanka. In this context, it is crucial to evaluate whether the health and economic benefits observed in the short run can be maintained over an extended period and if they lead to substantial cost savings in healthcare and other sectors. Consequently, this study aims to address this gap in the literature by investigating the long-term economic implications of health-based taxes.

Objectives

The main objective of this study is to examine the role of health-related taxes in reducing NCD's in Sri Lanka during the period of 2017 to 2022 with the use of time-series data. This study utilizes correlation analysis and multiple regression analysis to examine the contribution of health-related taxes in reducing the NCDs in Sri Lankan population. Therefore, this study contributes to the existing literature by analysing the impacts of health tax on healthcare expenditure by examining the health economic effects of excise taxation on SSBs, TOB and LIQ in Sri Lanka. (Nnoaham et al., revenue can then be reinvested into societal health and well-being initiatives, if it is earmarked. 2009)

This paper is structured as follows: firstly introduction, and then provides a brief review of the literature, followed by the methodology. Then, the results of the study pertaining to the economic impact of the health-based taxes on NCDs are presented. Finally, study findings are discussed, highlighting the policy implications, while acknowledging the limitations of the existing literature, and proposing avenues for future research.

Literature Review

This paper contributes to the rapidly expanding literature on the socio-economic and demographic repercussions of the role of health-based taxes in reducing NCD's. There are two main strands in the literature: the first investigates the theoretical background, while the second examines the empirical evidence of the importance of fiscal measures to curb the consumption of SSBs, tobacco, and alcohol and reduce DALY_NCDs. The Health Belief Model explains how individuals' perceptions of health risks influence their behaviours. By increasing the cost of harmful products, taxes enhance the perceived severity and susceptibility to health risks, motivating healthier behaviour (Colchero et al., 2017). The Health Transition model explains that socio-economic determinants of health and how societies developed economically and socially shift in pattern on health and diseases through the incorporation of socio-economic, cultural, behavioural, and policy-driven factors (Caldwell, 1993). Health impact is typically combined with projected alterations in demand for unhealthy food consumption to estimate the impacts of tax changes on the health outcomes of populations. For example, according to the Nnoaham et al, (2009), identifying income group differences in the health and economic impacts of targeted food taxes and subsidies finds no clear pattern. However, if low-income persons have more elastic demand and higher levels of consumption patterns of unhealthy food and/or poorer health to start with, the beneficial health effects of the high taxation of unhealthy food would definitely be greatest for them. The regressivity argument against the heavy taxation of food may therefore be overturned when not only the monetary cost but also the beneficial health effects of taxes are taken into account (Härkänen et al., 2014).

An excise tax is a government-mandated levy on particular goods or services at the point of purchase. These taxes are imposed within a nation's borders, making them intranational, as opposed to international taxes, which apply across country boundaries (Katz et al., 1983). Moreover, internationally, food and beverage taxes

have been recommended as a key part of a comprehensive approach to addressing health concerns (Jou and Techakehakij, 2012). One primary objective of SSB taxes is to raise the retail price of these beverages, thus discouraging their purchase and consumption. By making SSBs more expensive, these taxes aim to curb the excessive intake of sugary drinks, which are associated with various health issues like obesity, diabetes, and dental problems (Falbe, 2020). SSB taxes also aim to encourage a shift in consumer behaviour towards the consumption of healthier alternatives, such as safe drinking water. By making SSBs less affordable, individuals are prompted to opt for alternatives that contribute to better health outcomes (Novak and Brownell, 2011, Hsiao and Wang, 2013). SSB taxes also have a fiscal objective. They aim to generate substantial government revenue. This revenue can then be reinvested into societal health and well-being initiatives. Such earmarked health taxes could fund public health programs, healthcare infrastructure, and other services that directly benefit the population, creating a positive feedback loop for health promotion (Thow et al., 2021). In many countries, empirical evidence on health-related taxes revealed that these taxes are an effective strategy for reducing the consumption of harmful substances associated with NCDs. Studies from countries such as Mexico, the United Kingdom, and Australia highlight that excise taxes on SSBs, tobacco, and alcohol can lead to significant reductions in their consumption, contributing to improved health outcomes (Sassi et al., 2018). For example, Mexico's sugar tax introduced in 2014 resulted in a 7.6% decline in SSB consumption within the first two years (Colchero et al., 2017). Similarly, tobacco taxation is cited as one of the most effective measures to reduce smoking prevalence globally, with a price increase of 10% leading to a 4% reduction in tobacco use in high-income countries and having an even greater effect in low- and middle-income countries (Chaloupka et al., 2019).

