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# Reducing Noncommunicable Disease Risk Factors in Adolescents: An Investment Case for India

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Noncommunicable diseases (NCDs) are diseases that are not caused by an infection and not spread through contact with another person.

Noncommunicable diseases (NCDs) such as cardiovascular disease, diabetes, cancer, respiratory disorders, and mental and neurological disorders are the cause of 55% of deaths in India.[1] Adolescents—young people between the ages of 11 and 19—make up 21% of India's population.[1] Their ongoing neural, psychosocial, and physical development makes them especially vulnerable to the four main risk factors for NCDs[2,3]:

*Unhealthy diet, lack of physical activity, alcohol use, and tobacco use*

In this brief, we examine the benefits and costs of a set of effective interventions for reducing NCD risk factors among adolescents in India. When people initiate these (and other) unhealthy behaviors in adolescence, they often adopt these behaviors for life, which increases their risk for NCDs as they age. The three dominant NCD risk factors affecting adolescents are alcohol, tobacco use, and physical inactivity.

## What You Need to Know

- Adolescents make up 21% of India's population.
- Adolescents are frequently exposed to risk factors for NCDs, putting them at high risk of lifetime diseases and early death.
- Implementing evidence-based interventions that target adolescents could avert between 900,000 and 4.2 million premature NCD deaths from 2020 to 2070.
- Avoiding these deaths would provide economic benefits ranging from USD 5 billion to USD 36 billion.
- One way to reduce key NCD risk factors for adolescents in India such as the use of tobacco, the consumption of sugar-sweetened beverages, and the harmful use of alcohol—is the use of well-designed excise taxes.

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About 1.7% of adolescent boys and 2.4% of adolescent girls in India are overweight.[4] Between the ages of 15 and 19, about 11% of adolescent boys and 1% of adolescent girls consume alcohol, with 3% consuming daily; and 29% of adolescent boys and 4% of adolescent girls use tobacco. Because of unhealthy diets and physical inactivity, prediabetes is on the rise among adolescents.[4,5] These risk factors can be modified, and adolescence presents an important opportunity to reduce them.[3]

The Government of India and nongovernmental organizations (NGOs) have prioritized reducing and preventing NCDs among India's adolescents. The Government has implemented the Mid-day Meal Scheme in schools across the country to improve healthy food habits, increase student school attendance, and improve children's nutritional status. Additionally, the Food Safety and Security Authority of India (FSSAI) issued guidelines for more transparent and accessible food nutrition labels, taxation, and regulation of children's food advertisements. Through the FSSAI's Safe and Nutritious Food campaign, initiatives are under way to deliver safe and nutritious food to the people of India by way of Project Clean Street Food. This project trains street food vendors in proper food handling and hygiene. It also helps children adopt and maintain healthy food habits by providing Health and Wellness Coordinators in schools to deliver messages about eating nutritious food.[6]

Donor programs aimed at adolescent health have made major investments in tobacco control among youth but have not targeted other NCD risks influencing youth health behavior. The emphasis in donor programs has been on sexual and reproductive health and HIV/AIDs prevention, whereas the budget for donor programs targeted to adolescents remains small—only 2.2% of total developmental assistance for health in 2015.[7] If the current trend of adolescent NCD risk exposure continues, by 2060, there will be 20 million premature deaths globally at an economic cost of USD 300 billion.[8]

# Making the Investment Case for India

This NCD risk factor investment case shows the benefits of investing in cost-effective, policy-level interventions for adolescents in India to reduce the risk of acquiring NCDs later in life.

## Approach

We estimated the health and economic gains that could be realized through maximum implementation of select evidence-based interventions targeted at tobacco use, harmful use of alcohol, and obesity among adolescents in India. We looked at the current implementation level for these interventions in the country and assessed how closing the gap between current and maximum implementation could reduce premature death among adolescents. Additionally, we estimated the economic consequences of not fully implementing these interventions throughout adulthood to age 70; ultimately, the cost of inaction.

## Interventions

We conducted structured literature reviews from 2000 to 2018 using multiple databases to identify tobacco, alcohol, and obesity interventions in India designed specifically for adolescents. We also searched World Health Organization (WHO) materials and India's Ministry of Health and Family Welfare's policy documents, then reviewed their relevant citations and recommendations. Additionally, we conducted stakeholder interviews with country experts in each domain to substantiate and finalize our selection of interventions.

Although we were not able to identify interventions implemented among Indian adolescents for each of our risk factors, we applied the best available evidence from India and other contexts. Our review suggests that intersectoral and fiscal policies are promising for improving health in India. The most promising interventions and the estimates of their effectiveness used in our analysis are summarized in Table 1.

## Tobacco Use

The most likely factors to have an impact on tobacco use among adolescents are an increase in the excise tax on tobacco products and school-based interventions to address tobacco use.

*Tobacco taxes* are often seen as a "win-win" because they lead to improved health outcomes and contribute to government revenue, which can be used to further tobacco control or other public health programs. Currently, India has about a 64% tax on cigarettes (which includes a Goods and Services tax [GST]), Cess (an additional tax over existing tax to raise funds for a specific purpose), and an excise tax.[9] However, this level is still below the WHO's recommendation to tax tobacco at 75% of the price. Further, the WHO recommends relying on excise taxes.