These measures align with Sri Lanka's commitments to the WHO Framework Convention on Tobacco Control (FCTC) and the Global NCD Action Plan 2013-2020 (Perera et al., 2020). Research on tobacco taxation in Sri Lanka reveals its effectiveness in reducing smoking prevalence. A study by Perera et al. (2020) found that increasing excise taxes on cigarettes led to a significant decline in smoking rates, particularly among low-income groups. However, challenges such as the availability of cheaper alternatives, illicit trade, and enforcement gaps have undermined the full potential of these taxes. Alcohol taxation in Sri Lanka has shown mixed results. While excise duties on alcoholic beverages have contributed to reduced consumption, studies indicate a shift towards illicit alcohol, which poses significant health risks (Wijesinghe & Jayawardana, 2019). Effective enforcement and complementary strategies, such as public awareness campaigns, are necessary to enhance the impact of alcohol taxation. Although Sri Lanka has not yet implemented a comprehensive SSB tax, the increasing prevalence of diabetes and obesity highlights the need for such measures. Such earmarked health taxes could fund public health programs, healthcare infrastructure, and other services that directly benefit the population, creating a positive feedback loop for health promotion (Thow et al., 2021). More importantly the text talks of imposition of an SSB tax – an SSB tax is already in place, but is ineffective due to low tax rates and operationalization issues such as not covering milk drinks this needs to be understood and the wording revised to highlight the need for

the imposition of an effective SSB tax rather than the imposition of an SSB tax. In Sri Lanka, with regards to tobacco and alcohol taxes, it is evident that when the 20% alcohol tax increased in 2023, leading to a reduction in pure alcohol consumption by 8.3 million litres and an increase in government tax revenue by Rs 11.6 billion. Similarly, cigarette tax revenue rose by Rs 7.7 billion, while sales dropped by 521.5 million units (Seram, 2025).

Health-related taxation presents a promising avenue for reducing NCD prevalence in Sri Lanka. While tobacco and alcohol taxation have shown partial success, expanding the tax framework to include SSBs and other unhealthy products could further mitigate the NCD burden. Addressing implementation challenges and integrating taxation policies with comprehensive health strategies will be critical for achieving sustainable health outcomes. However, there is a noticeable gap in the literature concerning the long-term sustainability and enduring impact of these taxes.

Methodology

Data

This empirical analysis is based on various data sources to comprehensively analyse health-related taxation and its impacts on reducing NCDs in the Sri Lankan population. Historical data on tax rates, implementation dates, and changes in health-related taxes on tobacco, alcohol, and sugary beverages were gathered from the World Bank database and official publications by the Ministry of Finance and the Ministry of Health. The data for Age-standardized DALY (Disability-Adjusted Life Year) rates per 100,000 individuals from non-communicable diseases (NCDs) from the database of “Our World in Data”. Additionally, data related to control variables such as demographic trends (population growth and proportion of aging population), GDP per capita growth, health expenditure as a percentage of GDP, inflation rate, and literacy rate were collected from published data of International Monetary Fund (IMF), Central Bank of Sri Lanka (CBSL), and Department of Census and Statistics (DCS).

Methods

First, the study employs correlation analysis to examine the relationship between Disability-Adjusted Life Years due to NCDs and health-based taxes in Sri Lanka. In addition, to investigate the impacts of health-based taxes in reducing NCD's in Sri Lanka, the following multiple regression (Ordinary Least Square model (OLS)) was used. The main advantage of the OLS model is that it provides long-run relationships between independent variables and the dependent variable.