For this study, we defined maximum implementation of the tobacco policy as rapid achievement of the target level of excise tax in India. We estimated the percentage price increase to reach the WHO-recommended level of taxation by using the state average price of cigarettes[10] to calculate the amount untaxed and the absolute price needed for a 75% tax. We then used published data to calculate the reduction in adolescent smoking prevalence that would result from the tax increase.

**Table 1.** Adolescent Noncommunicable Disease Risk Factor Interventions Selected for Modeling in India[a]

| RISK FACTOR | OUTCOME | INTERVENTION | ESTIMATE OF EFFECTIVENESS | SOURCE |
|---|---|---|---|---|
| Tobacco use | Reduce monthly smoking prevalence among adolescents | Increase in excise tax to 75% of final retail price of tobacco products | For every 10% increase in price, smoking prevalence declines by 2.8% among male adolescents and 6.0% among female adolescents | Joseph and Chaloupka, 2014[10] |
| | | School-based intervention (Mobilizing Youth for Tobacco-Related Initiatives in India) | Full implementation leads to a 17% reduction in the chance of smoking | Perry, Stigler, Arora, & Reddy, 2009[11] |
| Harmful use of alcohol | Reduce heavy episodic drinking (having 5 or more than 5 drinks in a row during the past 30 days) among adolescents | Increase in 50% excise tax as compared with current levels | For every 10% increase in price, binge drinking declines by 10% | Mahal, 2000[16] |
| Obesity (High body mass index [BMI]) | Reduce the population mean BMI among adolescents | Addition of 20% excise taxes on sugar-sweetened beverages | A 10% increase in price will lead to a 9.4% decrease in consumption, considering an elasticity of -0.94 | Basu, Vellakkal, Agrawal, Stuckler, Popkin, & Ebrahim, 2014[20] |
| | | School-based nutrition and physical activity programs to reduce obesity or overweight | Program implementation leads to a long-term -0.29 kg/m$^2$ reduction in BMI | Meng, Xu, Liu, Van Raaij, Bemelmans, Hu, & Ma, 2013[22] |

[a]The highlighted effectiveness estimates are from studies done in India.

*Intervention programs* that target youth in schools are an effective strategy to curb the tobacco epidemic in India.[11,12] For the school-based intervention, we drew from the Mobilizing Youth for Tobacco-Related Initiatives in India program, which showed a substantial decline in tobacco use.[12] We accounted for the fact that some adolescents do not attend school and adjusted our calculations to reflect secondary school completion rates in India.

## Harmful Use of Alcohol

We identified excise tax increases on alcohol as being most likely to reduce the harmful use of alcohol among adolescents in India. Excise taxes on alcohol are a major source of revenue for all Indian states, except states with a complete ban on alcohol. Although there is no fixed target for alcohol tax levels in India, the WHO suggests a 50% increase over current tax rates for harmful use of alcohol.[13,14] We calculated the reduction in heavy episodic drinking prevalence based on a 50% tax increase and estimates of effectiveness from the literature.[15,16]

## Obesity

Sugar-sweetened beverage (SSB) sales have risen 13% every year in India since 1998.[17] We identified excise taxes on SSBs and school-based physical and nutrition education programs as being most likely to reduce obesity among adolescents. Also, school-based programs that encourage physical activity and teach children about nutrition have shown promise in reducing obesity. In most countries, schools are a logical site for programs that encourage healthy diet and lifestyle habits.[18] We defined maximum implementation of the two interventions as uniform execution of an SSB tax and scale-up of the nutrition and physical activity programs to every adolescent currently attending school in India.

For ***SSB taxes***, we collected SSB consumption data for India,[19] estimates of tax effectiveness,[20] and information on the relationship between SSB consumption and

body mass index (BMI)[21] to calculate reduction in mean BMI among adolescents in India. In 2017, the new GST tax[9] system in India imposed a 28% tax on SSB consumption. Because this system has yet to take full effect, we used this tax level to evaluate the potential benefits.

For the *school-based education intervention*, we drew evidence from a multicomponent model of a nutrition and lifestyle intervention for adolescents conducted in Chinese schools.[22] We adjusted our calculations based on secondary school completion rates in India.

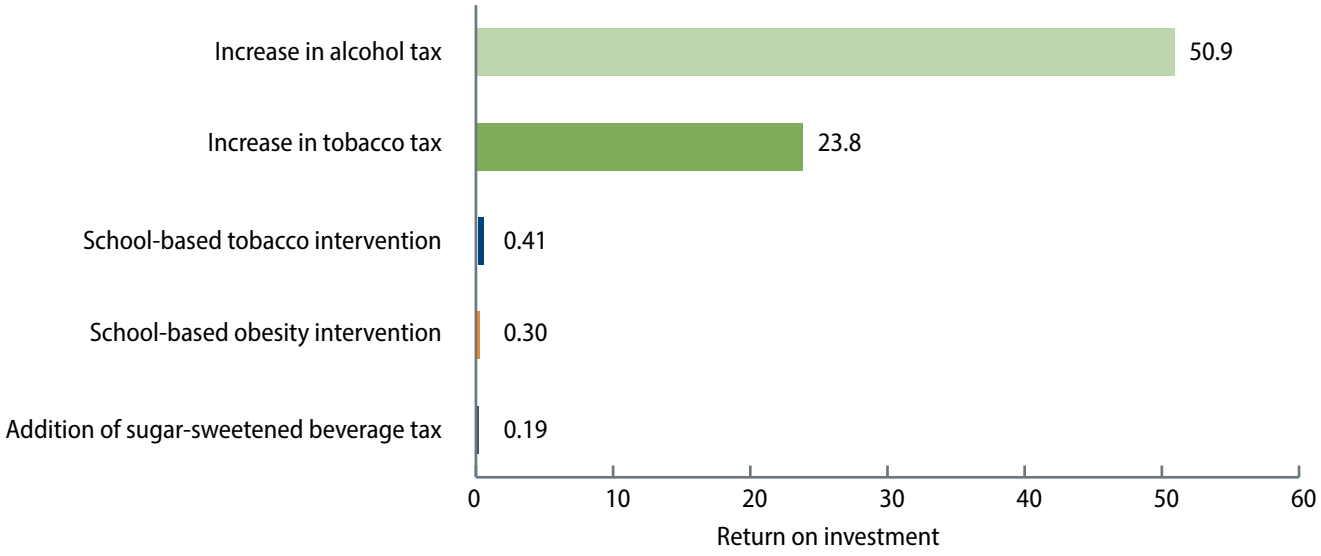
## What We Found

Implementation of adolescent-specific interventions for the three main NCD risk factors—tobacco use, harmful use of alcohol, and obesity—would result in the following significant health and economic benefits for India over the long term:

- By increasing tobacco taxes and implementing school-based tobacco programs, an estimated 1.9 million premature deaths from tobacco use could be avoided over the next 50 years.
- Full implementation of legislated SSB taxes and implementation of school-based obesity programs, and an increase in alcohol taxes will avert 330,000 and 1.2 million premature deaths, respectively.
- Together, these interventions would provide an economic benefit of USD 22 billion from 2020 to 2070 (INR 1.5 trillion),[b] or USD 440 million annually (INR 29 billion). The tobacco interventions would provide annual economic benefits of 200 million (INR 14 billion), alcohol control interventions would provide USD 190 million (INR 13 billion), and the obesity interventions would provide USD 42 million (INR 2.8 billion) annually.[c]

The return on investment (ROI) for each intervention category over more than 50 years is shown in Figure 1. In India, increasing alcohol taxes has the highest ROI (50.9), followed by increasing tobacco taxes (23.8). Neither the school-based interventions nor the SSB excise tax is cost-beneficial.

**Figure 1.** Return on investment (ROI) for tobacco, alcohol, and obesity interventions for India (2015–2070)




[b] Based on the average 2016 exchange rate of 67.195 rupees per USD.

[c] Numbers may not add because of rounding. All figures are rounded to the second significant digit.

To the extent possible, our intervention scenarios are based on experience in India to demonstrate what can be achieved with maximum effort. Reducing tobacco use, harmful use of alcohol, and obesity beyond the levels assumed here may be possible by implementing a broader set of interventions. However, the evidence for additional India-specific interventions is lacking, and additional research is needed to support this assertion.

# Discussion

Policy and programmatic actions to support adolescents to live long and healthy lives have not been fully explored by donors and governments. In India, where one-fifth of the population is between the ages of 11 and 19, it is imperative that central, state, and local governments prioritize NCD prevention during adolescence by implementing cost-effective interventions to reduce NCD risk factors, curb the NCD epidemic, avoid premature deaths, increase productivity, and improve the well-being of the future generation.

The low ROI on obesity reduction among school children does not imply that this is a poor solution. The cost of implementing the intervention in schools is high, but the intervention example has shown cost-effectiveness in China. With additional trials to adapt the school-based intervention in other contexts, we anticipate that the implementation costs would decline and the benefits would grow, especially in countries with high and rising youth obesity.

## Recommendations

Because the increasing NCD risk in India threatens to reduce the life expectancy of today's adolescents, the following set of recommended interventions will provide multiple options for the country's NCD action plans:

- **Taxation** for tobacco, alcohol, and SSBs should be a top priority at the country level.
- **Advocacy** for these policies, at the country and global levels, should emphasize the benefits to adolescents.
- **School-based programs** are effective, but they can be resource intensive. However, the school-based intervention needs to be tried in different states of the country, which would be expected to reduce the cost over time and make the intervention a better investment.

## Study Limitations

Our assessment of lives saved relies on existing projections[23] of population size and structure during the next several decades and the presumption that current death rates will continue in the future, absent changes such as those identified. To the best extent possible, we used Indian adolescent-specific data, although we had to rely on a small number of rigorous intervention studies for reducing NCD risk factors.

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