The general OLS equation for the dependent variable DALY_NCDs can be written as: Equation 1:

$$DALY_{NCDs_t} = \beta_0 + \beta_1gGDP_t + \beta_2HCE_t + \beta_3INF_t + \beta_4LIT_t + \beta_5SSB_t + \beta_6TOB_t + \beta_7POP_t + \epsilon_t$$

Table 1: Selected variables for the analysis

Variable/ Measurement	Description
GDP per capita growth (gGDP) -Scale	Annual percentage growth of GDP per capita, indicating overall economic
Health Care Expenditure (HCE) - Scale	Total healthcare expenditure as a percentage of GDP.
Inflation Rate (INF) - Scale	The National Consumer Price Index (NCPI) measures the changes in prices paid by consumers for goods and services.
Aging Population (aging) - Scale	Population aged 60 and above (as a % of total population).
Literacy Rate (LIT) - Scale	Percentage of literate population, reflecting creating awareness levels.
Government Taxes on Sugar-Sweetened Beverages (SSB) - Scale	Government taxes on Sugar-Sweetened Beverages.
Government Taxes on Tobacco (TOB)- Scale	Government Taxes imposed on tobacco products.
Government Taxes on Alcohol (LIQ) - Scale	Government Taxes on alcoholic beverages
Disability-Adjusted Life Years due to NCDs (DALY_NCDs) - Scale	Burden of Non-Communicable Diseases, measuring years lost due to illness, disability, or early death.

According to the equation 1, the independent variables are the gGDP, HCE, INF, LIT, SSB, TOB, LIQ, and Population aged 65 and above (as a % of total population), β_0 is the intercept, β_t are the coefficients of the independent variables, ϵ_t is the error term, and t represents time. The yearly data was transformed into fortnightly observations for the period 2017 to 2022 using EViews software to allow for higher-frequency analysis and to better capture short-term trends and dynamics that may not be visible in annual data. The OLS model assumes homoscedasticity, normality of residuals, and no multicollinearity. These assumptions are tested in the study. The multiple regression model establishes a connection between the natural logarithm of Disability-Adjusted Life Years due to NCDs and a predefined set of independent variables, as specified in Equation 2.

$$\ln DALY_{NCD_t} = \beta_0 + \beta_1 \ln GDP_t + \beta_2 \ln HCE_t + \beta_3 \ln INF_t + \beta_4 \ln LIT_t + \beta_5 \ln SSB_t + \beta_6 \ln TOB_t + \beta_7 \ln POP_t + \epsilon_t$$

Results

The relationship between dependent and independent variables is examined by utilizing Pearson correlation which measures the strength and direction of linear associations.

Table 2: Correlation Matrix

	DALY_NCDs	gGDP	HCE	INF	LIQ	LIT	POP	SSB	TOB
DALY_NCDs	1.000 ***								
gGDP	0.342 ***	1.000							
HCE	-0.868 ***	-0.525 ***	1.000						
INF	-0.802 ***	-0.685 ***	0.824 ***	1.000					
LIQ	-0.791 ***	0.010 ***	0.593 ***	0.663 ***	1.000				
LIT	-0.712 ***	-0.539 ***	0.893 ***	0.655 ***	0.499 ***	1.000			
POP	-0.627 ***	-0.732 ***	0.875 ***	0.666 ***	0.263 ***	0.944 ***	1.000		
SSB	0.267 ***	0.585 ***	-0.536 ***	0.252 ***	0.333 ***	0.478 ***	-0.706 ***	1.000	
TOB	0.796 *	0.070 **	-0.472 ***	0.379 ***	0.585 ***	0.396 ***	-0.294 ***	0.121 ***	1.000

Note: The significance levels are 1% (***), 5% (**), and 10% (*), respectively

The correlation matrix provides insights into the relationships between DALY_NCDs (Disability-Adjusted Life Years due to Non-Communicable Diseases) and various economic, demographic, and policy-related factors that effect on the outcome variable. A strong negative correlation (-0.868) between healthcare expenditure and DALY_NCDs suggests that higher healthcare spending is linked with a lower burden of non-communicable diseases. Increased investment in healthcare services, preventive care, and treatment significantly improves health outcomes by reducing disease prevalence and severity. Similarly, inflation shows a strong negative correlation (-0.802) with DALY_NCDs, indicating that rising inflation may limit access to healthcare, medications, and nutritious food, thereby worsening health conditions.

The negative correlation (-0.791) between government taxes on liquor and DALY_NCDs suggests that higher liquor taxes are associated with lower NCD burdens, reinforcing the effectiveness of alcohol-based taxes as a public health measure. Additionally, the negative correlation (-0.712) between literacy rate and DALY_NCDs implies that higher literacy levels contribute to better health outcomes, likely due to increased health awareness and access to healthcare services.

A moderate negative correlation (-0.627) between the proportion of ageing population (60+ years) and DALY_NCDs suggests that countries with universal healthcare access facilitate larger elderly populations, may have better healthcare systems that mitigate the impact of NCDs.

In contrast, the positive correlation (0.267) between SSB tax (Sugar-Sweetened Beverage Tax) and DALY_NCDs suggests that taxation alone may not be sufficient to reduce the disease burden without complementary lifestyle and dietary interventions. A significant positive correlation (0.796) between tobacco tax and DALY_NCDs suggests that higher tobacco taxation is linked to a greater disease burden. This could indicate that if countries with severe tobacco-related health issues implement higher taxes as a control measure, rather than these taxes actively reducing the burden they could contribute to increasing the NCD burden. Beyond health outcomes, GDP per capita growth shows a moderate positive correlation (0.342) with DALY_NCDs, suggesting that economic growth may be associated with lifestyle changes that contribute to NCDs, such as increased processed food consumption, sedentary lifestyle behavior, and stress-related living and work environments. Additionally, the strong positive correlation (0.893) between healthcare expenditure and literacy rate indicates the role of education in promoting higher economic status that leads to increased healthcare investments and better health outcomes.

These findings emphasize the critical role of healthcare investment in reducing NCD burdens, as higher expenditure correlates with improved health outcomes. Government taxes on alcoholic beverages appear to be effective in controlling health risks, although they should be complemented by broader regulatory and awareness campaigns. Literacy levels also play a crucial role in public health awareness. Literacy is important for having the potential to create awareness because it reinforces the need for long-term investments in education as part of a comprehensive health policy.

Economic factors such as inflation and GDP growth influence health outcomes, highlighting the importance of maintaining economic stability while ensuring accessible healthcare. Finally, while taxing unhealthy products like tobacco, alcohol, and sugary drinks is a necessary strategy, it should be accompanied by public health initiatives such as lifestyle interventions, dietary regulations, and preventive care programs to maximize their impact on reducing the burden of NCDs.

The Ordinary Least Squares (OLS) regression results provide insights into the relationship between the dependent variable (DALY_NCDs) and the independent variables (HCE, gGDP, INF, LIQ, LIT, SSB, and TOB, POP>60). Below is a detailed interpretation of the findings. Adjusted R-squared is 0.792236 and adjusted for degrees of freedom, still very high, suggesting that the independent variables effectively explain variations in DALY_NCDs. F-statistics are 2849.167, and the p-value is 0.000. It indicates that the model is statistically significant, meaning at least one independent variable significantly affects DALY_NCDs. Durbin-Watson statistics are 2.0414, and this value is close to 2, indicating no strong autocorrelation in residuals.

The coefficient of HCE is nearly zero, and likely, HCE has no significant impact on DALY_NCDs in this model. A negative and statistically significant relationship exists, with one percent increasing in gGDP, leading to DALY_NCDs 0.0019 percent decreasing, indicating that better economic conditions lead to a lower NCD burden.

Table 3: Multiple Regression Model

Dependent Variable: DALY_NCDs				
Method: Least Squares				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
HCE	-0.000001	0.00152	0.000009	0.999
gGDP	-0.00195	0.00042	-4.7014	0.000
INF	-0.00105	0.00018	-5.8413	0.000
LIQ	0.016481	0.02238	0.73657	0.463
LIT	-0.00855	0.00336	-2.5434	0.012
SSB	0.000354	0.00021	1.65026	0.101
TOB	0.098378	0.00737	13.3539	0.000
POP	0.097267	0.00634	12.2411	0.000
C	4.371663	0.17925	24.389	0.000
R-squared	0.792585	Mean dependent var		4.1333
Adjusted R-squared	0.792236	S.D. dependent var		0.0206
S.E. of regression	0.001815	Akaike info criterion		-9.735
Sum squared resid	0.000491	Schwarz criterion		-9.58
Log likelihood	772.2241	Hannan-Quinn criter.		-9.672
F-statistic	2849.167	Durbin-Watson stat		2.0414
Prob(F-statistic)	0			

Interestingly, we find a statistically significant negative association between inflation and DALY_NCDs, which is contrary to expectations. This result does not easily align with standard economic or health investment theory, as inflation is more commonly associated with reduced real purchasing power and increased fiscal constraints on public services, including healthcare. While one might speculate that inflationary pressures could shift demand from private to public healthcare, such dynamics are complex and unlikely to directly result in increased health investment. However, this contradictory finding may be attributed due to the study period encompassing the COVID-19 pandemic during which higher healthcare investment remained high despite the inflationary conditions experienced by the country.

According to the results, there is a positive relationship between government taxes on alcoholic beverages and DALY_NCDs; however, it does not have a statistically significant impact on DALY_NCDs. There is a significant ($p < 0.01$) and negative relationship in terms of literacy, meaning higher literacy reduces DALY_NCDs, as expected. Educated individuals are likely to adopt healthier lifestyles. Surprisingly, a significant ($p < 0.05$) and positive relationship between DALY_NCDs and SSB taxes was found, indicating that higher taxation may not always lead to improved health

outcomes without complementary measures. Further, there is a highly significant ($p < 0.01$) and positive relationship between government taxes on tobacco and DALY-NCDs. Although a positive relationship is observed between higher tobacco taxation and DALY_NCDs, this may reflect a reverse relationship. Higher tobacco taxes might lead users to switch to other harmful substances (like cheaper smokeless tobacco or alcohol), not reduce overall risky behavior, thus maintaining or even increasing DALY_NCDs.

The higher proportion of the ageing population (60+) in the population is positively associated with increased rates of DALY-NCDs in Sri Lanka. Non-communicable diseases (NCDs) such as cardiovascular diseases, diabetes, cancer, and chronic respiratory diseases are more common among older adults. As Sri Lanka's elderly population grows, lifestyle changes and unhealthy diets cause the prevalence of NCDs, contributing to a higher disease burden.

Discussion

The Preston Curve (1975) suggests that economic growth leads to improvements in health outcomes. As GDP per capita increases, countries can afford better healthcare services, improved nutrition, and higher standards of living, which reduce the disease burden measured by DALY_NCDs (Disability-Adjusted Life Years due to Non-Communicable Diseases). The regression result aligns with economic theory, where a 1% increase in gGDP leads to a decline in DALY_NCDs, signifying that economic growth contributes to a healthier population. However, the magnitude of this effect depends on how economic gains are distributed and whether healthcare investments are prioritized.

According to Grossman's Human Capital Model (1972), healthcare spending is expected to enhance health outcomes by improving access to medical services, preventive care, and advanced treatments. However, it is important to acknowledge that the period under analysis coincides with the COVID-19 pandemic, which likely had a significant impact on variable interactions and may have compromised data quality. Moreover, in the immediate aftermath of the pandemic, Sri Lanka experienced a severe economic crisis that left many socio-economic sectors highly vulnerable. This period of economic instability, compounded by political and social uncertainty, has had a detrimental effect on livelihoods and overall well-being (Ruzaik, 2021).

Economic theory suggests that high inflation can reduce real incomes, affecting access to healthcare and nutritious food, thereby worsening health outcomes. However, the regression shows a negative and significant relationship between inflation and DALY_NCDs. Inflation may increase healthcare costs, leading governments to increase public health spending to offset these effects.

The Grossman Model (1972) suggests that higher education improves health outcomes, as educated individuals are more likely to adopt healthy behaviors and effectively utilize healthcare services. Cutler & Lleras-Muney (2006) show that higher education leads to better knowledge about health risks, increased demand for

preventive care, and improved disease management. Educated individuals are more likely to avoid unhealthy behaviors, such as smoking and excessive alcohol consumption, leading to lower NCD burdens. The regression confirms that higher literacy rates are associated with lower DALY_NCDs, emphasizing the role of education in reducing the disease burden.

Theoretically taxation on unhealthy goods (Pigouvian Tax) should reduce consumption, leading to better health outcomes. However, the regression shows that higher SSB taxation is associated with increased DALY_NCDs, which contradicts expectations. The possible reasons for this situation would be that consumers shift to alternative sugary products (e.g., milk products, processed snacks), reducing the intended health benefits of the tax or if the tax is too low, it might not significantly alter consumption behavior.

Tobacco taxes are considered an effective policy tool to reduce smoking rates and the associated health burden. However, the regression indicates that higher tobacco taxation is associated with increased DALY_NCDs, which is unexpected. The higher taxes may drive consumers towards smuggled or counterfeit tobacco products, which may be even more harmful. Further, some smokers may reduce quantity but increase intensity, inhaling more deeply or choosing stronger tobacco products. In Sri Lanka, tobacco taxes are linked to length of cigarette, so smokers switch to shorter cigarettes which are considered even more harmful. Therefore, the full benefits of reduced smoking due to taxation might not be immediate, requiring a longer time horizon for accurate measurement.

In Sri Lanka, about 55 percent of the population aged 60 years or older have experienced NCDs which are mostly associated with age-related cardiovascular diseases, cancers, diabetes, arthritis, depression, dementia, and Alzheimer's diseases (Perera, 2017). The positive relationship between the proportion of the elderly and the DALY_NCDs in Sri Lanka highlights the urgent need for targeted interventions such as strengthening geriatric healthcare, promoting active and healthy aging, enhancing social support systems, and improving NCD prevention strategies to reduce the burden of disease among the elderly.

The findings of this study offer important policy implications in light of the rising NCD burden in Sri Lanka. The limited effectiveness of current health taxation strategies suggests the need for a more comprehensive approach. Fiscal authorities should be made aware that standalone taxation may not sufficiently curb NCD prevalence unless it is integrated with broader public health initiatives. This includes expanding health literacy programs, promoting behavioral change, and implementing other risk reduction strategies. Given the significant macroeconomic and household-level consequences of the growing NCD burden, a multisectoral approach linking fiscal, health, and education policies is essential for sustainable impact.

Conclusion

This study investigates the effects of health-based taxes on DALY_NCDs in Sri Lanka from 2017 to 2022, employing a set of demographic and socio-economic variables.

The findings of this study highlight the complex interplay between economic, fiscal, and health policies in determining the burden of non-communicable diseases (NCDs), measured through Disability-Adjusted Life Years (DALY_NCDs). While some results align with established economic and public health theories, others suggest unintended consequences of policy interventions, necessitating a more effective approach to health and fiscal policymaking. The negative relationship between gGDP and DALY_NCDs confirms that economic prosperity leads to improved health conditions, likely through better access to healthcare, higher living standards, and increased government expenditure on public health infrastructure. Similarly, higher literacy rates significantly reduce the burden of NCDs, emphasizing the role of human capital investment. Governments should prioritize inclusive economic growth and universal education policies to ensure that increased prosperity translates into better healthcare access and improved health literacy. Investing in education, particularly in health-related awareness and knowledge of preventive care, can significantly reduce the burden of NCDs.

At the same time, fiscal policies need to be refined to maximize the public health impact. This involves optimizing targeted taxation policies by implementing higher tax rates on sugar-sweetened beverages, tobacco, and alcohol, ensuring robust enforcement mechanisms to prevent illicit trade, and introducing complementary behavioral interventions such as public education campaigns and alternative subsidies for healthier options. Moreover, rather than focusing solely on increasing healthcare expenditure, governments should prioritize efficiency in healthcare delivery by investing in preventive care programs, enhancing primary healthcare accessibility to all, particularly targeting elderly people, and implementing digital health solutions to improve service delivery while reducing costs.

To effectively reduce the burden of non-communicable diseases (NCDs), health taxation should be well combined with health literacy initiatives and broader risk reduction strategies. While taxes on tobacco, alcohol, and sugary beverages can discourage harmful consumption, their impact is significantly enhanced when paired with public awareness campaigns that educate individuals about the risks of unhealthy behaviors. Health literacy empowers people to make informed lifestyle choices, increasing the effectiveness of fiscal measures. Additionally, complementary interventions such as raising physical activity, improving access to nutritious foods, and strengthening primary healthcare are crucial in addressing the root causes of NCDs. This integrated approach is vital from a public health standpoint and necessary to mitigate the broader economic consequences of NCDs, which strain national health budgets, reduce labour productivity, and push households into poverty due to high out-of-pocket medical expenses. Therefore, a coordinated policy framework that links taxation, education, and prevention is essential for achieving long-term health and economic sustainability. Finally, future research should place greater emphasis on examining the impacts of the COVID-19 pandemic and exploring gender-based differences, as these factors may significantly influence health-related behaviors, economic vulnerability, and access to healthcare services. Incorporating these dimensions can lead to more comprehensive and context-sensitive findings, ultimately

contributing to the development of targeted and equitable tax policy interventions in reducing NCDs.

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